POLITECNICO DI TORINO

Department of Ingegneria Informatica, del Cinema e Meccatronica Master of Science in INGEGNERIA INFORMATICA (COMPUTER ENGINEERING)

Master's Thesis

Project and implementation of a multifaceted score system for online gaming



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To my family, I will be forever in their debt.

"Sé valiente. Toma riesgos. Nada puede sustituir la experiencia" Paulo Coelho

Summary

Nowadays, Gamification is a very effective technique used for any kind of business that seeks to maintain the interest and motivation of its members over time. Typically this concept applies to business that looks for keeping customers nearly from the business even they donât have to. This technique can encourage people to use a system in a voluntary and fun way, in which they can experience it in a game-like environment. Unfortunately, the implementation of the game design processes are complex and are not integrated in the software development processes of the organizations.

This work proposes the enrichment of the actual MAK07 system thanks to the integration of the Gamification technique on software development methodologies and designing of point system and levels. Additionally the classification of the input data by clusterization which is a data mining technique.

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Chapter 1

Introduction

The first best known mobile game is Snake (1997) which was preinstalled in all devices of Nokia that arrives to 350 million. The limitations of that times are related to hardware, the game was shown on a screen of monochrome dot matrix and one single channel tone. since this point the evolution of mobile games grows in parallel with the improvement of the smartphone technology.

The Gamification technique [3] is widely used in contexts other than games in which it seeks to create changes in user behavior in front of a system, either for external or internal purposes of an organization. It is usually used to take advantage of human psychology behaviors against the game systems creating a sense of engagement or hooking of people experiencing the system as a game[3].

The use of Gamification has been growing rapidly in numerous software developments due to its efficiency, examples such as Facebook [8], Foursquare [9], LinkedIn [10] use elements of Gamification in their systems and it is how they have achieved great acceptance in all the world [7] [3].

Gamification can be present in any aspect of life for example Social media the 3 most popular are Facebook 78.804.144, Instagram 67.932.248, Youtube 26.645.304, sports the 3 most popular are Nike+ Run Club 721.116, InstaFit 4.382, Runtastic 834.595, RunKeeper 504.407 Endomondo 570.057. The most popular Language learning apps are Duolingo 6.436.766, Memrise 1.126.271, Babbel 280.306, Rosetta Stone 175.891. Educational Games like Math Games 1.868, Maestro de matematicas 4.817, Mental calculation 775, Mental 17.296, Math games 40.760, Brain training 119.896, MathMaster 4.731, Math Master â Brain Quizzes Math Puzzles 4.083, Ruzzle 336.012 [1].

Nowadays everyone can develop mobile applications and sell or distribute it on a market like Play store for android or App store for iOS. At the time you create the product, you must know the type of customers target that the application wants to have. the most used are:

1. Buy and play it all: User buy the game on the market in order to get it. 2.

Advertisement income: Games that accept adds that generate money every time a user play and visualize them. 3. F2P or free to play: Game played for free, payment of some booster or additional elements can be done with real money. [2][4]

1.1 Scope of the thesis

1.1.1 Context description

is a game developed by Tonic Minds s.r.l. This game allows to the user to Combine the 7 numbers of a scheme using the four basic operations (addition, multiplication, subtraction and division) in order to get 0 as the final result. The idea with this thesis is to design a solution using elements of Gamification a new version of taking in count previous constraints and necessities of the client and game in order to increase downloads and generate incomes.

1.1.2 Actual achievements of MAK07

In v1 of the user was allow to play and know the score done by each schema, In v2 of the score was keep by the system, v3 of was develop the challenge mode game in which the user is allow to challenge another player to solve as much schemas as possible in certain time. v4 of was develop the chat. On v5 of was develop the tournaments.

1.1.3 Actual drawbacks of MAK07

has 43 users on play store and App Store is 500 which is not too much and also the application is free and has any mobile gaming business model in order to earn money. The points system is poor and the input combination and permutation of numbers are not classified in a way to classified them as easy medium or hard to play.

is classified as a math game and not many users has interest of this kind of games compared to adventure or strategy games.

1.1.4 Problem to solve

How to improve the number of downloads and generate some income with Gamification in a multifaceted score system for online gaming?

1.1.5 Justification

As many mobile applications in the world, the number of downloads, rating and feedback are important to improve and somehow earn money. [6] [11] the objectives are:

1. Incorporate elements of Gamification into MAK07 taking in count the already developed system

- 2. Improve the point system of MAK07
- 3. Establish the Level system of MAK07
- 4. Classify the input combination and permutation numbers of MAK07 in order to assign schema according with the level of difficulty and level of the player.
- 5. Improve the number of downloads of MAK07.

1.1.6 Impact expected

MAK07 users will download and play voluntary, fun and in a continue way. All kinds of players will play and discover elements of Gamification that supply their interest.

The documentation of MAK07 about analysis and design will be complete and it can remain as a reference material and as a deliverable for the client

Chapter 2

State of art

2.1 Gamification

Gamification is the use of game elements and game design techniques in non-game contexts [3]. Although it seems simple, Gamification is much more than its elements, since the game design techniques are not easy, much less obvious, a technical and strategic approach is needed to achieve the success of its implementation [3] [18] [12]. Gamification arose in the study of business from the need to find methods to motivate customers or employees of an organization using new techniques due to the high competitiveness and the changing context of the companies. Since the games are really effective in using human psychology to "hook" (better known as Engagement) to players [3] [7] using elements such as: Points, levels, rewards, progress bars, avatars, badges, social systems, among others; Many companies began to implement this series of elements to motivate customers or their employees in their businesses [3].

2.2 Benefits of gamification

Each business that wants to have employees or developed products that wants to have happy users should use Gamification. Following I describe 3 main reasons why Gamification can improve the business and product results.

2.3 Engagement

The objective of Gamification is to get engagement of users[7][3]. Being a game designer is thinking about how to get your target audience engaged by taking advantage of the elements of the games and managing to change the behavior of the target audience. Many times we have felt a certain addictive feeling towards a game, however simple it may be, since the games provide some pleasure and Gamification takes advantage of this quality of the games to use it in contexts that are not games [3].

Gamification can offer a powerful set of tools to develop challenges for customers, employees, user, player, for example some stores give points for making purchases and reward them with discounts with certain limit of redeemable points, or airlines have a system of miles for their clients, examples like these are pure Gamification and they produce an increase in Engagement and loyalty of people towards the business, achieving high profits and productivity results in many organizations.

2.4 Experimentation

A second aspect of the game based on motivation is to open the space of experimentation, since to master the challenges presented in a game is all about experimentation for the player. For a player to feel a failure or loss is not so discouraging because you can always start from scratch and you will feel motivated to continue playing to improve your game experimentation. If the game is correctly designed, the player can not always lose, the game will lead him to strive to improve his skills and win [3] [7]. In systems with gamification, it is important to provide an environment of experimentation, not very complex or too easy, that produces motivation in the target audience to overcome a challenge. Gamification elements of real life that achieve experimentation are the levels, the medals, teams, challenges, among others [3] [7].

2.5 Results

The results is the third reason why Gamification is a valuable technique to use in numerous contexts other than games. Currently Gamification has taken great strength [3] [7] in organizations, which have obtained great results by incorporating game elements into their Business processes such as Nike [?], Facebook [8], American Express [20], Microsoft [21], Samsung [22], among others. The results that can be achieved with gamification are to maintain the motivation and interest of the users over time [3]. Organizations that have incorporated gamification have obtained great results [7] [23] translated into an increase in the number of clients, higher sales, advertising with voice to voice, customer loyalty, among many others.

2.6 Related works

In market there are many games related to education focused on maths operations, the following table describe the relation between level points and time after have played several times in order to find their gamification point system.

In addition, the devices' specifications are shown in table 2.1 2.2 2.3 2.4.

2.6 – Related works

Game name	Form	Image		
Math Games	Level	Points	Time	Juegos de mater
/Juegos de	1 - 10	20	10	Pavel Ölegovich
Matemáticas	11 - 20	40	8	Prueba de matemáticas es un juego educativo
	21 - 30	60	6	+-×÷ para todo el mundo!
	31	80	4	***** 0
Juegos Mentales:	Points	Hearts	Reaction	Juegos Mentale:
Entrenamiento	Number of	(Number of cor-	Milliseconds	Peoresnada.com
Cerebral /	correct ques-	rect questions	sends on	Entrene su cerebro con +50 divertidos juegos
Mental	tions - wrong	* 100)/Total of	gaming	para la memoria, stención
	questions	questions		***** 0
	done			

Table 2.1: Related Works

Game name	Formula		Images	
MathMaster /	Points	Starts		Maestro en mate
Maestro en	7500 - $(250 * number of$	Max 3	Maestro en matemáticas	Juego matemático. ¡Calcule mentalmente!
Matematicas	penalties)		+-×÷	¡Desarrolle tu mente!
				***** 📀

Table 2.2: Related Works cont. 2

Game name	Formula		Images
	Level	Range	
	1	0 - 250000	
	2	0 - 250000	
Math Master -	3	0 - 250000	Math Master - Br
Brain Quizzes	4	0 - 250000	
and Math	5	0 - 250000	+ ? + ? , Retos y exámenes matemáticos gratuítos para todas las edades'
Puzzles	6	0 - 250000	para todas las edades: *****
1 uzzies	7	0 - 250000	
	8	0 - 250000	
	9	0 - 250000	
	10	0 - 250000	
	Points	Hearts	
	(100 * Number of	5 Herts which	Cálculo mental
Mental	hearts) + $(-0,0491$	means 0 errors	Volodymyr Kuprych
Calculation	(Time in seconds) $*$	4 hearts which	Pon a prueba tus habilidades en el cálculo mental
Calculation	EXP(2) + 21,585	means 1 error	****
	(Time in seconds) +	3 Hearts which	
	3853,5)	means 2 errors	
		2 Hearts which	
		means 3 errors	
		1 Heart which	
		means 4 errors	
		0 Hearts which	
		means 5 errors	

Table 2.3: Related Works cont. 3

2.6 – Related works

Game name	Formula found to assign points			Image
	Level	Coins	+Points	
Maestro de	1	5		
Matematicas	2 - 6	6	-	
	7-13	7		
	14 - 19	8	Time (Mil-	Maestro de mate
	20 - 25	9	liseconds)	;Aprende, practica y
	26 - 31	10	+100 *	evalúa tus conocimientos de matemáticas de forma
	32 - 37	11	(Number of	****
	38 - 43	12	shields)	
	44 - 49	13		
	50 - 54	14		
	55	15		

Table 2.4: Related Works cont. 4

Chapter 3

Methodolgy

3.1 MAK07

MAK07 came from an idea of desider of a customer who wants to produce some income having fun playing a math game. Tonic Minds start to develop this game since 2017 The following image was the proposal to implement progressively the components of MAK07 [figure 3.1].

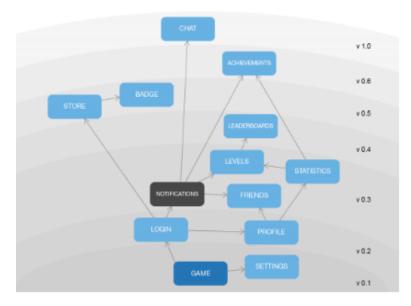


Figure 3.1: MAK07 proposal implementation

In v1 of MAK07 the user was allow to play and know the score done by each schema, In v2 of MAK07 the score was keep by the system, v3 of MAK07 was develop the challenge mode game in which the user is allow to challenge another player to solve

3 – Methodolgy

as much schemes as possible in certain time. v4 of MAK07 was develop the chat. On v5 of MAK07 was develop the tournaments. This is a navigation map of version 1 of MAK07 [figure 3.2].

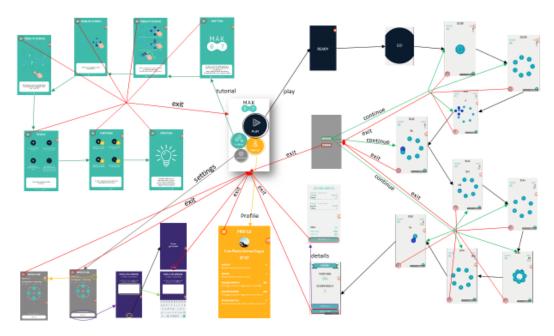


Figure 3.2: MAK07 version 1

The following image [figure 3.3] shows the progression of MAK07, notice that gamification components (orange lines) will be present and complement previous implementations.

Each of the following images will represent the gamified flow using all the gamification components inserted on MAK07 [figures 3.4, 3.5, 3.6, 3.7].

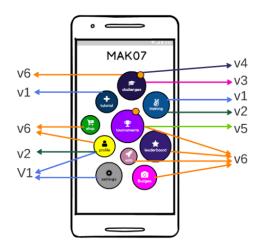


Figure 3.3: MAK07 visioning evolution

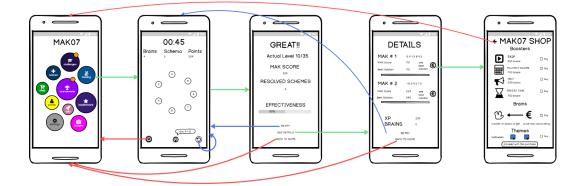


Figure 3.4: Training

3.2 Analysis and design

3.2.1 User cases MAK07

3-Methodolgy



Figure 3.5: Solo Game

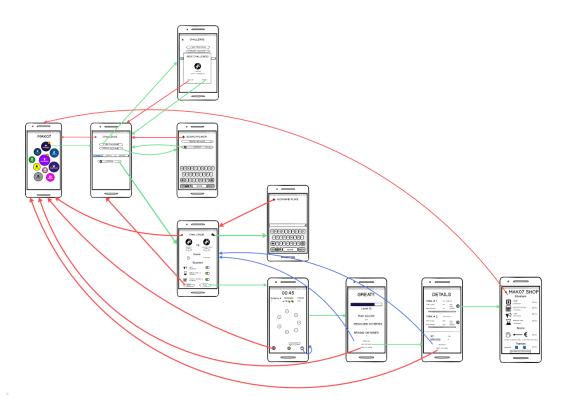


Figure 3.6: Challenge

3.2 – Analysis and design

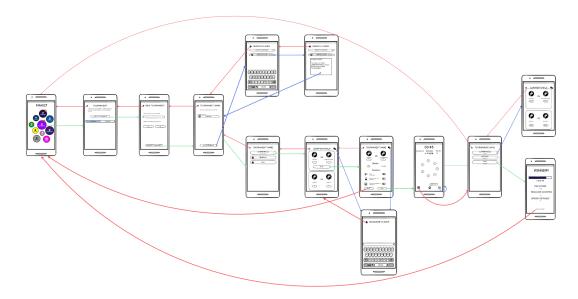


Figure 3.7: Tournament

User cases are classified in the following groups:

- UCH# that represents Home and general user cases [figures 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.20, 3.21, 3.22, 3.23, 3.24, 3.25, 3.26, 3.27, 3.28, 3.29, 3.30]
- UCS# that represents Settings user cases [figures 3.31, 3.32, 3.33, 3.34, 3.35, 3.36, 3.37, 3.38, 3.39, 3.40, 3.41, 3.42, 3.43, 3.44, 3.45, 3.46, 3.47, 3.48, 3.49, 3.50, 3.51]
- UCLOG# that represents Log in user cases [figures 3.52, 3.53, 3.54, 3.55, 3.56, 3.57, 3.58]
- UCP# that represents Profile user cases [figures 3.59, 3.60, 3.61, 3.62, 3.63, 3.64, 3.65, 3.66, 3.67, 3.68, 3.69, 3.70, 3.71, 3.72, 3.73]
- UCTU# that represents Tutorial user cases [figures 3.74, 3.75, 3.76, 3.77, 3.78, 3.79, 3.80]
- UC3-6P# that represents Progressive user cases [figures 3.81, 3.82, 3.83, 3.84, 3.85]
- UCSH# that represents Shop user cases [figures 3.86, 3.87, 3.88, 3.89, 3.90, 3.91, 3.92, 3.93]
- UCTR# that represents Training user cases [figures 3.95, 3.96, 3.97, 3.98, 3.99, 3.100, 3.101, 3.102, 3.103, 3.104, 3.105, 3.106, 3.107, 3.108, 3.109, 3.110, 3.111, 3.112, 3.113, 3.114, 3.115]
- UCSOLO# that represents Solo game user cases [figures 3.116, 3.117, 3.118, 3.119, 3.120, 3.121, 3.122, 3.123, 3.124, 3.125, 3.126, 3.127, 3.128]
- UCC# that represents Challenge user cases [figures 3.129, 3.130, 3.131, 3.132, 3.133, 3.134, 3.135, 3.136, 3.137, 3.138, 3.139, 3.140]
- UCTOUR# that represents Tournament user cases [figures 3.141, 3.142, 3.143, 3.144, 3.145, 3.146, 3.147, 3.148, 3.149, 3.150, 3.151, 3.152, 3.153, 3.154, 3.155, 3.156, 3.157, 3.158, 3.159, 3.160, 3.161, 3.162, 3.163, 3.164, 3.165, 3.166, 3.167, 3.168, 3.169, 3.170, 3.171, 3.172]
- UCLEAD# that represents Leaderboard user cases [figures 3.173, 3.174, 3.175]
- UCB# that represents Budges user cases[figures 3.176, 3.177, 3.178, 3.179, 3.180, 3.181, 3.182, 3.183, 3.183, 3.185]

UCH01			Consult Home		
Targ	Target of Use case User can consult the home interface of MAK07.			me interface of MAK07.	
Inputs User must already have an account associated to MAK07			an account associated to MAK07		
				login to MAK07	
Out	puts	Display the initia	l hom	e or the unblocked home.	
		Ba	asic fl	ow	
No	User		No	System	
1	User start navigate t functionalities	to MAK07			
			2	The system must display the unblocked or blocked home interface of MAK07	
		Inte	rface	view	
MAK07			MAK07		
	rnative flow 1:				
Alte	ternative flow 2: UCH22: Switch application on device in which MAK07 w				
Exte	nsions	continue run in background. UCH02, UCH03, UCH04, UCH05, UCH6, UCH07, UCH08, UCH09, UCH10, UCH11, UCH12, UCH13, UCH14, UCH15, UCH21, UCH22.			

3.2 – Analysis and design

Figure 3.8: Use Case UCH01

	UCH02	UNBL	оск	FUNCTIONALITIES OF HOME	
Target of Use case Unblock all functionalities (challenge, tournament, leaderboard game, badges and shop) of home					
Inputs User must already play the first tutorial and first training			the first tutorial and first training		
Out	puts	Home interface f	unctio	nalities will be unblocked	
		В	asic fl	ow	
No	User		No System		
1	User play the tutori	al game			
2	User play a training	, ,			
			3	System unblock challenge, tournament, leaderboard, solo game, badges and shop functionalities	
Interface view					
FROM					
Alte	Mternative flow 1: UCH21: Exit from MAK07				
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	ensions	ions UCH02, UCH03, UCH04, UCH05, UCH6, UCH07, UCH08, UCH09, UCH10, UCH11, UCH12, UCH13, UCH14, UCH15, UCH21, UCH22.			

Figure 3.9: Use Case UCH02

	UCH03 Consult tutorial			Consult tutorial		
Targ	Target of Use case Consult the tutorial of MAK07					
Inputs User must alre			ady have an account associated to MAK07			
		User must already		-		
Out	puts	User visualize the				
		Ba	asic flo			
No	User		No	System		
1	User select the tuto	orial from home				
			2	System shows the tutorial instructions		
		Inte	rface	view		
MAK07 MA						
Alternative flow 1: UCH21: Exit from MAK07						
Alter				lication on device in which MAK07 will		
continue run in backgrou			round.			
Exte	Extensions UCTU01					

Figure 3.10: Use Case UCH03

	UCH04			Consult profile
Targ	get of Use case	Consult user pro:	file of I	MAK07
Inpu	ıts		-	an account associated to MAK07 login to MAK07
Out	puts	User visualize hi	-	
		В	asic fl	ow
No	User		No	System
1	User select profile fi	rom home		
			2	System shows the user profile
		Inte	erface	view
	MAK07 MA			
Alte	Alternative flow 1: UCH21: Exit fr			AK07
Alter	Alternative flow 2: UCH22: Swite continue run in			lication on device in which MAK07 will round.
Exte	nsions	UCP01, UCP02	, UCP	03, UCP04, UCP05, UCP06, UCP07, UCP08, 11, UCP12, UCP13, UCP14, UCP15

Figure 3.11: Use Case UCH04

	UCH05			Consult settings
Targ	get of Use case	Consult the setting		
Inpu	ıts			an account associated to MAK07
		User must already		
Out	puts	User visualize the	setting	g interface of MAK07
		Ba	asic flo	DW
No	User		No	System
1	User select settings	from home		
			2	System shows the settings
		Inte	rface	view
MAK07				
Alte	Alternative flow 1: UCH21: Exit f			AK07
Alte	Alternative flow 2: UCH22: Swite continue run in			lication on device in which MAK07 will round.
Exte	ensions	UCS01, UCS02	, UCS	03, UCS04, UCS05, UCS06, UCS07, UCS08

Figure 3.12: Use Case UCH05

	UCH06			Consult shop
Targ	get of Use case	Consult the shop of	of MA	K07
Inpu	ıts	User must already	have	an account associated to MAK07
		User must already	have	login to MAK07
Out	puts	User visualize the	shop	of MAK07
		Ba	asic fl	DW
No	User		No	System
1	User select shop fi	rom home		
			2	System shows the shop
		Inte	rface	view
				Image: State of the state
Alte	Alternative flow 1: UCH21: Exit from MAK07.			AK07.
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	ensions	UCSH01, UCSH	H02, U	JCSH03

Figure 3.13: Use Case UCH06

	UCH07			Consult budges
Target of Use case Consult the collection		n of bu	1 of budges that a user has in MAK07	
Inpu	ıts			account associated to MAK07
		User must already ha	we log	in to MAK07
Out	puts	System shows the co	llection	n of budges of MAK07
		E	Basic f	low
No	User		No	System
1	User select bud	ges		
			2	System shows the list of budges that a user
				has collected until that time, some are in
				gray which means are blocked and others
				has their authentic colors.
	Interface view			
				C Cont Budge C Lost Budge C
Alter	rnative flow 1: UCH21: Exit from MAK07.			AK07.
Alternative flow 2: UCH22: Switch application on device			ation on device in which MAK07 will continue	
		run in backgrou		
Exte	nsions	UCB01, UCB02	2, UCE	303, UCB04

Figure 3.14: Use Case UCH07

UCH08			Play solo game	
Targ	get of Use case	Play the solo game of	f MAF	\$07
Inpu	ıts	User must already ha	ve an	account associated to MAK07
		User must already ha	ve log	in to MAK07
Out	puts			ne interface with a starting and finish point and
		path game, pointing v	where	the user is over the path
	-	E	Basic f	low
No	User		No	System
1	User play solo	game		
			2	System shows the interface of solo game
		Int	erface	view
		MAK07		MAK07 M
Alternative flow 1: UCH21: Exit from MAK07.				AK07.
Alter	Alternative flow 2: UCH22: Switch application on device in which MAK07 will contin run in background.			
Exte	nsions	UCSOLO01, U	CSOL	O02, UCSOLO03, UCSOLO05

Figure 3.15: Use Case UCH08

UCH09			Play tournament		
Targ	get of Use case	Play the tournament			
Inpu	ıts			account associated to MAK07	
		User must already ha			
Out	puts	System shows the tou	urname	ent interface	
		E	Basic f	low	
No	User		No	System	
1	User play tourn	ament			
			2	System shows the interface of tournament	
		Int	erface	view	
				Counter a la constante e a reasta e ana constante e a reasta e reasta e a reasta e a reasta e a reasta e reasta e a reast	
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:		UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	ensions	UCTOUR01, UCTOUR02, UCTOUR03			

Figure 3.16: Use Case UCH09

	UCH10			Play challenge
Targ	get of Use case	Play the challenge of	MAK	07
Inpu	ıts			account associated to MAK07
		User must already ha		
Out	puts	System shows the ch	allenge	e interface
	-	I	Basic f	low
No	User		No	System
1	User play chall	enge		
			2	System shows the interface of challenge
		Int	erface	view
Alte	Alternative flow 1: UCH21: Exit from MAK07.			AK07.
Alte	Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			cation on device in which MAK07 will continue
Exte	ensions	UCC01, UCC04	4, UCC	205

Figure 3.17: Use Case UCH10

	UCH11		C	Consult leaderboard
Targ	get of Use case	Consult the player le	aderbo	ard of MAK07
Inpu	ıts			account associated to MAK07
		User must already ha		
Out	puts	System shows the us	er lead	erboard interface
		H	Basic f	low
No	User		No	System
1	User select lead	lerboard from home		
			2	System shows the interface of leaderboard
		Int	erface	view
				WEFNICKNAME Level 10 Userson Userson
Alte	ternative flow 1: UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	ensions	UCLEAD01, U	CP01,	UCP2, UCP3, UCP4

Figure 3.18: Use Case UCH11

	UCH12			Play training	
Targ	get of Use case	Play the training of N	/IAK0	7	
Inpu	ıts		r must already have an account associated to MAK07 r must already have login to MAK07		
Out	puts	System shows the tra	ining i	interface	
		I	Basic f	low	
No	User		No	System	
1	User select train	ning from home			
			2	System shows the interface of training	
		Int	erface	view	
				OO:45 Brains Schema Points C C C C C C C C C C C C C	
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:		UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	nsions	UCTR01, UCT	R02, U	JCTR03, UCTR04, UCH16, UCH17	

Figure 3.19: Use Case UCH12

	UCH13			Show notification
Targ	get of Use case	Show notification of	MAK	07
Inpu	ıts	User must already ha	ve an	account associated to MAK07
_		User must already ha	we log	in to MAK07
Out	puts	System shows the no	tificati	ions of MAK07
		Η	Basic f	low
No	User		No	System
1	User has done a	an activity that trigger		
	the system to sh	now a notification.		
	An activity can	be chat message,		
		ber to play, alert for		
	challenge, alert	for tournament.		
			2	System shows the notification of the activity
				of MAK07
		Int	erface	view
		MAK07		
				TU:04 Thursday, 4 October
				A hold head on (199402)
Alte	Alternative flow 1: UCH21: Exit fro			AK07.
Alter	rnative flow 2:	UCH22: Switch	applic	ation on device in which MAK07 will continue
		run in backgrou	nd.	
Exte	nsions	UCH114, UCH	15, U	CC02, UCC10, UCH18, UC3-6P05, UCH20,
		UCB01		

Figure 3.20: Use Case UCH13

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	UCH14	Show nu	mber o	of new chat messages on challenge		
Targ	get of Use case	Show the number of	new cł	new chat messages on challenge of MAK07		
Inpu	its			account associated to MAK07		
		User must already ha	ve log	in to MAK07		
Out	puts	System shows the nu	mber o	of new chat messages on challenges of MAK07		
		E	Basic f	low		
No	User		No	System		
1	User start chatt	ing with a friend				
			2	System shows the number of new chat		
			erface	messages for an open challenge		
Alte	Alternative flow 1: UCH21: Exit from MAK07.			AK07.		
Alte	Iternative flow 2: UCH22: Switch application on device in which MAK07 will continu run in background.					
Exte	nsions	UCC10, UCC1	I, UCE	308		

Figure 3.21: Use Case UCH14

	UCH15	Show nur	nber o	f new chat messages on tournament	
Targ	get of Use case	Show the number of	new cł	new chat messages on tournament of MAK07	
Inpu	ıts			account associated to MAK07	
		User must already ha			
Outp	puts	System shows the MAK07	numbe	r of new chat messages on tournaments of	
		I	Basic f	low	
No	User		No	System	
1	User start chatt	ing with a friend			
			2	System shows the number of new chat	
			erface	messages for an open tournament	
Alter	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
	Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				
Extensions UCTOUR24, UCB08					

Figure 3.22: Use Case UCH15

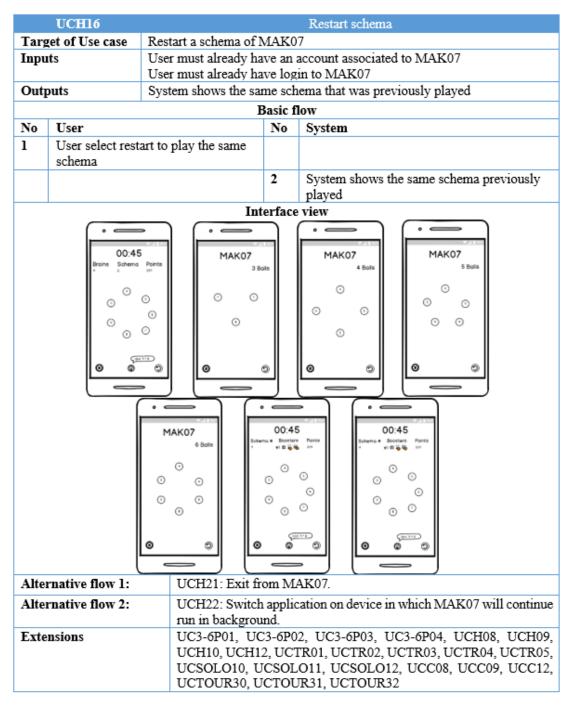


Figure 3.23: Use Case UCH16

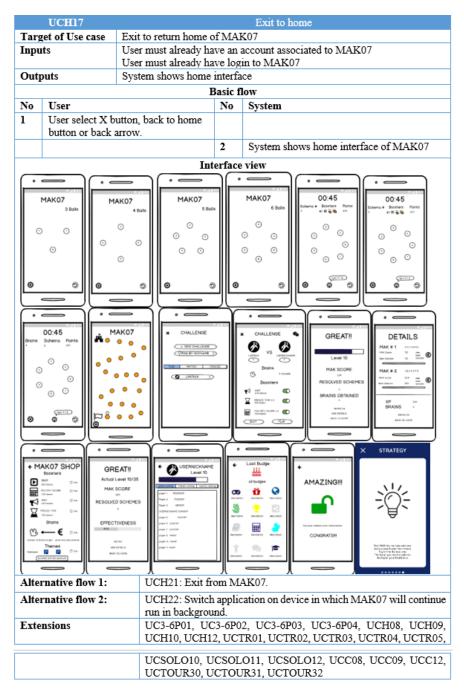


Figure 3.24: Use Case UCH17

	UCH18			Show new badge	
Tar	get of Use case	Show the new badge	won i	n MAK07	
Inputs User must already ha				account associated to MAK07	
User must already ha			ive login to MAK07		
Outputs System shows home		interfa	ice		
Basic flow		low			
No	User		No	System	
1	User has compl requirements to	eted some get the new badge			
			2	System shows the new badge won by the user on MAK07	
	1	Int	erface		
				AMAZING!! In decision of NAME DESCRIPTION decision	
Alte	rnative flow 1:	UCH21: Exit fr	om M.	AK07.	
Alte	rnative flow 2:	UCH22: Switch run in backgrou		cation on device in which MAK07 will continue	
Exte	ensions	-	-	UCB01, UCB03, UCB04, UCB05, UCB06, 311, UCH19, UCH20	

Figure 3.25: Use Case UCH18

	UCH19	Check re	quiren	nents of player has reach new level	
Targ	get of Use case	Check the requirement reach a new level	nts of next level of plater in order to see if a player has		
			account associated to MAK07		
-		User must already ha			
Outputs System shows unblo all requirements		cked b	oadge of new level in case user have complete		
		H	Basic f	low	
No	User		No	System	
1	User has compl to get new leve	eted all requirements l			
			2	System shows the new badge won by the user on MAK07	
		Int	erface	view	
Alter	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
Alter	rnative flow 2:	UCH22: Switch run in backgrou		cation on device in which MAK07 will continue	
Exte	nsions	UCB01, UCB UCB10, UCB1		CB03, UCB04, UCB05, UCB06, UCB08, 120	

Figure 3.26: Use Case UCH19

	UCH20 No			player have reach new level	
Targ	get of Use case		ave reach a new level of MAK07		
			we an account associated to MAK07		
	User must already ha				
Outputs System shows unblo all requirements		cked t	badge of new level in case user have complete		
		Basic flow			
No	User		No	System	
1	User has compl to get new level	eted all requirements			
			2	System shows the new badge won by the user on MAK07	
			3	System save the new level and new badge won on DB	
		Int	erface	view	
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
Alte	rnative flow 2:	UCH22: Switch run in backgrou		cation on device in which MAK07 will continue	
Exte	ensions	UCB01, UCB UCB10, UCB1	-	CB03, UCB04, UCB05, UCB06, UCB08, 119	

Figure 3.27: Use Case UCH20

	UCH21			Exit from MAK07
Targ	get of Use case	The user want to exit	from i	MAK07
Inpu				account associated to MAK07
User must already ha				
			th all d	lata saved until this point
		Basic f	low	
No	User		No	System
1	User exit from	MAK07		
			2	System save the information on DB
			3	System close the application MAK07
	1	Int	erface	view
			SETTIO	40 eve 1000 FRISING ended Arr

Figure 3.28: Use Case UCH21

	UCH22			ation run in background MAK07
Tar	get of Use case			g to run in background MAK07
Inpu	ıts			account associated to MAK07
		User must already ha	ave log	in to MAK07
			ckgrou	nd MAK07 and display another application
				low
No	User		No	System
1		ed the application o other installed on		
			2	System save the information in DB
			3	System display the interface of the other application and run in background MAK07
Alte	rnative flow 1:	UCH21: Exit fi	rom M	AK07.
Exte	ensions	UCH21, UCH0	1, UC	H23

Figure 3.29: Use Case UCH22

	UCH23 Resume MAK07			Resume MAK07
Target of Use case Allow the user to resume the previous state on MAK07				
Inpu	Inputs User must already ha			account associated to MAK07
	User must already ha			in to MAK07
Outj			interf	ace or previous interface where the user was
Basic flow			low	
No	User		No	System
1	User has switch MAK07	ed the application to		
			2	System display the interface of MAK07 where the user was before
	rnative flow 1:	UCH21: Exit fr		
Exte	nsions	UC3-6P(01-05)	, U UCC(CH22, UCS(01-08), UCP(01-15), UCTU01, CSOLO(01,02,05,07,08,09), UCTR(01-10), 01,04,05,06,07,10), UCTOUR(01-06,09,10), B(01-06)

Figure 3.30: Use Case UCH23

	UCS01			Enable sound	
Taro	Target of Use case Allow the user to ena				
				account associated to MAK07	
User must already ha					
User must already ha User must already ha					
Outputs The sound of MAK0					
•			Basic f		
No	User		No	System	
1	User has enable	ed the sound of			
-	MAK07				
			2	System enable the sound of MAK07	
		Int	erface	view	
				00 14470 VE 10 10 X0300(* X02710748201) X02710748201 X02710774 X027107777777777777777777777777777777777	
Alternative flow 1: UCH21: Exit from					
Ante	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
	rnative flow 1: rnative flow 2:	UCH22: Switch	applio	cation on device in which MAK07 will	
Alte			n applie backgr	cation on device in which MAK07 will round.	

Figure 3.31: Use Case UCS01

	UCS02			Set operations
Targ	get of Use case	Allow the user to set	the op	-
			ive an a	account associated to MAK07 in to MAK07
			the in	nterface for setting the operations position of
		H	Basic f	low
No	User		No	System
1	User has set the operations for p	position of playing MAK07		
			2	System displays the interface for setting the operations position of MAK07
		Int	erface	
		SETTING Inser, race Setting Setting		
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.
Alte	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.
Alte	rnative flow 3:	UCH17: Exit to	Home	;
Alte	rnative flow 4:	UCS09: Return	to sett	ings
	ensions	UCH05, UCS (09 11-	15)
Exte	ensions	001105, 005 (02,11	

Figure 3.32: Use Case UCS02

	UCS03			Choose theme
Tar	get of Use case	Allow the user to che	oose th	e theme of MAK07
Inputs User must already h User must already h User must already h			ave log	
· · · ·				erface for set the theme of MAK07
Basic flow			low	
No	User		No	System
1	User has click of MAK07	on choose theme of		
			2	System displays the interface for choose the theme of MAK07
		Inf	erface	
		× SETTIN	GS	
		SETTIN Investment Investment		
Alte	rnative flow 1:		1 (runtya el	Classics split (Pare)
	rnative flow 1: rnative flow 2:	UCH21: Exit fr	om M.	AK07. cation on device in which MAK07 will
Alte		UCH22: Switch	om M. applic backg	AK07. cation on device in which MAK07 will round.
Alte Alte	rnative flow 2:	UCH22: Switch continue run in	om M. applic backg	AK07. cation on device in which MAK07 will round.

Figure 3.33: Use Case UCS03

	UCS04			Rate us	
Targ	et of Use case	Allow the user to rate	e MAF	\$07	
Inpu			we an account associated to MAK07		
	User must already ha				
	User must already ha				
Outp			the int	erface of MAK07 on apple store or play store	
		H	Basic f	low	
No	User		No	System	
1	User has click o	on rate us button			
			2	The system saves the configuration and data on DB	
			3	MAK07 runs in background	
			4	The system displays the interface of MAK07	
				on apple store or play store	
		Int	erface	e view	
		SETTINGS Hear tool determine determine	line.	Image: Second Poly Image: Second Poly Image: Second Poly Image: Second Poly	
Alter	rnative flow 2:			cation on device in which MAK07 will	
.		continue run in	backg	round.	
Exte	nsions	UCH22			

Figure 3.34: Use Case UCS04

	UCS05 Like on Facebook				
			ication on MAK07 official Facebook web page		
			• • •		
-				account associated to MAK07	
User must already ha					
User must already ha Outputs The system displays					
Ծաղ	puis			AK07 official Facebook web page	
		ł	Basic f		
No	User		No	System	
1	User clicks on 1	ate us			
			2	The system displays the MAK07 official	
				Facebook web page	
		Int	erface	view	
		GETTTTTG Generous Generous		Alt 190 reads to CALLEND	
Alter	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
Alter	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.	
Alter	rnative flow 3:	UCH17: Exit to	Home	,	
Alter	rnative flow 4:	UCS09: Return	to sett	ings	
Exte	nsions	UCS22			

Figure 3.35: Use Case UCS05

UCS06		Sh	are MAK07 to friends		
application installed		.07 to	friends using MAK07 chat or another device		
Inputs User must already ha		ve an account associated to MAK07			
User must already h		ave login to MAK07			
Outputs MAK07 is shared on a			or on another application installed in the device		
		В	asic f	low	
No	User		No	System	
1	User share MA	K07			
			2	MAK07 is shared on a chat or on another application installed in the device	
		Inte	erface		
4.44		SETTINGS Invariance Inv		All conductions All conductions </th	
	rnative flow 1:	UCH21: Exit fro			
Alte	rnative flow 2:		UCH22: Switch application on device in which MAK07 will continue run in background.		
Alte	rnative flow 3:	UCH17: Exit to	Home	;	
Alte	rnative flow 4:	UCS09: Return	to sett	ings	
Exte	ensions	UCH05, UCS09)		
,,,					

Figure 3.36: Use Case UCS06

UCS07			Download recommended app			
Targ	et of Use case	The user downloads a	e user downloads a recommended application from MAK07			
-		User must already have	er must already have an account associated to MAK07 er must already have login to MAK07			
Outp	puts	Apple store or play s interface	store	is opened with the application recommended		
		В	asic f	low		
No	User		No	System		
1	User select the the recommend	button to download ed app				
			2	Apple store or play store is opened with the application recommended interface		
		Inte	erface	view		
	SETTINGS SETTINGS International Setting Settin			HO TO A FILL AND A FIL		
			UCH21: Exit from MAK07.			
		UCH22: Switch continue run in b		cation on device in which MAK07 will round.		
Alter	rnative flow 3:	UCH17: Exit to	Home	•		
Alter	rnative flow 4:	UCS09: Return t	to sett	ings		
Exte	nsions	UCH05, UCS09)			

Figure 3.37: Use Case UCS07

UCS08				Logout	
Targ	get of Use case	The user logout from MAK07			
Inputs		User must already have an account associated to MAK07 User must already have login to MAK07			
Outputs MAK07 is closed		MAK07 is closed			
		Ι	Basic f	low	
No	User		No	System	
1	User select the MAK07	button to logout from			
			2	The system saves the configuration and data on DB	
			3	MAK07 is closed	
		Int	erface	view	

Figure 3.38: Use Case UCS08

	UCS09	Return to settings				
Tar	get of Use case	The user returns to settings of MAK07				
Inputs		User must already have an account associated to MAK07				
_		User must already have login to MAK07				
Out	puts	The system shows the settings interface				
		Basic flow				
No	User	No System				
1	User select the comeback to se	button left arrow to ttings				
		2 The system shows the settings interface				
	1	Interface view				
		SETTINGS How the spectrum is the lateral particle Control and (1) Con				
Alte	rnative flow 1: UCH21: Exit from MAK07.					
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.				
Exte	Extensions UCH05					

Figure 3.39: Use Case UCS09

UCS10			Disable sound			
Targ	get of Use case	Allow the user to disa	ow the user to disable the sound of MAK07			
			er must already have an account associated to MAK07			
			er must already have login to MAK07			
			er must already have access to settings			
Out	puts	The sound of MAK07	7 is dis	sable.		
		В	asic f	low		
No	User		No	System		
1	User has disabl MAK07	ed the sound of				
			2	System disable the sound of MAK07		
				AMCON 56 14456 105300(* 10570700000 00770700000 00770 000004 lg Truntrus et		
	rnative flow 1:	UCH21: Exit fro		AC ACTOR		
	rnative flow 1: rnative flow 2:	UCH22: Switch		AK07. Cation on device in which MAK07 will		
Alte				AK07. Cation on device in which MAK07 will round.		

Figure 3.40: Use Case UCS10

UCS11		Se	et + operation position			
Targ	get of Use case	Allow the user to set the +operation to up, down, left or right				
Inputs		User must already ha User must already ha	User must already have an account associated to MAK07 User must already have login to MAK07 User must already have access to settings			
Outputs The system disp		The system displays the new position war		terface for setting the + operation position with the user		
]	Basic f	low		
No	User		No	System		
1	User has set the operation for pl (up, down, left	aying MAK07 to				
			2	The system displays the interface for setting the + operation position with the new position wanted by the user		
			+ SET			
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.		
Alte	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.		
Alte	rnative flow 3:	UCS09: Return	to set	tings		
Exte	ensions	UCS(12-15)				
		1				

Figure 3.41: Use Case UCS11

UCS12			et - operation position			
			user to set the - operation to up, down, left or right			
		User must already have an account associated to MAK07				
		User must already have login to MAK07				
~ /			User must already have access to settings			
Out	puts	the new position war	ited by			
		1	Basic f			
No	User		No	System		
1	User has set the operation for p (up, down, left	laying MAK07 to				
			2	The system displays the interface for setting		
				the - operation position with the new		
				position wanted by the user		
			• ==			
			• =	view		
Alte	rnative flow 1:	Int UCH21: Exit fr	• SET	TINGS		
	rnative flow 1: rnative flow 2:	UCH21: Exit fr	• SET	TINGS AK07.		
Alte		UCH21: Exit fr UCH22: Switch	• SET	TINGS AK07. Cation on device in which MAK07 will round.		

Figure 3.42: Use Case UCS12

UCS13			Se	t * operation position		
Targ	get of Use case	Allow the user to set	Allow the user to set the * operation to up, down, left or right			
Inpu	ıts		Jser must already have an account associated to MAK07			
			ser must already have login to MAK07 ser must already have access to settings			
Out	oute	· · · · · · · · · · · · · · · · · · ·	system displays the interface for setting the * operation position with			
Ծաղ	puts	the new position war				
		•	Basic f			
No	User		No	System		
1	User has set the operation for pl (up, down, left	aying MAK07 to				
			2	The system displays the interface for setting the * operation position with the new position wanted by the user		
		Inf	erface			
Alternative flow 1: UCH21: Exit from MAK0			AK07.			
Alte	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.		
Alte	rnative flow 3:	UCS09: Return				
Exte	nsions	UCS(11,12,14,1	15)			

Figure 3.43: Use Case UCS13

UCS14		Set (/ :) operation position	
Targ	get of Use case	Allow the user to set		/:) operation to up, down, left or right
User must already h		ave an account associated to MAK07 ave login to MAK07		
		User must already ha		· · ·
Outj	puts	The system displays with the new position		erface for setting the ($/$:) operation position ed by the user
		I	Basic f	low
No	User		No	System
1		e position of (/ :) aying MAK07 to or right)		
			2	The system displays the interface for setting the (/ :) operation position with the new position wanted by the user
			+ SET	
Alternative flow 1: UCH21: Exit from			om M	AK07.
Alte	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.
Alte	rnative flow 3:	UCS09: Return		
Exte	ensions	UCS(11-13,15)		

Figure 3.44: Use Case UCS14

UCS15 Save new o		onfigu	aration of position operation controls			
Targ	get of Use case	Save new configuration	ave new configuration of position operation controls			
Inputs		User must already ha	ser must already have an account associated to MAK07			
		User must already ha	ser must already have login to MAK07			
		User must already ha				
Outj	puts			urnament, solo game or training game the hat the user saved them		
			asic f			
No	User		No	System		
1	User has set the	position operations				
			2	The system displays the order of position		
				operations as they saved them		
Interface view						
Alternative flow 1: UCH21: Exit fro			om Ma	AK07.		
Alte	rnative flow 2:	UCH22: Switch continue run in 1		cation on device in which MAK07 will round.		
Alte	rnative flow 3:	UCS09: Return	-			
Exte	ensions	UCS(09,11-14)				

Figure 3.45: Use Case UCS15

UCS16			Select one theme			
Target of Use case Sel		Select one theme of N	lect one theme of MAK07			
Inputs U		User must already ha	ser must already have an account associated to MAK07			
			ser must already have login to MAK07			
		User must already ha		· · · · · · · · · · · · · · · · · · ·		
Outp	outs	The system displays t	the int	erface with the theme of MAK07 chosen		
		E	Basic f	ow		
No	User		No	System		
1	User has chosen	n a theme of MAK07				
			2	System displays the interface of the chosen theme of MAK07		
		Int	erface	view		
			Casas aga prog Casas an (Par (au)ros) (recrus (Par) Istoren (Par)	EMES		
Alternative flow 1: UCH21: Exit fr						
Alternative flow 2: UCH22: Switch continue run in				ation on device in which MAK07 will ound.		
Alternative flow 3: UCH17: Exit to He						
Alter	mative flow 3:	UCH17: Exit to	Home	•		
	rnative flow 3: rnative flow 4:	UCS09: Return		-		

Figure 3.46: Use Case UCS16

Target of Use case Provide information about how to buy an item Inputs User must already have an account associated to MAK07 Outputs The system displays the information about how to buy an item No User No User Vert in the ? button Imputs Imputs System Imputs User information about how to buy an item No User Vert information System Imputs Imputs Vert information System Imputs Imputs Vert information System Imputs Imputs Vert information Imputs Imputs Imputs Vert information Imputs Imputs Imputs Imputs Imputs Vert information Imputs Imputs Imputs Imputs<		UCS17		Drowid	le information how to buy
Inputs User must already have an account associated to MAK07 Outputs The system displays the information about how to buy an item No User No System 1 User has click in the ? button 2 System displays the information needed of how to buy an item Interface view Interface view Altermative flow 1: UCH21: Exit from MAK07. Altermative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background. UCH21: Exit to Home Altermative flow 3: UCH17: Exit to Home UCS09: Return to settings UCS09: Return to settings					2
User must already have login to MAK07 Outputs The system displays the information about how to buy an item No User No System 1 User has click in the? button 2 System displays the information needed of how to buy an item Interface view Interface view Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background. Output Alternative flow 3: UCH17: Exit to Home UCH20: Return to settings					
The system displays the information about how to buy an item No User No System 1 User has click in the ? button 2 System displays the information needed of how to buy an item Interface view Interface view <tr< th=""><th>шр</th><th>11.5</th><th></th><th></th><th></th></tr<>	шр	11.5			
Basic flow No User No System 1 User has click in the ? button 2 System displays the information needed of how to buy an item Interface view Interface view <th>Out</th> <th>outs</th> <th></th> <th></th> <th></th>	Out	outs			
No User No System 1 User has click in the ? button 2 System displays the information needed of how to buy an item Interface view					-
1 User has click in the ? button 2 System displays the information needed of how to buy an item Interface view					

Figure 3.47: Use Case UCS17

	UCS18		(Open store on device	
Targ	get of Use case	Open apple store or p	olay sto	lay store on device MAK07 profile	
Inpu	ıts			account associated to MAK07	
		User must already ha			
Out	puts	The system displays	the int	erface of MAK07 on apple store or play store	
	-	E	Basic f	low	
No	User		No	System	
			1	The system displays the interface of MAK07	
				on apple store or play store	
		Int	erface	view	
				\$.d (%) 2243	
		÷ (Google Play	Q, [
		• •	•/ 3		
		Comb		deuna MARcon al fin de	
				nsutato fisi 0 r min	
		Califo	aciones y reseña	ы ()	
		4	5		
		4.	J	-	
			CAURCACIÓN	IDE FUNCIONES	
	(5.0★) (5.0★) (4.8★)				
	Begins Ballyangan Galiforni Consumities				
	kna marka some cogas safe 1 kna marka some cogas safe 1 kna marka some cogas				
Alte				cation on device in which MAK07 will	
	continue run in background.			round.	
Exte	Extensions UCH22				

Figure 3.48: Use Case UCS18

	UCS19	Open MAK07 profile on Facebook			
Tar	get of Use case	Open MAK07 profile on official Facebook web page			
Inpu	ıts	User must already have an account associated to MAK07			
-		User must already have login to MAK07			
Out	puts	The system displays the MAK07 official Facebook web page			
		Basic flow			
No	User	No System			
		 System displays the MAK07 official 			
		Facebook web page			
		Interface view			
Alte	Att 150 FLANT TO CALLENSE?				
	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.			
Alte	rnative flow 3:	UCH17: Exit to Home			
Alte	rnative flow 4:	UCS09: Return to settings			
Exte	Extensions UCH22				

Figure 3.49: Use Case UCS19

	UCS20	Gener	rate petition to share MAK07			
Targ	get of Use case	Generate petition to share	share MAK07 in to other app installed on device			
Inpu	ıts	User must already have ar	n account associated to MAK07			
		User must already have lo	ogin to MAK07			
Out	puts	MAK07 is shared on a cha	at or on another application installed in the device			
		Basic	flow			
No	User	No	System			
		1	MAK07 save the user data on DB			
		2	Create a link to share the MAK07			
		3	The system opens the multiple applications where the link can be shared.			
		Interfac	ce view			
	A South Aut: No. Hauger 10. CHALE URDAL Aut: No. Hauger 10. CHALE URDAL					
Alte	rnative flow 1:	UCH21: Exit from MAK07.				
Alte	rnative flow 2:		UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	ttensions UCH05, UCS09, UCS06					

Figure 3.50: Use Case UCS20

	UCS21	Oj	pen s	tore on recommended app	
Targ	et of Use case	Open apple store or pla MAK07	ay sto	re on a recommended application associated to	
Inpu	ts	User must already have User must already have		account associated to MAK07	
Out	outs			is opened with the application recommended	
		Ba	sic fl	ow	
No	User	1	No	System	
		1	1	Apple store or play store is opened with the application recommended interface	
		Inter	rface		
	HOTE ALL THE A				
Alternative flow 1: UCH21: Exit from MAK07.			AK07.		
Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.					
Exte	nsions	UCH05, UCS09,	UCS	07	

Figure 3.51: Use Case UCS21

	UCLOG01		G	ive user and password
Targ	Target of Use case Give user and passwo			-
Inpu		-		account associated to MAK07
-		User must already ha		
Out	puts	The user is authentic	ated	
	-	I	Basic f	low
No	User		No	System
1	The user fills up and password	p a form giving user		-
	_		2	MAK07 has login the user
	Interface view			
Alte	Alternative flow 1: UCH21: Exit from MAK07.			
Alte	rnative flow 2:	flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	Extensions UCH04, UCLOG(02,03,07)			

Figure 3.52: Use Case UCLOG01

	UCLOG02		Link Facebook		
Targ	et of Use case	Link Facebook to Lo	gin		
Inpu	ıts	User must already ha	ve an	account on Facebook	
Out	puts	The user is authentica	ated		
		F	Basic f	low	
No	User		No	System	
1	Click on login	with Facebook button			
			2	MAK07 has login the user	
		Int	erface	view	
Alte	rnative flow 1:	UCH21: Exit fr			
Alternative flow 2: UCH22: Switch application on device in which MA					
.		continue run in			
Exte	Extensions UCH04, UCLOG(01,03,07)				

Figure 3.53: Use Case UCLOG02

1	UCLOG03			Link Google		
Target of Use case Link Google to Login						
Inpu	its	User must already ha		account on Google		
Outp	puts	The user is authentic	ated			
		H	Basic f	low		
No	User		No	System		
1	Click on login	with Google button				
			2	MAK07 has login the user		
		Int	erface	view		
Alton	WELCOME TO MAKO7 ELCON WITH FACEBOX GLOON WITH FACEBOX ON LOON WITH FALL DON LIF					
	rnative flow 1:		UCH21: Exit from MAK07.			
Alter	rnative flow 2:		UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	nsions	UCH04, UCLO	G(01,	02,07)		

Figure 3.54: Use Case UCLOG03

	UCLOG04			Create nickname
Target of Use case Create a nickname				
Inpu	ıts			
Out	puts	The user has a nickna	ame fo	r MAK07
		I	Basic f	low
No	User		No	System
1	User type a nic	kname		
			2	The system checks the email and the
				nickname verifying the uniqueness account
			3	The system saves the nickname of a user
		Int	erface	view
	SING UP enal enal confirm paseword @ SING UP SING UP			NG UP
Alte	rnative flow 1:	v 1: UCH21: Exit from MAK07.		
Alte	rnative flow 2:	ative flow 2: UCH22: Switch application on device in which MAK07 will		
continue run in background.				
Exte	Extensions UCH04, UCLOG(01,02,03)			02,03)

Figure 3.55: Use Case UCLOG04

	UCLOG05		C	heck unique account	
	get of Use case	Check uniqueness of		-	
Inpu		User has an account			
Out	puts	The system only has	one ac	count linked with the email	
]	Basic f	low	
No	User		No	System	
1	User type an er	nail to link with			
			2	The system checks the email and the nickname verifying the uniqueness account	
			3	The system saves the nickname and email of a user	
		Int	terface		
	SING UP enal enal enal enal enal enal enal enal SING UP SING UP				
Alte	rnative flow 1:	UCH21: Exit fr	UCH21: Exit from MAK07.		
Alte	rnative flow 2:	UCH22: Switch	UCH22: Switch application on device in which MAK07 will		
			continue run in background.		
Test	ensions		UCH04, UCLOG(01,02,03,04)		

Figure 3.56: Use Case UCLOG05

	UCLOG06		S	ave user information	
Target of Use case Save in MAK07 syste			tem the	e user information given by the user	
Inpu	uts	User has an account			
Out	puts	The system only has	one ac	count linked with the email	
]	Basic f	low	
No	User		No	System	
1	User type an er	nail to link with			
			2	The system checks the email and the nickname verifying the uniqueness account	
			3	The system saves the nickname and email of a user	
		Int	terface	view	
SING UP email email confirm paseword SING UP				* NG UP	
Alte	ernative flow 1:	UCH21: Exit fr	UCH21: Exit from MAK07.		
Alte	ernative flow 2:		UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	ensions	UCH04, UCLC	_		

Figure 3.57: Use Case UCLOG06

	UCLOG07			Login	
	get of Use case	Login into MAK07		5	
Inpu			we an	account associated to MAK07	
Out	puts	The system login a u	ser and	d shows home interface	
	-	I	Basic f	low	
No	User		No	System	
1	User type emai	l and password			
			2	The system login a user	
			3	The system shows home interface	
		Int	erface	e view	
	LOGIN errol porsept LOGIN Tugge posseerd?				
Alte	ernative flow 1:	UCH21: Exit fr	UCH21: Exit from MAK07.		
Alte	ernative flow 2:		UCH22: Switch application on device in which MAK07 will		
		continue run in			
Exte	ensions	UCH04, UCLO	UCH04, UCLOG(01,02,03,04,05,06)		

Figure 3.58: Use Case UCLOG07

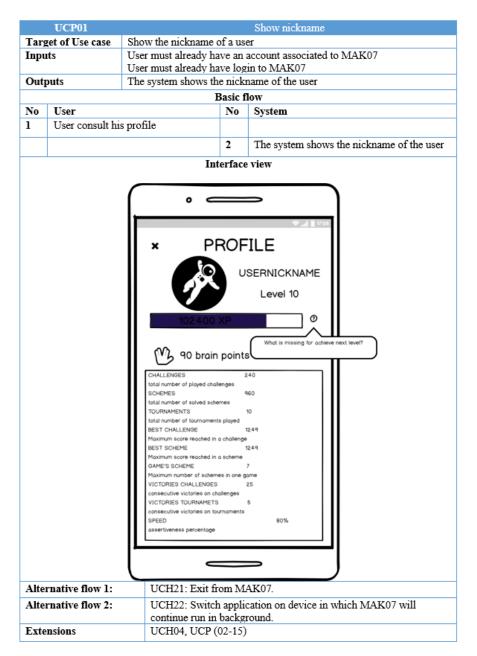


Figure 3.59: Use Case UCP01

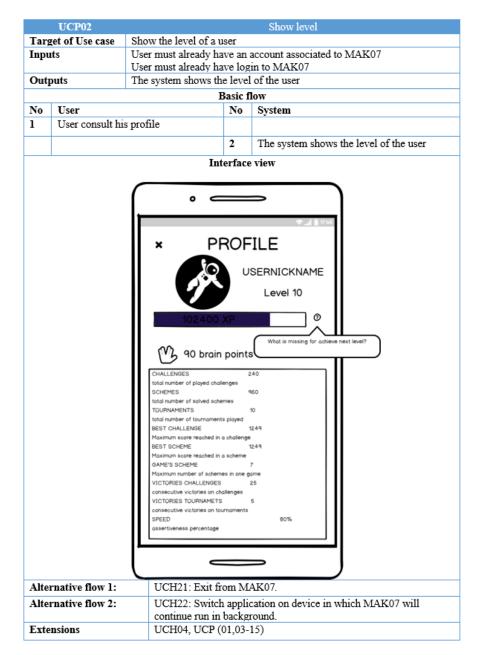


Figure 3.60: Use Case UCP02

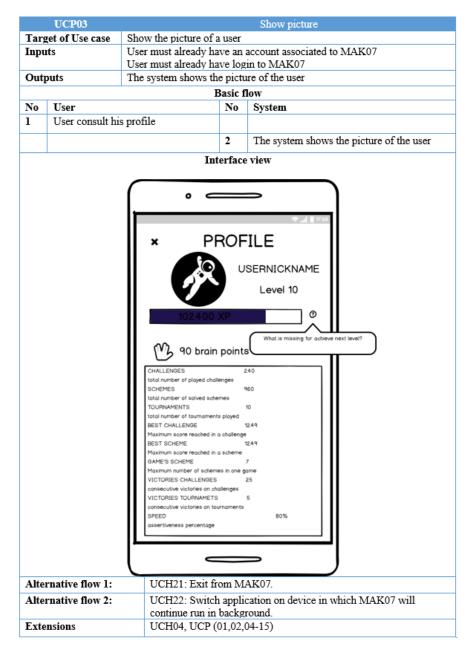


Figure 3.61: Use Case UCP03

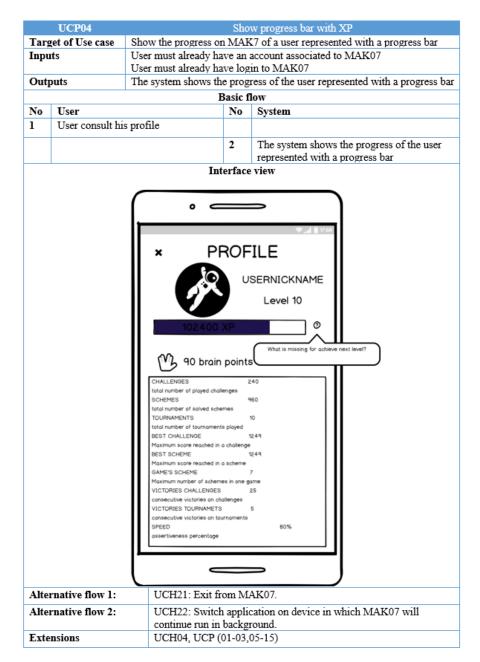


Figure 3.62: Use Case UCP04

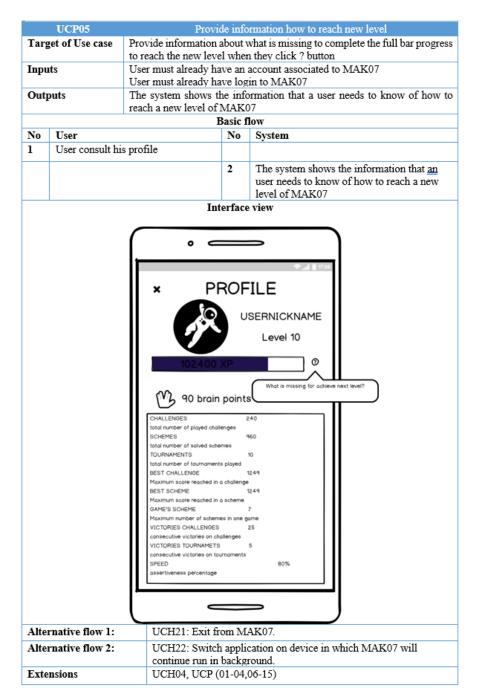


Figure 3.63: Use Case UCP05

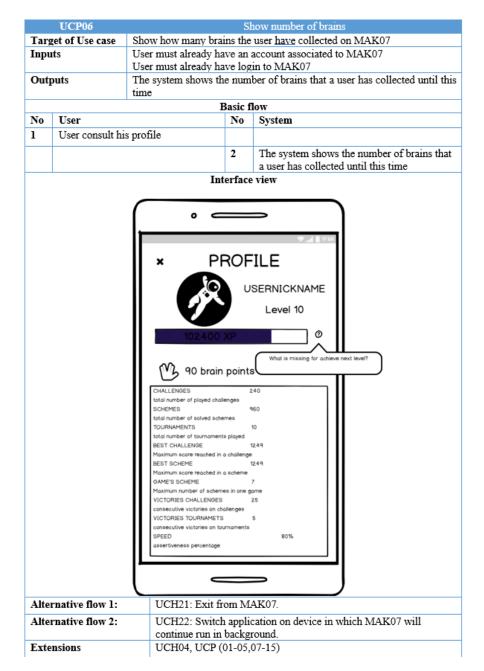


Figure 3.64: Use Case UCP06

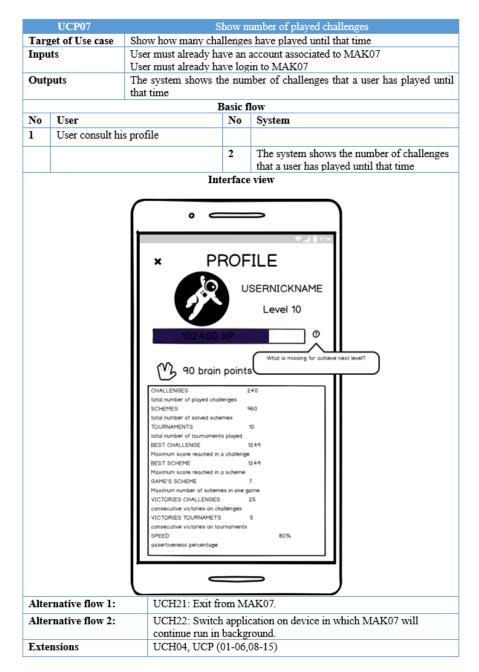


Figure 3.65: Use Case UCP07

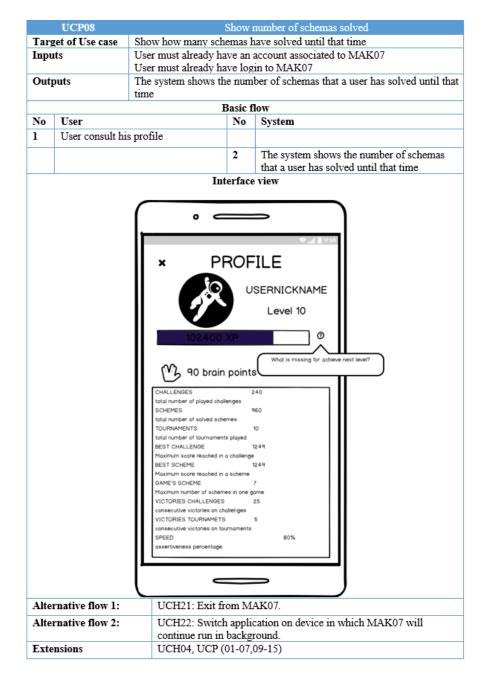


Figure 3.66: Use Case UCP08

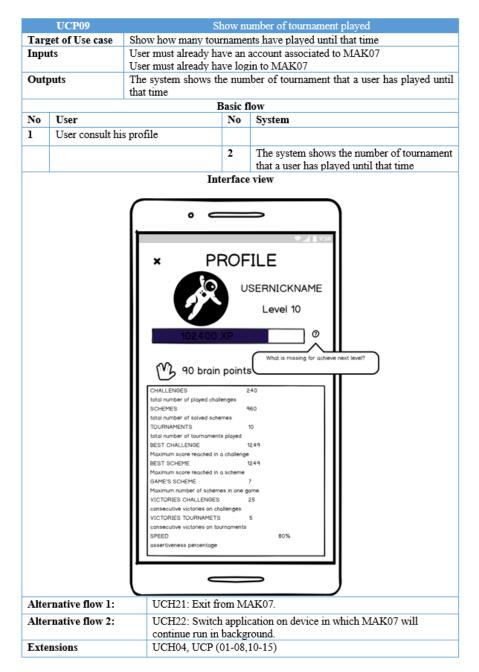


Figure 3.67: Use Case UCP09

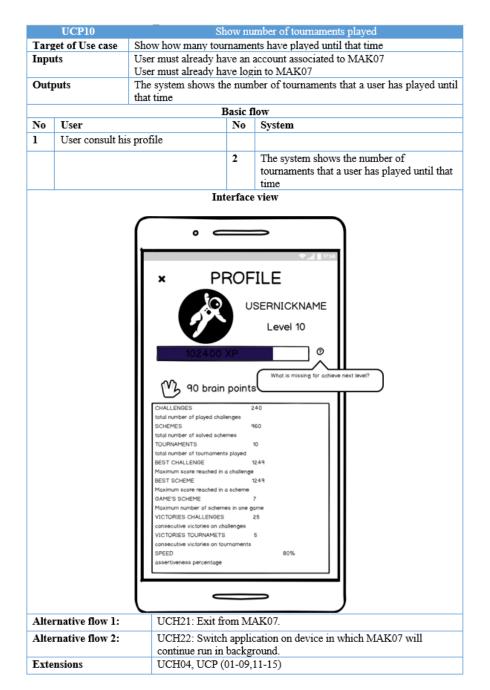


Figure 3.68: Use Case UCP10

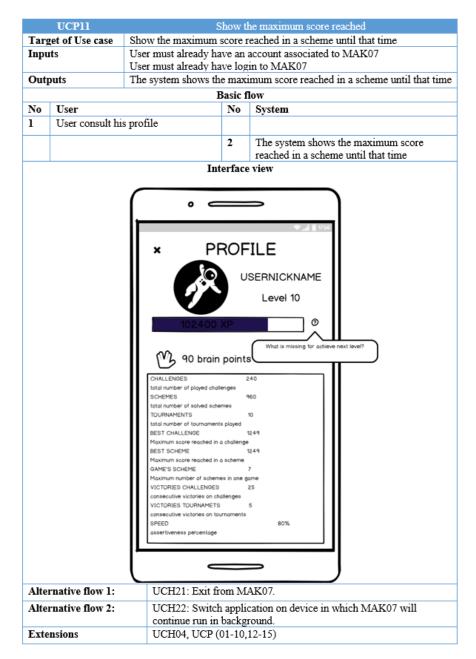


Figure 3.69: Use Case UCP11

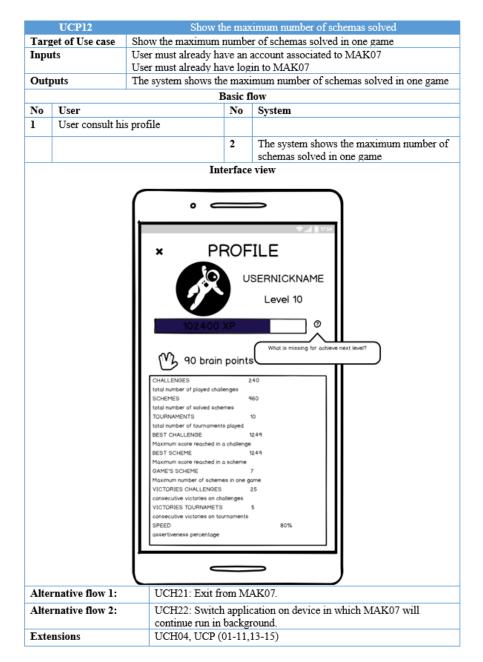


Figure 3.70: Use Case UCP12

	UCP13	secutive victories on a challenge				
Tar	get of Use case	Show the consecutive	victor	ries on a challenge that have done until that time		
Inputs User must already ha User must already ha				ave an account associated to MAK07 ave login to MAK07		
Out	puts	The system shows the until that time	ne consecutive victories on a challenge that have done			
		E	Basic f	low		
No	User		No	System		
1	User consult hi	s profile				
			2	The system shows the consecutive victories on a challenge that have done until that time		

	0	n a cha	llenge t	that	have	done	untıl	that	tu
Int	erface vi	ew							

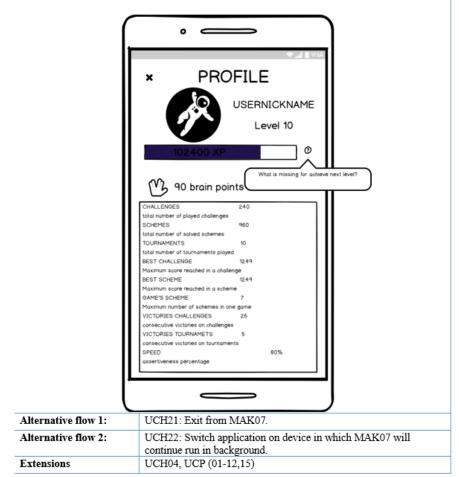


Figure 3.71: Use Case UCP13

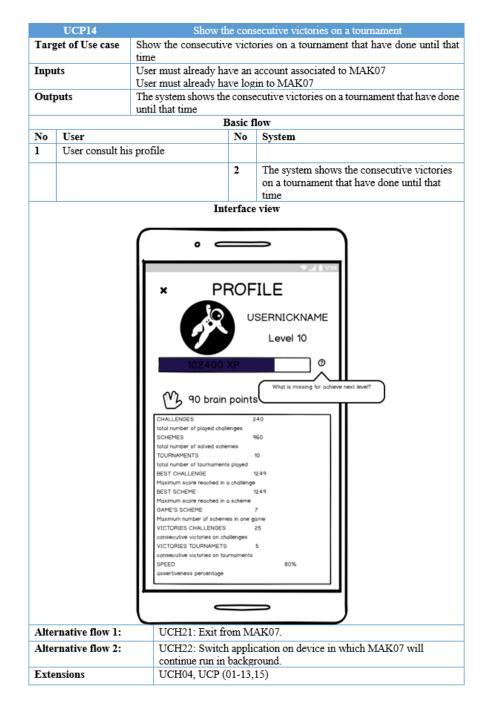


Figure 3.72: Use Case UCP14

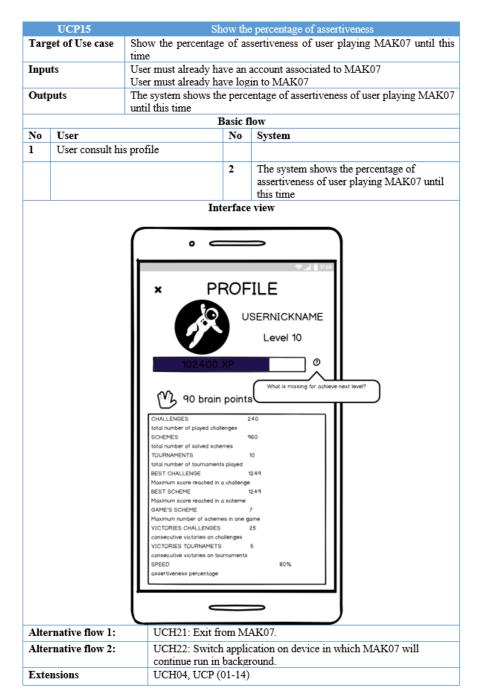


Figure 3.73: Use Case UCP15

	UCTU01		Show the goal of MAK07				
Targ	et of Use case	Show the goal of play	Show the goal of playing MAK07				
Inpu	ıts			account associated to MAK07			
		User must already ha					
Out	puts	The system shows the	e goal	of MAK07			
		В	asic f	low			
No	User		No	System			
1	User consult the	e tutorial					
			2	The system shows the goal of MAK07			
		Int	erface	view			
Alternative flow 1: UCH21: Exit from MAK07.							
			UCH21: Exit from MAK07.				
				cation on device in which MAK07 will			
	continue run in						
Extensions UCH03, UCTU			(02-0	7)			

Figure 3.74: Use Case UCTU01

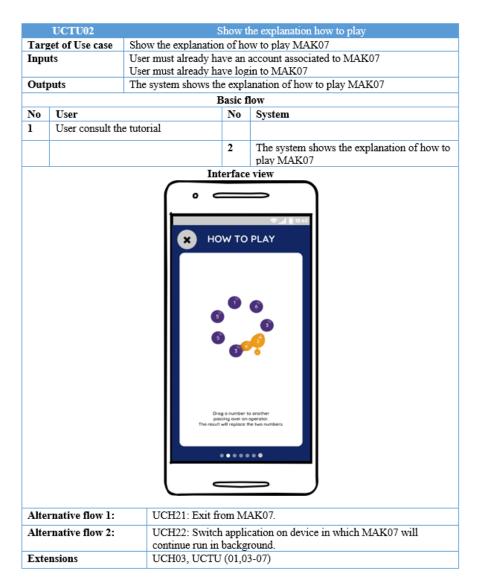


Figure 3.75: Use Case UCTU02

UCTU03			Show how the results are shown				
Targ	get of Use case			w the results are shown until arrived to 0			
Inpu	ıts			account associated to MAK07			
		User must already ha					
Out	puts		the exp	planation of how the results are shown until			
		arrived to 0					
		I	Basic f				
No	User		No	System			
1	User consult the	e tutorial					
			2	The system shows the explanation of the results are shown until arrived to 0			
	1	Inf	erface				
HOW TO PLAY							
Alte	rnative flow 1:	UCH21: Exit from MAK07.					
Alte	Alternative flow 2: UCH22: Switch application on device in which MAK07 will						
	continue run in			round.			
Exte	Extensions UCH03, UCTU (01,02,04-07)						
		(

Figure 3.76: Use Case UCTU03

	UCTU04	Show how to restart or cancel the game			
Target of Use case 5		Show the explanation	n of ho	w to restart or cancel the game	
Inpu	ıts	User must already ha	ave an	account associated to MAK07	
-		User must already ha			
Out	puts	The system shows th	e expl	anation of how restart or cancel the game	
		I	Basic f	low	
No	User		No	System	
1	User consult th	e tutorial			
			2	The system shows the evolution of how to	
			2	The system shows the explanation of how to restart or cancel a game	
		Inf	terface	· · · · · · · · · · · · · · · · · · ·	
		° '		-	
		💮 н	оw то	PLAY	
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			6		
			-		
				>0	
		When you	realize that you	ean nen eknole (),	
			our ourens		
			••••	• •	
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
Alte	rnative flow 2:	UCH22: Switch	1 appli	cation on device in which MAK07 will	
		continue run in			
Exte	ensions	UCH03, UCTU			
				1 I I I I I I I I I I I I I I I I I I I	

Figure 3.77: Use Case UCTU04

	UCTU05			Show the rules		
Targ	get of Use case	Show the rules of MA				
Inpu	ıts			account associated to MAK07		
		User must already ha				
Out	puts	The system shows the				
		E	Basic f			
No	User		No	System		
1	User consult the	e tutorial				
			2	The system shows the rules of MAK07		
	1	Int	erface	view		
Image: Second secon						
	rnative flow 1:	UCH21: Exit fr				
Alte				cation on device in which MAK07 will		
T (continue run in background.			
Exte	Extensions UCH03, UCTU (01-04,06,07)					

Figure 3.78: Use Case UCTU05

	UCTU06	S	show h	ow the points are calculated			
		Show the information	on of h	ow the points are calculated according to each			
Inpu	ıts	•	ave an	account associated to MAK07			
-		User must already ha					
Out	puts			formation of how the points are calculated			
		according to each op					
]	Basic f				
No	User		No	System			
1	User consult th	e tutorial					
			2	The system shows the information of how			
				the points are calculated according to each			
		-		operation			
		In	terface	view			
Alte	rnative flow 1:	UCH21: Exit fr	rom M	AK07.			
	rnative flow 2:			cation on device in which MAK07 will			
Ante	i native now 2:	continue run in					
Extensions UCH03, UCTU (01-05,07)							

Figure 3.79: Use Case UCTU06

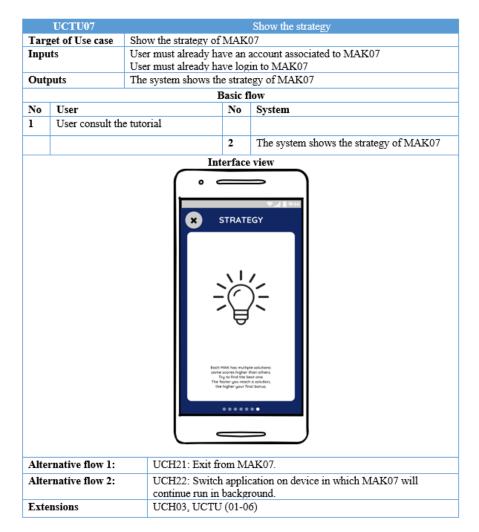


Figure 3.80: Use Case UCTU07

	UC3-6P01	Show a	MAK	schema composed of 3 numbers
Tar	get of Use case	Show a MAK schem	a com	posed of 3 numbers
Inpu	uts	User must already ha	we an	account associated to MAK07
		User must already ha	we log	in to MAK07
Out	puts	The system shows a	schem	a of 3 numbers
		I	Basic f	low
No	User		No	System
1	User play train	ing mode		
			2	The system shows the schema composed by 3 numbers
	1	Int	erface	view
		MAK07		MAK07 3 Bolls C C
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.
Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				

Figure 3.81: Use Case UC3-6P01

Target of Use case Show a MAK schema composed of 4 numbers Inputs User must already have an account associated to MAK07 Outputs The system shows a schema of 4 numbers No User I User play training mode Interface view Interface view Image: play training mode Image: play training mode		UC3-6P02	Show a	ı MAK	schema composed of 4 numbers	
User must already have login to MAK07 Outputs The system shows a schema of 4 numbers Basic flow No System 1 User play training mode 2 The system shows the schema composed to 4 numbers Interface view Interface view Outputs Interface view Interface view Outputs Interface view Outputs Interface view Output	Target of Use case Show a MAK schema		a com			
Outputs The system shows a schema of 4 numbers Basic flow No User No System 1 User play training mode 2 The system shows the schema composed to 4 numbers	Inputs User must already have					
Basic flow No User No System 1 User play training mode 2 The system shows the schema composed by 4 numbers Interface view Image: Markor of the strength of the strengt of the strength of the strength of the strengt						
No System 1 User play training mode 2 3 The system shows the schema composed by 4 numbers Interface view Interface view Image: State of the system shows the schema composed by 4 numbers Interface view Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 4 numbers Image: State of the system shows the schema composed by 5 numbers Image: State of the system shows the schema composed by 5 numbers Image: State of the system shows the schema composed by 5 numbers Image: State of the system shows the schema composed by 5 numbers Image: State of the system shows the schema composed by 5 numbers Image: State of the system shows the schema composed by 5 numbers	Out	puts				
1 User play training mode 2 The system shows the schema composed by 4 numbers Interface view Interface view Image:			I		low	
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH21: Switch application on device in which MAK07 will continue run in background.				No	System	
Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.	1	User play train	ing mode			
Interface view MAK07 MAK07<				2	The system shows the schema composed by	
MAK07 MAK07 MAK07 MAK07 Hais O					1 Hourisers	
Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			Int	erface	view	
Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			MAK07		4 Balls 	
continue run in background.	Alternative flow 1: UCH21: Exit fro				AK07.	
continue run in background.	Alte	rnative flow 2:	UCH22: Switch	applio	cation on device in which MAK07 will	
Extensions UCH02_UC3-6P (01 03)						
	Exte	ensions	UCH02, UC3-6	P (01,	03)	

Figure 3.82: Use Case UC3-6P02

3-Methodolgy

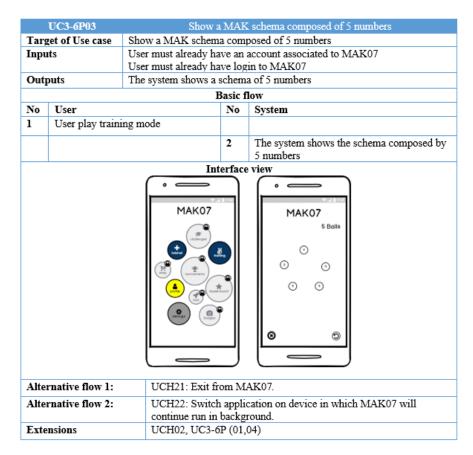


Figure 3.83: Use Case UC3-6P03

	UC3-6P04	Show a	ı MAK	schema composed of 6 numbers
Targ	Target of Use case Show a MAK schema composed of 6 numbers			
Inpu	ıts			account associated to MAK07
		User must already ha		
Out	puts	The system shows a	schem	a of 6 numbers
		H	Basic f	low
No	User		No	System
1	User play train	ing mode		
			2	The system shows the schema composed by
				6 numbers
		Int	erface	view
		$(\circ \bigcirc$		
			1 1273	
		MAK07		MAK07
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				• •
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.
Alte	rnative flow 2:	UCH22: Switch	applio	cation on device in which MAK07 will
		continue run in	backg	round.
Exte	nsions	UCH02, UC3-6	P (01,	05)

Figure 3.84: Use Case UC3-6P04

	UC3-6P05	Ī	Inhloci	k functionalities of MAK07
Targ	get of Use case			ublock the rest of functionalities of MAK07
Inpu				
Out	puts	The system shows a	trophy	of unblock functionalities
			Basic f	
No	User		No	System
1	User finish all p schemas	orogressive training		
			2	The system shows a trophy won by the user
			3	The system unblocks the rest of functionalities
	1	In	terface	
		KO7		
Alte	Alternative flow 1: UCH21: Exit fr			AK07.
Alte	Alternative flow 2: UCH22: Switch continue run in			cation on device in which MAK07 will round.
Exte	ensions	UCH02		

Figure 3.85: Use Case UC3-6P05

	UCSH01		S	how all items to buy
Target of Use case Show all the items to buy of MAK07				
Inpu	-			account associated to MAK07
•		User must already ha		
Out	puts			items with the price related
-	-]	Basic f	low
No	User		No	System
1	User consult th	e shop		
			2	The system shows a list of items with the
				price related
		Int	erface	view
		(•		_)
		∠ M	AKO	7 SHOP
			Booste	
		ם ה	SKJP 500 brains	Duy
			MULTIPLY SC	ORE by
			700 brains	Devy
			200 braina	L 0.9
			FREEZE TIME 700 braina	D buy
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		l		⇒)
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.
Alte	rnative flow 2:	UCH22: Switch	applio	cation on device in which MAK07 will
		continue run in		
Exte	xtensions UCH02, UCSH (02-08)			

3.2 – Analysis and design

Figure 3.86: Use Case UCSH01

	UCSH02		Se	lection of items to buy
Targ	get of Use case	Allow the check box		e selected representing the list of items to buy
Inpu				account associated to MAK07
_		User must already ha		
Out	puts	The system allows th	ie selec	ction of items to buy from the list
		H	Basic f	low
No	User		No	System
1	User select the the check box	items to buy using		
			2	The system saves the list of items selected to buy
		Int	erface	-
			AKO Booste SKIP Stobsans HNT 200 brans HNT 200 brans PREZE THE 200 brans Brain Preze to get Them Proceed with the	□ buy □ buy □ buy s € □ buy price real concurrency PS □ buy
Alte	ernative flow 1:	UCH21: Exit fr	om M	AK07.
Alte	ernative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.
Exte	ensions	UCH02, UCSH		

Figure 3.87: Use Case UCSH02

	UCSH03	Show t	the but	ton to proceed with the purchase
Tar	get of Use case	Show the button to p		
Inpu				account associated to MAK07
-		User must already ha	we log	in to MAK07
Out	puts	The system shows the	e butto	on to proceed with the purchase
		E	Basic f	low
No	User		No	System
1	User select the the check box	items to buy using		
			2	The system saves the list of items selected to
				buy
			3	The system allows the button to proceed
		T4	erface	with purchase
			AKO Booste SKIP 500 brans HULTIPLY SC 700 brans HANT 200 brans PRECZE TIME 200 brans Brain PrecZE TIME Project of the Them Core of with the	CORE ☐ Hoy ☐ Hoy ☐ Hoy ☐ Hoy B Hoy Price Feal concurrency Price Feal concurrency Price Feal concurrency Price Feal concurrency
Alte	ernative flow 1:	UCH21: Exit fr	om M	AK07.
Alte	ernative flow 2:			cation on device in which MAK07 will
		continue run in		
Exte	ensions	UCH02, UCSH		

Figure 3.88: Use Case UCSH03

	UCSH04 Select the method of payment				
Targ	et of Use case	Show the button to p	proceed with the purchase		
Inpu	ts	User must already ha	ave an	account associated to MAK07	
		User must already ha	ave log	in to MAK07	
		User must already ha	ave ass	ociated a payment account	
Out	puts	The system shows th	e butto	on to proceed with the purchase	
		I	Basic f	low	
No	User		No	System	
1		items to buy using			
	the check box				
			2	The system saves the list of items selected to	
			-	buy	
			3	The system allows the button to proceed with purchase	
	Interface view				
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		de Deta	ils		
		Credit or debit			
		Vica-95 Vic Expiration date		Security code	
		05 /	17	cve 🔘	
		Dilling address			
		Mathew		omes Phase 1	
		the second			
		Card nickname			
		Visa-9665			
		Sav	•	Cancel	
		02015 Google - Te		vary Notice Help -	
		Geogle Hume - Sen	d Foedback		
Alte	rnative flow 1:	ive flow 1: UCH21: Exit from MAK07.			
Alte	rnative flow 2:			cation on device in which MAK07 will	
		continue run in	backg	round.	
Exte	Extensions UCH02, UCSH (01-03,05-08)			3,05-08)	

Figure 3.89: Use Case UCSH04

	UCSH05	Allow the user to	confir	m the purchase before connexon to the bank
Tare	get of Use case	Show the button to p		-
Inpu	-	User must already ha User must already ha	we an we log	account associated to MAK07
Out	puts	The system shows th	e butto	n to confirm the purchase
		Η	Basic f	low
No	User		No	System
1	User select the purchase	button proceed		
			2	The system shows a message of confirmation
		, °		
MAKO7 SHOP Boosters Confirm purchase wermaligenation to buy with card enter you with card enter your pin vertex accurate Cogle play COHFIRM runber of brans to get: proceed with the purplexe Lobumer Lobumer				
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.
	rnative flow 1: rnative flow 2:		appli	cation on device in which MAK07 will

Figure 3.90: Use Case UCSH05

	UCSH06			send the receipt	
Target of Use case Send the receipt of the purchase by email					
Inpu		User must already ha User must already ha	y have an account associated to MAK07 y have login to MAK07 y have associated a payment account		
Out	puts			ot of the purchase by email	
	-	F	Basic f	low	
No	User		No	System	
1	User bought an	item			
			2	The system sends the receipt of the purchase by email	
		Int	erface	~	
		Confi vermali soo brain enter yee	Booste irm purc prail.com in to buy with ur pin	terred concernance	
Alter	ternative flow 1: UCH21: Exit from MAK07.				
Alter	rnative flow 2:		UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	Extensions UCH02, UCSH (01-05,07,08)				

Figure 3.91: Use Case UCSH06

	UCSH07 send the receipt			send the receipt
Targ	get of Use case	Send the receipt of th		
Inpu	its			account associated to MAK07
		User must already ha		
				ociated a payment account
0.1		User must already ha		•
Out	puts	-		ot of the purchase by email
		В	Basic f	
No	User		No	System
1	User bought an	ıtem		
			2	The system sends the receipt of the purchase
				by email
		Int	erface	view
Alter	rnative flow 1:	flow 1: UCH21: Exit from MAK07.		
Alte	rnative flow 2:	UCH22: Switch	appli	cation on device in which MAK07 will
		continue run in	backg	round.
Exte	Extensions UCH02, UCSH (01-05,07,08)			5,07,08)

Figure 3.92: Use Case UCSH07

	UCSH08 Show the receipt					
т		Could service of d		-		
	get of Use case	Send the receipt of th				
Inpu	its			account associated to MAK07		
		User must already ha				
				ociated a payment account		
		User must already ha		-		
Out	puts	The system shows th	e recei	pt of the purchase		
		I	Basic f	low		
No	User		No	System		
1	User bought an	item				
			2	The system shows the receipt of the		
				purchase		
		Int	terface	e view		
				♥ _d 1127		
		+ M.	AK0	7 SHOP		
			Boost	ers		
			RECEI	РТ		
		You have	e bougth 50	00 brains on		
		MAK07				
		Doogk	e pisy	ок		
		number of br	oins to get	price real concurrency		
			Them			
		Halloween		Duy Duy		
		pro	coeed with the	purchase		
				_)		
Alte	rnative flow 1:	UCH21: Exit from MAK07.				
Alte	rnative flow 2:	UCH22: Switch	1 appli	cation on device in which MAK07 will		
Exte	ensions					
Alte						

Figure 3.93: Use Case UCSH08

	UCSH09 Transaction security			
Targ	get of Use case	Allow the user to intr	oduce	bank account information
Inpu	its			account associated to MAK07
		User must already ha		in to MAKU7 ociated a payment account
		User must already ha		
0.4				-
Out	puts			to introduce bank account information
NT-	T	E	Basic f	
No	User	•.	No	System
1	User bought an	item	-	
			2	The system allows the user to introduce bank account information
		Tut	erface	
		Confii externalid SSD brance enter you without Without subset sub	Booste rm purc prealLearn a to buy with r pin	aard CONFJAU The field calculations File boy
Alte	rnative flow 1:	: UCH21: Exit from MAK07.		
Alte	rnative flow 2:	UCH22: Switch	appli	cation on device in which MAK07 will
		continue run in		
Exte	nsions	UCH02, UCSH	(01-0	7)

Figure 3.94: Use Case UCSH09

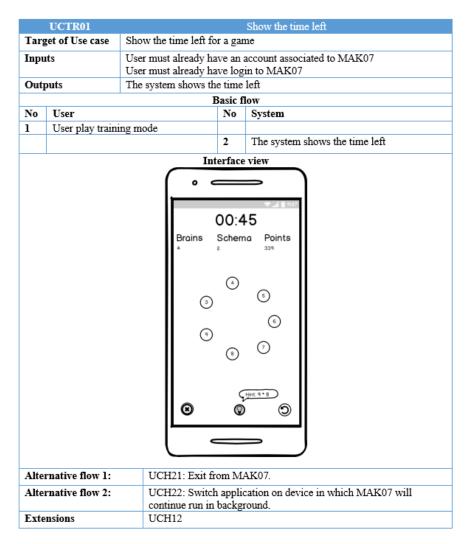


Figure 3.95: Use Case UCTR01

	UCTR02	Show number of brains accumulated		
Target of Use case Show the time left for a game				
Inpu	-	User must already have an account associated to MAK07 User must already have login to MAK07		
Out	puts	The system shows the time left		
		Basic flow		
No	User	No System		
1	User play train			
		2 The system shows the time left Interface view		
		Image: second		
	rnative flow 1:	UCH21: Exit from MAK07.		
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	ensions	UCH12		

Figure 3.96: Use Case UCTR02

	UCTR03	Show number of schemas solve	A				
Target of Use case Show the number of schemas solved until that time in the same game							
Inpu							
Out	puts	The system shows the number of schemas solved untigame	l that time in the same				
		Basic flow					
No	User	No System					
1	User play train						
		2 The system shows the r solved until that time in					
		Interface view	U				
		$\overline{ \cdot = }$					
		·					
		00:45					
		Brains Schema Points					
		~ ∠ 551					
		(+)					
		3 (6)					
		6)					
		9					
		\odot					
		Hint 9 * 8					
		IC O					
Alte	rnative flow 1:	UCH21: Exit from MAK07.					
Alte	rnative flow 2:	UCH22: Switch application on device in which	UCH22: Switch application on device in which MAK07 will				
		continue run in background.					

Figure 3.97: Use Case UCTR03

UCTR04 Show number of points accumulated until that time in a game Target of Use case Show the number of points accumulated until that time in a game Inputs User must already have an account associated to MAK07 Outputs The system shows the number of points accumulated until that time in game Basic flow No User No System 1 User play training mode 2 2 The system shows the number of points accumulated until that time in a game Interface view Interface view Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.		TICTEDA		4	1 0 1 . 1 . 1			
Inputs User must already have an account associated to MAK07 Outputs The system shows the number of points accumulated until that time in game Basic flow No User No System 1 User play training mode 2 The system shows the number of points accumulated until that time in a game Interface view Interface view OU:45 Brains Schemo Points 2 00:45 328 Brains Schemo Points 2 00:45 328 Brains Schemo Points 3 0 0 4 2 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0 9 0 0								
User must already have login to MAK07 Outputs The system shows the number of points accumulated until that time in game Basic flow No User 1 User play training mode 2 The system shows the number of points accumulated until that time in a game Interface view Interface view 00:45 Brains Brains Schema 00:45 Brains Brains Schema 0 © © © © © Outputs © Image: Schema Points 304 © © © Output UCH21: Exit from MAK07. Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				-	-			
Outputs The system shows the number of points accumulated until that time in game Basic flow No User No System 1 User play training mode 2 The system shows the number of points accumulated until that time in a game Interface view Interface view 00:45 Brains Schema Points 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <th>Inpu</th> <th>ıts</th> <th></th> <th></th> <th></th>	Inpu	ıts						
Basic flow No System 1 User play training mode 2 The system shows the number of points accumulated until that time in a game Interface view Image: 1 Image: 1 Image: 1 Image: 1 2 The system shows the number of points accumulated until that time in a game Image: 1 Image: 1 Image: 1 Image: 1 Image: 1 Image: 1 Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.								
Basic flow No System 1 User play training mode 2 2 The system shows the number of points accumulated until that time in a game Interface view 00:45 Brains Schema 00:45 Brains Schema 0:45 Brains Brains Schema 0:0:45 Brains Brains Schema 0:0:45 Brains Brains Schema 0:0:45 Brains Brains Schema 0:0:50 Image: Schema	Out	puts	-	the nun	ber of points accumulated until that time in a			
No User No System 1 User play training mode 2 The system shows the number of points accumulated until that time in a game Interface view Image: Colspan="2">Interface view Image: Colspan="2">Image: Colspan="2" To colspan="2"				Dasia	1			
1 User play training mode 2 The system shows the number of points accumulated until that time in a game Interface view Interface view 00:45 Brains Schema Points 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	No	Usor						
2 The system shows the number of points accumulated until that time in a game Interface view 00:45 Brains Schema 00:45 Brains Schema 0 0 <th></th> <th></th> <th>ing mode</th> <th>110</th> <th>system</th>			ing mode	110	system			
Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.	1	User play train	ing mode	2	The system shows the number of points			
Interface view 00:45 Brains Schema 9 9 9				-				
Brains Schema Points 334 Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Im		1	In	terface				
Brains Schema Points 334 Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Im								
Brains Schema Points 334 Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Im			° '		>			
Brains Schema Points 334 Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Im			1		♥_al 1127			
Brains Schema Points 334 Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Image: Schema Im				00.4	5			
Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			Desires					
Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			Brains	2 Schen				
Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.								
Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				-				
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				4				
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			3		(5)			
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.								
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.					•			
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			U					
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				8	U II			
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.								
Image: Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.								
Alternative flow 1: UCH21: Exit from MAK07. Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				9	Hint 9*8			
Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			II 🗵	Ø	0			
Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.								
Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				_	_			
Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.								
Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.								
continue run in background.	Alte	rnative flow 1:		UCH21: Exit from MAK07.				
	Alte	rnative flow 2:						
Extensions UCH12								
	Exte	ensions	UCH12					

Figure 3.98: Use Case UCTR04

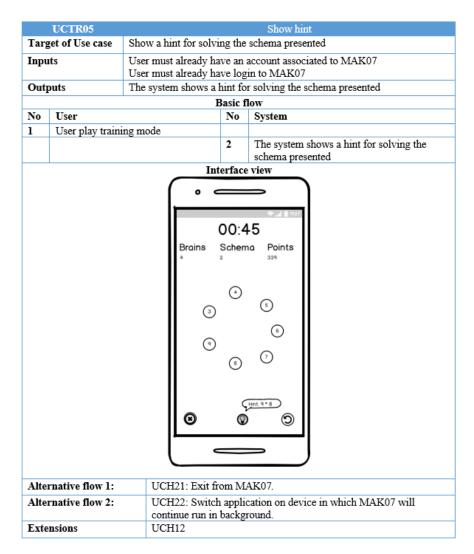


Figure 3.99: Use Case UCTR05

	UCTR06 Show results after times up						
Targ	get of Use case	Provide the resume	and res	sults of a game done after times up			
Inpu	ıts	User must already h User must already h		account associated to MAK07			
Out	outs			ume and results of a game done after times up			
,			Basic f	<u> </u>			
No	User		No	System			
1	User play train	ing mode					
		-	2	The system shows the resume and results of			
				a game done after times up			
			terface	ce view			
		(•		—)			
				terre ∎ ka 🕈			
			GREAT!!				
		A/	Actual Level 10/35				
			MAK SC	CORE			
			239				
		RES	RESOLVED SCHEMES				
			2				
		EF	FECTIVE	/ENESS			
		_	10%				
			RETRY	~			
			SEE DETAI				
				HOME			
				—)			
Alte	rnative flow 1:	UCH21: Exit f	CH21: Exit from MAK07.				
Alte	rnative flow 2:			ication on device in which MAK07 will			
		continue run in	ı backg	ground.			
Exte	Extensions UCH12						

Figure 3.100: Use Case UCTR06

	UCTR07	Show actual level of a player			
Tarş	get of Use case	Show the actual level of a player on MAK07			
Inpu	ıts	User must already have an account associated to MAK07 User must already have login to MAK07			
Out	puts	The system shows the actual level of a player			
		Basic flow			
No	User	No System			
1	User play traini				
		2 The system shows the actual level of a player			
		Interface view			
		GREAT!! Actual Level 10/35 MAK SCORE 334 RESOLVED SCHEMES 2 EFFECTIVENESS 50% RETRY BEE DE TALS BACK TO HOME			
	rnative flow 1:	UCH21: Exit from MAK07.			
	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	tensions UCH12, UCH01, UCTR (01-05,11-15)				

Figure 3.101: Use Case UCTR07

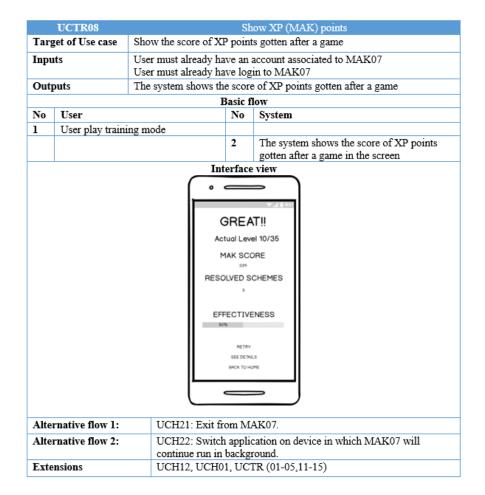


Figure 3.102: Use Case UCTR08

	UCTR09		UCTR09 Show number schemas solved				
Target of Use case Show the number of schemas solved in a game							
Inpu	ıts	User must already hav User must already hav		account associated to MAK07 in to MAK07			
Out	puts			ber of schemas solved in a game			
		В	asic f	low			
No	User		No	System			
1	User play traini	ng mode					
			2	The system shows the number of schemas solved in a game on the screen			
		Inte	erface	<u> </u>			
	G Actu MA RESOL			T!! PI 10/35 DRE CHEMES ENESS			
Alte	rnative flow 1:	UCH21: Exit fro	UCH21: Exit from MAK07.				
Alte	rnative flow 2:	UCH22: Switch continue run in b		cation on device in which MAK07 will round.			
Exte	Extensions UCH12, UCH01, UCTR (01-05,11-15)						

Figure 3.103: Use Case UCTR09

	UCTR10		S	how the effectiveness	
Targ	get of Use case	Show the effectivene	ss of a	game represented in a progress bar	
Inpu	ıts	User must already ha User must already ha		account associated to MAK07 in to MAK07	
Out	puts	The system shows the	e effec	tiveness of a game represented in a progress bar	
		I	Basic f	low	
No	User		No	System	
1	User play traini	ng mode			
			2	The system shows the effectiveness of a game represented in a progress bar on the screen	
		Int	erface		
		Aci M RESC EFF	RETRY SEE DETAIL BACK TO HO	IN 10/35 DRE CHEMES ENESS	
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	ensions	UCH12, UCH01, UCTR (01-05,11-15)			

Figure 3.104: Use Case UCTR10

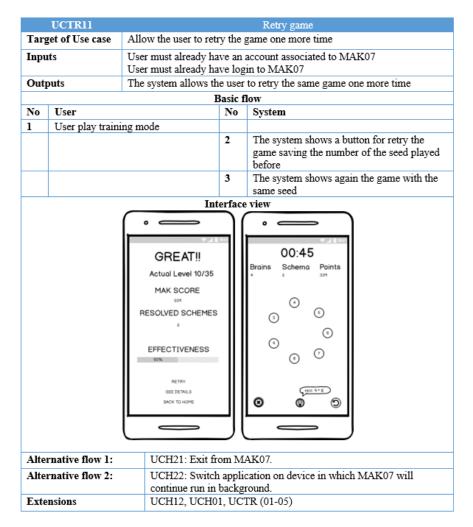


Figure 3.105: Use Case UCTR11

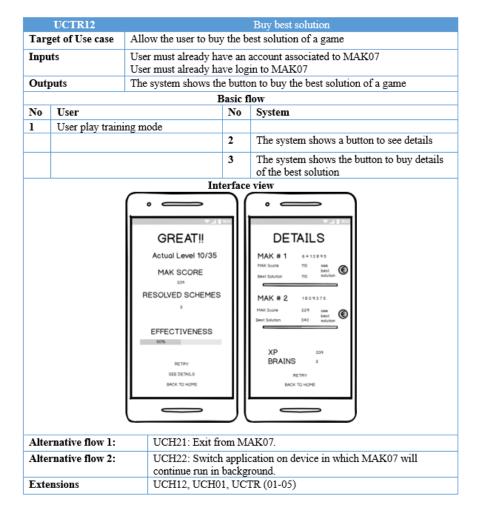


Figure 3.106: Use Case UCTR12

	UCTR13 Display a message of motivation					
Tar	get of Use case	Display a message of	fmotiv	ation after finished a game		
Inpu	ıts	User must already ha User must already ha		account associated to MAK07 in to MAK07		
Out	puts			reen a message of motivation		
		I	Basic f	low		
No	User		No	System		
1	User play train	ng mode				
			2	The system shows on the screen a message of motivation		
		Inf	orface			
Interface view C C C C C C C C C C C C C C C C C C						
	rnative flow 1:	UCH21: Exit from MAK07.				
	ernative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.					
Exte	Extensions UCH12, UCH01, UCTR (01-05)					

Figure 3.107: Use Case UCTR13

	UCTR14	Disp	lay the	e details of each schema solved	
Targ	get of Use case	Display as a list all t	he deta	ils of each schema solved in a game	
Inpu	ıts	User must already ha User must already ha		account associated to MAK07 in to MAK07	
Out	puts	~	n the s	creen a list of details of each schema solved in	
		the game			
No	User	1	Basic f	low System	
1	User play traini	ng mode	110	System	
-	eser play train	ing mode	2	The system shows on the screen a list of details of each schema solved in the game	
		Int	terface		
		C DETAILS MAK # 1 6413895 MAK 500 10 50 Best Soution 10 50 MAK # 2 1809375 MAK 500 239 50 Best Soution 340 50 MAK 500 239 Best Soution 340 50 C Best Soution 340 Best Soution 50 C Best Soution 50 Best Soution 50 C Best Soution 50 Best Soution 50 C Best Soution 50 C Best Soution 50 C Best Soution 50 C Best Soution 50 C Best Soution 50 C C C C C C C C C C C C C			
	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will			
Exte	ensions	continue run in background. UCH12, UCH01, UCTR (01-05)			
2.40					

Figure 3.108: Use Case UCTR14

	UCTR15	Di	splav i	nput numbers of each schema		
Targ	get of Use case	Display the combination		f numbers of input of each schema in a game		
	included in a list					
Inpu	ıts	User must already ha	ave an	account associated to MAK07		
		User must already ha	ave log	in to MAK07		
Out	puts			creen the combination of numbers of input of		
		each schema solved				
]	Basic f			
No	User		No	System		
1	User play train	ing mode				
			2	The system shows on the screen the		
				combination of numbers of input of each		
				schema solved in the game		
		In	terface	view		
		(•		=)		
				◆ ▲ 1 85		
			ETA]	LS		
		MAK #	1 .	13895		
		MAK Score		149		
		Best Solutio	m 190	teut C		
		MAK #	2 18	09375		
		MAK Score		test 🕑		
		Best Solution	1 34	o solution		
		II				
		XP		900		
		BRA	AINS	4		
			REMATO	н		
	BACK TO HOME					
		l		>]		
Alte	rnative flow 1:	UCH21: Exit fi	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch	h annli	cation on device in which MAK07 will		
Ane	manye now 2.	continue run in				
Exte	ensions					
LAIP	11310113	UCH12, UCH01, UCTR (01-05)				

Figure 3.109: Use Case UCTR15

	UCTR16	Disp	lay XF	points gotten for each schema	
Targ	get of Use case	Display the XP point	s gotte	en for each schema solved in a game	
Inpu	ıts	User must already ha User must already ha		account associated to MAK07 in to MAK07	
Outj	puts	solved in a game		screen the XP points gotten for each schema	
		I	Basic f		
No	User		No	System	
1	User play traini	ng mode	2	The system shows on the screen the XP points gotten for each schema solved in a game	
		Int	erface	view	
	Interface view Image: Second				
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	ensions	UCH12, UCH01, UCTR (01-05)			

Figure 3.110: Use Case UCTR16

UCTR17		Disnl	ay points of best solution	
Target of Use case	Display the points of		st solution for each schema solved in a game	
Inputs		ve an a	account associated to MAK07	
Outputs	The system shows or	n the s	creen numerically and with a progress bar the or each schema solved in a game,	
	•	anon i Basic f		
No User		No	System	
1 User play traini	ng mode		· ·	
		2	The system shows on the screen the points of the best solution for each schema solved in a game	
		3	The system shows a contrast between points gotten versus points of the best solution found for each schema solved in a game	
	Int	erface		
	C DETAILS MAK # 1 6413845 MAK BLOW 10 49375 MAK # 2 1809375 MAK # 2 1809375 MAK BCOV 224 mean Bett Solution 24 mean Bett Solution			
Alternative flow 1:	UCH21: Exit from MAK07.			
Alternative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.			
Extensions	UCH12, UCH01, UCTR (01-05)			

Figure 3.111: Use Case UCTR17

	UCTR18		Show	details of operations done	
Tar	get of Use case	Show the details of t	he ope	rations done	
Inpu	ıts	User must already ha User must already ha		account associated to MAK07 in to MAK07	
Out	puts	points of the best sol	ution f	screen numerically and with a progress bar the for each schema solved in a game,	
]	Basic f		
No	User		No	System	
1	User play traini	ng mode			
			2	The system shows on the screen the points of the best solution for each schema solved in a game	
			3	The system shows a contrast between points gotten versus points of the best solution found for each schema solved in a game	
	1	Int	terface		
	● DETAILS MAK # 1 110 0 0 0 Max Sum 10 me Wet Summ 10 me Bert Suutum 10 me OPERTIONS DONE Ell(1 + 0) + 0) + 0) + 0) + 1 Ell XP 321 BRAINS 2 BERAINS 2 ME Ell(1 + 0) + 0) + 0) + 0				
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
	rnative flow 2:		UCH22: Switch application on device in which MAK07 will		
Ane	1 Hattye 110w 2.	continue run in			
Exte	ensions	UCH12, UCH01, UCTR (01-05)			

Figure 3.112: Use Case UCTR18

UCTR19			Progress bar contrast				
		Display a progress bar that represent the comparation between best solution and the solution done by the user for each schema solved in a game					
Inp	uts	User must already have an account associated to MAK07					
_		User must already have login to MAK07					
Out	puts		The system shows a progress bar that contrast the points of the best solution				
		with the points gotten of a schema solved in a game					
		I	Basic f				
No	User		No	System			
1	User play train	ing mode					
			2	The system shows a contrast between points			
				gotten versus points of the best solution			
				found for each schema solved in a game represented with a progress bar			
<u> </u>		Tuá	erface				
				5			
		L [_]	DETAI				
		MAK	#1 110 100	20000			
		Devt Soluti	on 110	Level adulian			
			ERTIONS				
			(((* + 0) + 0) + 0	0 + 0) + 0) - 1			
		XP		229			
		BR	AINS	z			
			DCTRV				
			BACK SOLO G	AME			
Alte	ernative flow 1:	UCH21: Exit fr	om M	AK07.			
Alternative flow 2:		UCH22: Switch	UCH22: Switch application on device in which MAK07 will				
			continue run in background.				
Exte	Extensions UCH12, UCH01			TR (01-05)			

Figure 3.113: Use Case UCTR19

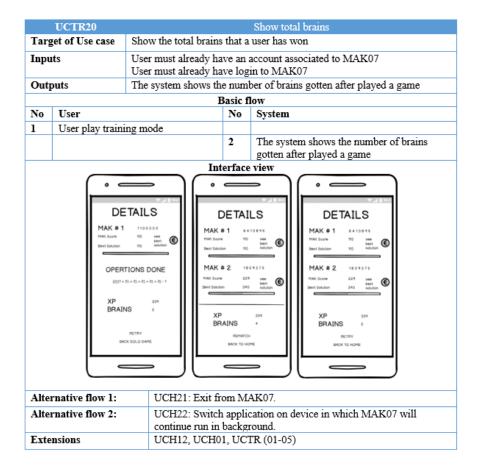


Figure 3.114: Use Case UCTR20

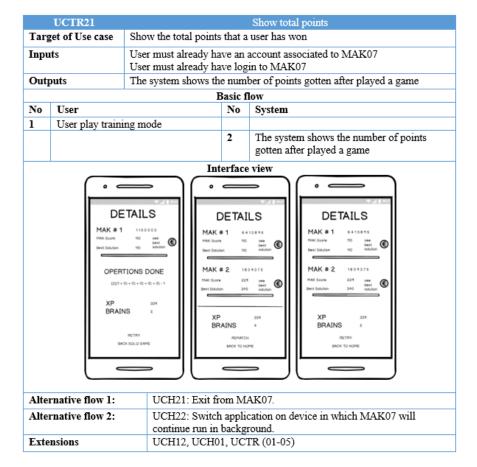


Figure 3.115: Use Case UCTR21

UCSOLO01			Show a path game			
Target of Use case	Show a path game where is visualized the starting point, the finish, each stop where the player can be and each stop that represent levels of difficulties progressive					
Inputs		User must already have an account associated to MAK07 User must already have login to MAK07				
Outputs	The system shows a path game where is visualized the starting point, the finish, each stop where the player can be and each stop that represent levels of difficulties progressive					
	I	Basic f	low			
No User		No	System			
1 User play solo	game mode					
		2	The system shows a path game where is visualized the starting point, the finish, each stop where the player can be and each stop that represent levels of difficulties progressive			
I	Int	terface				
MAK07 MAK07						
Alternative flow 1:	UCH21: Exit fr	om M	AK07			
Alternative flow 2:	UCH22: Switch	UCH22: Switch application on device in which MAK07 will				
	continue run in background.					
Extensions	UCH08, UCSO	LO (0	2-05)			

Figure 3.116: Use Case UCSOLO01

UCSOLO02		Show stop position on path			
Target of Use case S		Show where the user	how where the user is over the path game in solo game MAK07		
Inpu	ıts	2	User must already have an account associated to MAK07 User must already have login to MAK07		
Out	puts	The system shows w MAK07	The system shows where the user is over the path game in solo game MAK07		
		В	asic f	low	
No	User		No	System	
1	User play solo	game mode			
			2	The system shows a symbolic representation of the last stop where the user was, in the case of first game always be on 1st stop	
Interface view MAK07					
Alte	rnative flow 1:	w 1: UCH21: Exit from MAK07.			
Alte	Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				
Exte	Extensions UCH08, UCSO			1,03-05)	

Figure 3.117: Use Case UCSOLO02

UCSOLO03			Repeat game stop			
-		already has overcome	Allow the user play as many times the player want a level that he/she lready has overcome			
Inpu	ıts	User must already ha	User must already have an account associated to MAK07			
		User must already have login to MAK07				
Out	puts		• •	epeatedly an overcome game		
		E	Basic f			
No	User		No	System		
1	User play solo	game mode				
			2	The system allows to play repeatedly an		
				overcome game and save the results obtain after played		
		Tut	erface			
Alte	rnative flow 1:	ve flow 1: UCH21: Exit from MAK07.				
Alte	Alternative flow 2: UCH22: Switch application on device in which MAK07 will			cation on device in which MAK07 will		
continue run in		backgi	round.			
Exte	Extensions UCH08, UCSOLO (01,02,04,05)					

Figure 3.118: Use Case UCSOLO03

1	UCSOLO04			Change game stop
Targ	Target of Use case Allow the user to cha		ange t	he level when has overcome a level of a path
		game		
Inpu	ıts			account associated to MAK07
		User must already ha		
Out	puts		ie use t	to change the level when has overcome a level
		of a path game	Basic f	law
No	User	ſ	No	System
1	User play solo	rama mada	110	System
1	User play solo	game mode	2	The system allows the use to change the
			-	level when has overcome a level of a path
				game
		Int	erface	0
	MAK07			
Alte	rnative flow 1:	ive flow 1: UCH21: Exit from MAK07.		
Alte	rnative flow 2:	UCH22: Switch	applio	cation on device in which MAK07 will
		continue run in		
Exte	nsions	UCH08, UCSO	LO (01	1 - 03,05)

Figure 3.119: Use Case UCSOLO04

UCSOLO05 Visualized unblock stops on path			Visuali	zed unblock stops on path
Target of Use case Visualized unblock le		evels tl	hat user hasn't yet overcome in the game path	
Inpu Outr		User must already ha	ve log	account associated to MAK07 in to MAK07 evels that user hasn't vet overcome in the game
Ծաղ	, and a second s	path	OICCR	evens una user masir ryer evereenne in me game
		В	Basic f	
No	User		No	System
1	User play solo	game mode		
			2	The system shows unblock levels that user hasn't yet overcome in the game path
		Int	erface	view
MAK07				
Alter	Iternative flow 1: UCH21: Exit from MAK07.			AK07.
Alter	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will ound.
Exte	nsions	UCH08, UCSO		

Figure 3.120: Use Case UCSOLO05

UCSOLO06 Active booster				Active booster	
Targ	get of Use case	Allow the user to act	tive bo	oster for a game	
Inpu	ıts	User must already ha User must already ha	ave an ave log	account associated to MAK07 in to MAK07	
Out	puts			boosts available for the game	
]	Basic f	low	
No	User		No	System	
1	User play solo	-			
2	User select one	stop to play			
			3	The system shows a list of boosts available for the game	
Interface view					
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.	
Exte	nsions	UCH08			

Figure 3.121: Use Case UCSOLO06

UCSOLO07 Active booster				Active booster	
Tar	get of Use case	Allow the user to act	ive booster for a game		
Inpu	uts	User must already ha User must already ha		account associated to MAK07 in to MAK07	
Out	puts	The system shows a	list of l	boosts available for the game	
		I	Basic f		
No	User		No	System	
1	User play solo				
2	User select one				
3	User select the the game	booster to apply in			
			4	The system shows all the boosters selected for a game	
		Int	erface	view	
		MAK07 Brains Devalues Devalues		00:45 Broins Boosters Points + 00 € € ⊙	
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
Alte	ernative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.	
Exte	ensions	UCH08			

Figure 3.122: Use Case UCSOLO07

τ	UCSOLO08		Show	the cost of each booster	
Targ	Target of Use case Shows the cost of ear			ster for a game	
Inpu	ıts	User must already ha User must already ha		account associated to MAK07 in to MAK07	
Out	puts	The system shows a	list of l	boosts available for the game	
		I	Basic fl	low	
No	User		No	System	
1	User play solo	game mode			
			2	The system shows the cost of apply each	
		Ter	erface	booster for a game	
			eriace	view	
		°		>	
		 ♥ ♥	MAK(Brains 0 Audule Booster HUT 500 Brans FREIZE THE TO Brans HUTTPL'SO APPLY	5 CO CO K ² CO	
Alter	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will			
		continue run in			
Exte	nsions	UCH08			

Figure 3.123: Use Case UCSOLO08

l	UCSOLO09 Show brains available				
Targ	get of Use case	Shows the number of	f brains available at that moment that a player has		
Inpu Out		User must already ha	we log	account associated to MAK07 in to MAK07 ber of brains available for apply a booster in a	
		game			
		E	Basic f		
No	User		No	System	
1	User play solo	game mode	•	The content of some the court of the int	
			2	The system shows the number of brains available for apply a booster in a game	
		Int	erface		
Alte	rnative flow 1:	UCH21: Exit fr	om Ma	AK07.	
Alte	rnative flow 2:		UCH22: Switch application on device in which MAK07 will		
		continue run in	backgi	ound.	
Exte	nsions	UCH08			

Figure 3.124: Use Case UCSOLO09

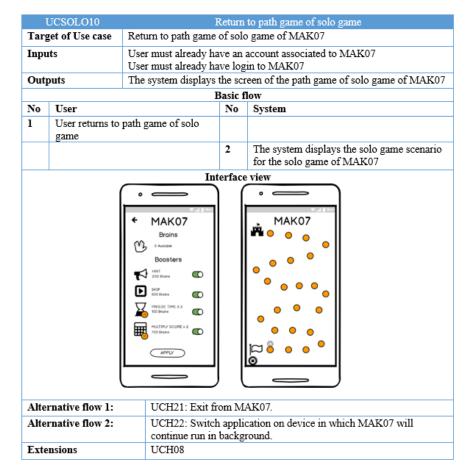


Figure 3.125: Use Case UCSOLO10

UCSOLO11	UCSOLO11 Active booster available			
Target of Use case	Show the active boost	ster av:	ailable in the game	
Inputs User must already ha User must already ha			account associated to MAK07 in to MAK07	
Outputs	The system shows th	e activ	e booster available in a game	
]	Basic f		
No User		No	System	
1 User play solo				
2 User select on				
3 User select the the game	booster to apply in			
		4	The system shows all the boosters selected for a game	
	00:45 Broins **			
Alternative flow 1:	UCH21: Exit fr	om M.	AK07.	
Alternative flow 1: Alternative flow 2:		1 appli	cation on device in which MAK07 will	

Figure 3.126: Use Case UCSOLO11

1	UCSOLO12		M	AK schema 7 numbers	
Targ	get of Use case	Show a MAK schem	a comj	posed of 7 numbers	
Inpu		User must already ha	we log	account associated to MAK07 in to MAK07 le combination of 7 numbers represented with	
ouq	puto	balls	Sorrao	to company of a manoers represented what	
Basic flow					
No	User		No	System	
1	User play solo	game mode	•		
			2	The system shows a solvable combination of 7 numbers represented with balls	
		Int	erface	view	
00:45 Brains Boosters Points Points					
Alte	rnative flow 1:	w 1: UCH21: Exit from MAK07.			
Alte	rnative flow 2:	low 2: UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	ensions	UCH08			

Figure 3.127: Use Case UCSOLO12

1	UCSOLO13		Sh	low position of player
Target of Use case Show the number of stop where the player actually is				
Inpu	Inputs User must already has User must already has			account associated to MAK07 in to MAK07
Out	puts	The system shows th	e num	ber of the stop where the player <u>actually is</u>
		I	Basic f	low
No	User		No	System
1	User play solo	game mode		
			2	The system shows the number of the stop where the player actually is
		Int	erface	
GREAT!! Actual Level 10/35			vei 10/35 DORE BTEINED VENESS	
Alte	rnative flow 1:	UCH21: Exit from MAK07.		
Alte	rnative flow 2:			cation on device in which MAK07 will
Exte	ensions	continue run in UCH08	oackgi	ound.

Figure 3.128: Use Case UCSOLO13

	UCC01		C	Create a new challenge		
Tar	get of Use case	Create a new challen	ge by i	ge by random search of opponent		
Inpu	ıts	User must already ha User must already ha		account associated to MAK07 in to MAK07		
Out	puts	The system creates a	new c	hallenge by random search of opponent		
		I	Basic f			
No	User		No	System		
1	User play chall	enge mode				
			2	The system shows the interface of a challenge game		
		Int	terface	view		
	CHALLENGE					
Alte	rnative flow 1:	UCH21: Exit from MAK07.				
Alte	rnative flow 2:			cation on device in which MAK07 will		
.		continue run in	backg	round.		
Exte	Extensions UCH08					

Figure 3.129: Use Case UCC01

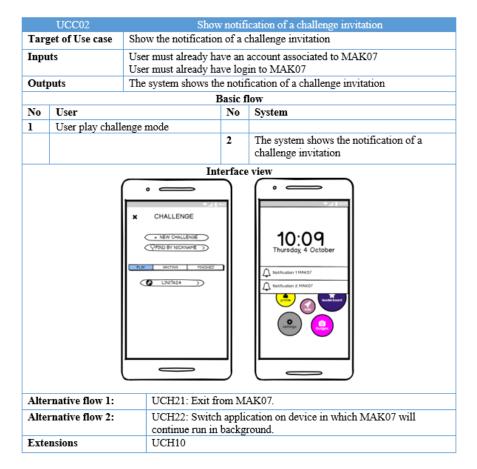


Figure 3.130: Use Case UCC02

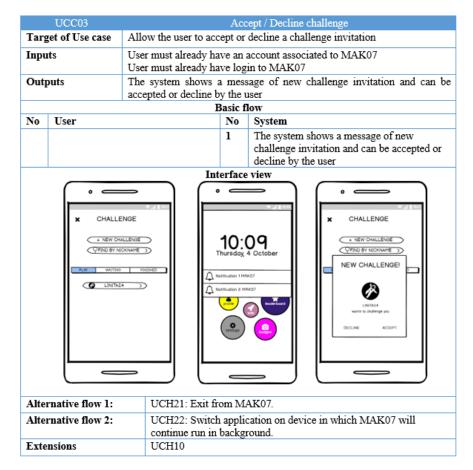


Figure 3.131: Use Case UCC03

	UCC04			Search a player
		ge bv :	searching a player with nickname	
Inpu			we an	account associated to MAK07
Out	puts	The system searche challenge with it	sapi	ayer by typing a nickname creating a new
		H	Basic f	
No	User		No	System
1	The user clicks nickname	the button of find by		
			2	The system shows the keyboard for typing the nickname of the player that the user wants to challenge
			3	The system searches on the nickname and sends an invitation to play a challenge by a notification
Alte	rnative flow 1:	UCH21: Exit from MAK07.		
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	ensions	UCH10		

Figure 3.132: Use Case UCC04

	UCC05 Sh			t of challenges ready to play		
Tar	get of Use case	Shows a list of challe	enges r	eady to play on MAK07		
Inpu	ıts		User must already have an account associated to MAK07 User must already have login to MAK07			
Out	puts			f challenges that are ready for playing		
		Ι	Basic f	low		
No	User		No	System		
1	The user clicks	on the tab play				
			2	The system shows the list of challenges ready to play		
		Int	erface	view		
	CHALLENGE · NEW CHALLENGE (7/F20/87 NCONAPE) LINITS24					
Alte	rnative flow 1:	ive flow 1: UCH21: Exit from MAK07.				
Alte	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.		
Exte	Extensions UCH10					

Figure 3.133: Use Case UCC05

UCC06		Show list of challenges waiting				
Target of Use case		Shows a list of challenges waiting to play on MAK07				
Inputs		User must already have an account associated to MAK07 User must already have login to MAK07				
Out	puts	The system displays	a list o	f challenges that are waiting for playing		
		I	Basic f	low		
No	User		No	System		
1	The user clicks	on the tab waiting				
			2	The system shows the list of challenges waiting to play		
	Interface view • <					
Alte	Alternative flow 1: UCH21: Exit from MAK07.					
Alte	Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.					
Exte	Extensions UCH10					

Figure 3.134: Use Case UCC06

UCC07		Show list of challenges recently played			
Target of Use case		Shows a list of challenges recently played on MAK07			
Inpu	ıts	User must already have an account associated to MAK07 User must already have login to MAK07			
Out	puts	The system displays	a list o	f challenges that are recently played	
		E	Basic f	low	
No	User		No	System	
1	The user clicks	on the tab finished			
			2	The system shows the list of challenges recently played	
		Int	erface	view	
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				
Exte	Extensions UCH10				

Figure 3.135: Use Case UCC07

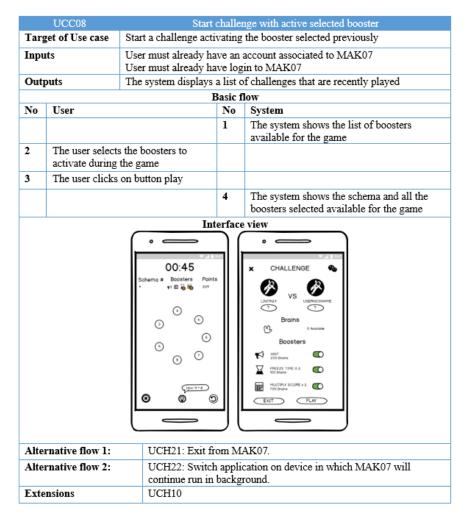


Figure 3.136: Use Case UCC08

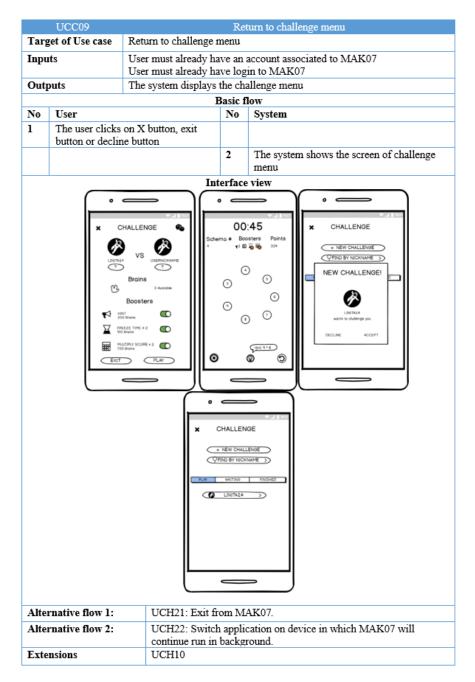


Figure 3.137: Use Case UCC09

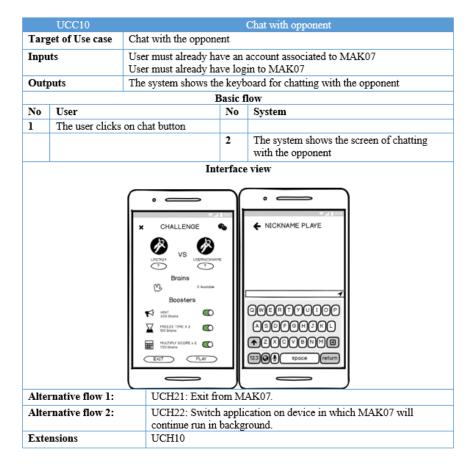


Figure 3.138: Use Case UCC10

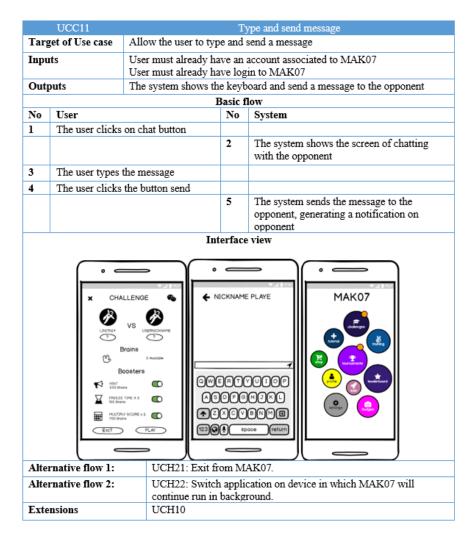


Figure 3.139: Use Case UCC11

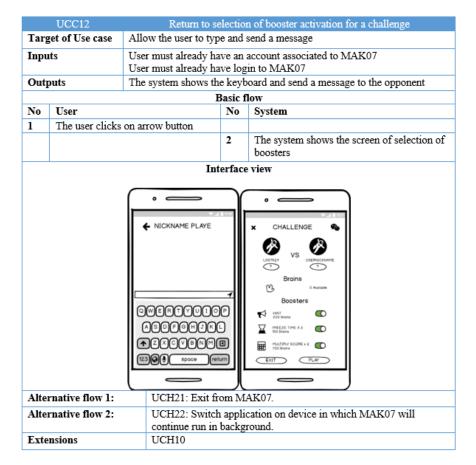


Figure 3.140: Use Case UCC12

τ	UCTOUR01			w a list of tournaments	
Target of Use case Show the		Show the list of tour	v the list of tournaments available to play		
Inpu	ıts	User must already have an account associated to MAK07 User must already have login to MAK07			
Out	puts	The system shows a	list of	tournaments that are available to play	
		I	Basic f	low	
No	User		No	System	
1	The user selects tournament	s to play a			
			2	The system shows the screen of tournament	
	COURNAMENT Set of the bolineer of under a set on an and the set of the bolineer of under a set of the set of th				
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	native flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	nsions	UCH09	Cheng		

Figure 3.141: Use Case UCTOUR01

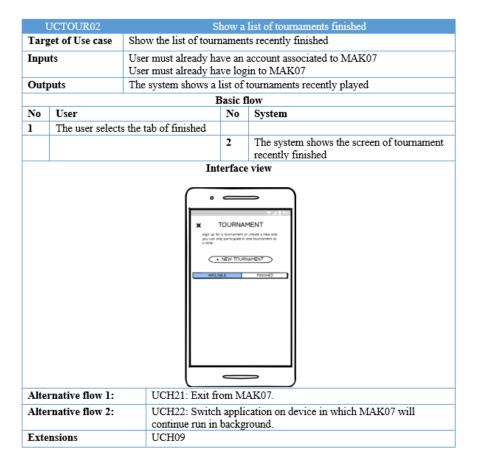


Figure 3.142: Use Case UCTOUR02

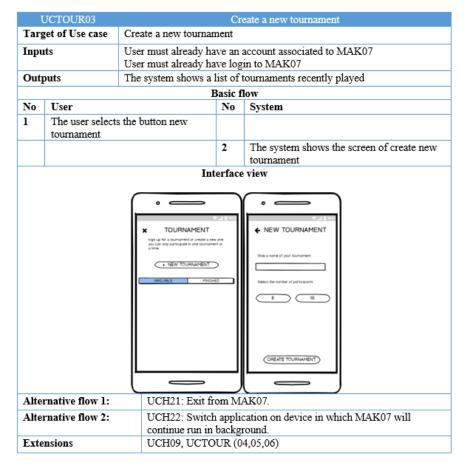


Figure 3.143: Use Case UCTOUR03

UCTOUR04		Give a name of a tournament				
Target of Use case Give		Give a name of a tou	e a name of a tournament to be created			
Inpu	ıts		er must already have an account associated to MAK07 er must already have login to MAK07			
Out	puts			or type the name of a tournament		
		I	Basic f	low		
No	User		No	System		
1	The user selects tournament	s the button new				
			2	The system shows the screen of create new tournament		
3	The user gives tournament	a name of the				
			4	The system saves the tournament name		
		COURNAMENT Figure does a bonneer or unable an one pointing on the second sec		NEW TOURNAMENT Dive a name of part loganame Select the number of participants		
Alte	Alternative flow 1: UCH21: Exit fro			AK07.		
Alte	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.		
Exte	Extensions UCH09, UCT					

Figure 3.144: Use Case UCTOUR04

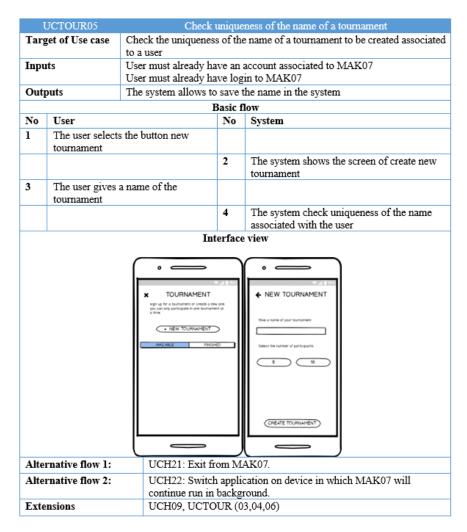


Figure 3.145: Use Case UCTOUR05

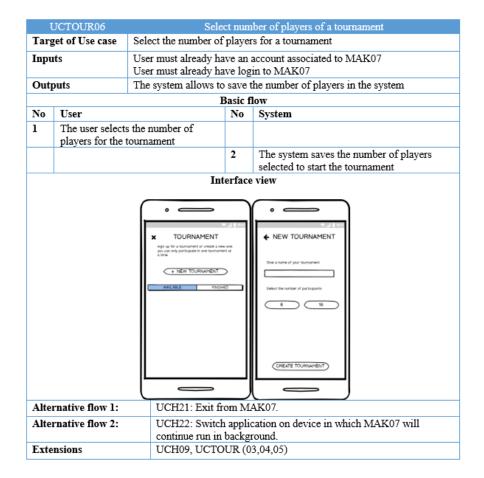


Figure 3.146: Use Case UCTOUR06

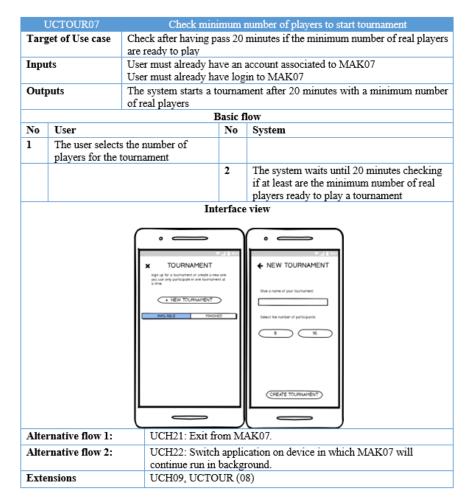


Figure 3.147: Use Case UCTOUR07

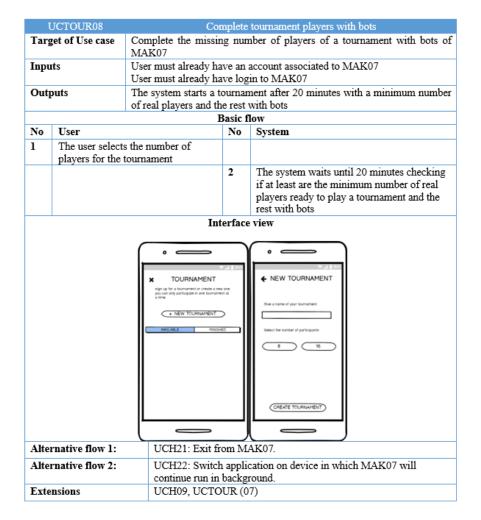


Figure 3.148: Use Case UCTOUR08

UCTOUR09			Invite a friend		
Target of Use case Invite friends to join		a touri	nament		
Inpu	ıts	User must already have an account associated to MAK07 User must already have login to MAK07			
Out	puts	The system sends an	invitat	tion to the user with the nickname given	
		I	Basic f	low	
No	User		No	System	
1	The user selects friends	s the button invite			
			2	The system searches a player by nickname to send an invitation of join to new tournament	
	1	Int	erface		
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	tive flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	Extensions UCH09, UCTOUR (10)			0)	

Figure 3.149: Use Case UCTOUR09

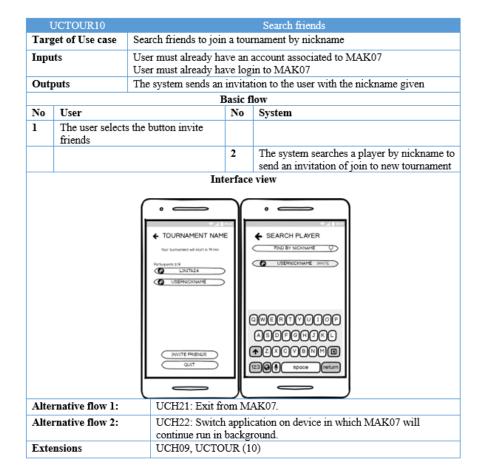


Figure 3.150: Use Case UCTOUR10

UCTOUR11				Type nickname		
Target of Use case Allow the user to ty		e nickname to search player				
Inputs		User must already have an account associated to MAK07 User must already have login to MAK07				
Out	puts	The system shows th of searching	The system shows the keyboard in order to type the nickname of the user			
]	Basic f	low		
No	User		No	System		
1	The user select friends	s the button invite				
			2	The system shows the keyboard in order to type the nickname of the user of searching		
3	The user types searching	the nickname of				
			4	The system searches a player by nickname to send an invitation of join to new tournament		
	Send an inivitation of join to new tournament Interface view					
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.		
Alte	rnative flow 2:	UCH22: Switch continue run in		cation on device in which MAK07 will round.		
Exte	nsions	UCH09, UCTC				

Figure 3.151: Use Case UCTOUR11

UCTOUR12 S		end invi	itation to join the tournament			
		Send the invitation t nickname	d the invitation to join the tournament a friend previously searched by cname			
			er must already have an account associated to MAK07 er must already have login to MAK07			
Out	puts	The system sends the previously by nickna		tion to join the tournament to the user searched		
			Basic f	low		
No	User		No	System		
1	The user selects friends	s the button invite				
			2	The system shows the keyboard in order to type the nickname of the user of searching		
3	The user types searching	the nickname of				
			4	The system searches a player by nickname to send an invitation of join to new tournament		
Interface view				• · · · · · · · · · · · · · · · · · · ·		
	TOURNAMENT NAME Vor torsamere eti duri ti Hinne Partnaporo VB LincTa24	10:09 Thursday, 4 October		TOURNAMENT NAME Vor tournament vis stort is 1% no. Processor 2% USERNOCOLAWE USERNOCOLAWE		
	mative flow 1:	UCH21: Exit f				
continue run in		backg				
Extensions UCH09		UCH09, UCTO	JUR (1	0,11)		

Figure 3.152: Use Case UCTOUR12

3-Methodolgy

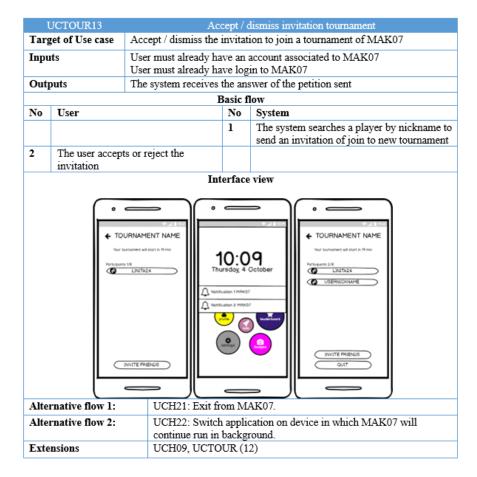


Figure 3.153: Use Case UCTOUR13

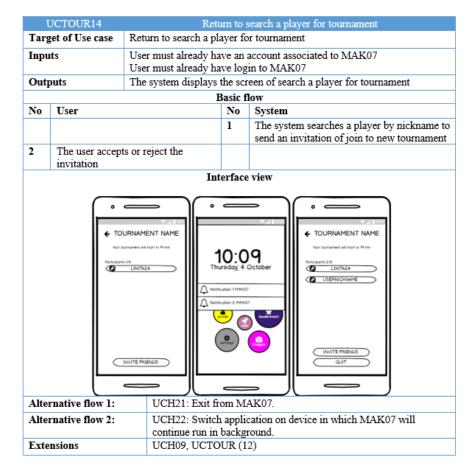


Figure 3.154: Use Case UCTOUR14

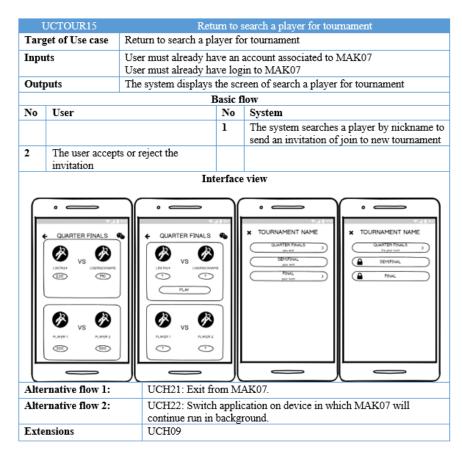


Figure 3.155: Use Case UCTOUR15

UCTOUR16 U		Unbloc	k semifinal of tournar	nent	
Target of Use case Unblock semifinal of		tourn	tournament MAK07		
		ve an account associated to MAK07 ve login to MAK07			
Out	puts	The system unblocks	the se	mifinal and shows the	button without the lock
		E	Basic f	low	
No	User		No	System	
1	The user wins t	he quarter finals			
			2	The system unblocks	s the semifinal
		Int	erface	view	
6			~		\frown
	CUARTER FINALS	CLARTER FINALS		TOURNAMENT NAME GUATER FRANS in ter in ter	X TOURNAMENT NAME
Alternative flow 1: UCH21: Exit fr		om MA	AK07.		
Alte	Alternative flow 2: UCH22: Switch continue run in			cation on device in wh round.	ich MAK07 will
Exte	ensions	UCH09			

Figure 3.156: Use Case UCTOUR16

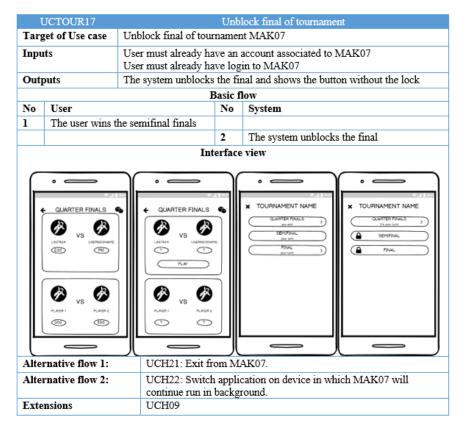


Figure 3.157: Use Case UCTOUR17

UCTOUR18		Unblo	ock quarter of tournam	ent	
Tar	Target of Use case Unblock quarter of to		ournam	nent MAK07	
Inputs User must already has User must already has		ve an account associated to MAK07 ve login to MAK07			
Out	puts	The system unblocks	the qu	arter and shows the b	utton without the lock
		E	Basic f		
No	User		No	System	
1	The user starts	the tournament			
			2	The system unblock	s the quarter
		Int	erface	view	
	CULARTER FINALS	CUARTER FINALS		CARTER FINALS	COURNAMENT NAME
Alte	Alternative flow 1: UCH21: Exit fr				
Alte	Alternative flow 2: UCH22: Switch continue run in			cation on device in wh round.	ich MAK07 will
Exte	ensions	UCH09			

Figure 3.158: Use Case UCTOUR18

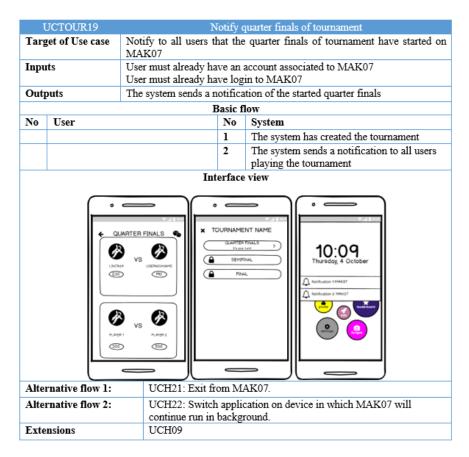


Figure 3.159: Use Case UCTOUR19

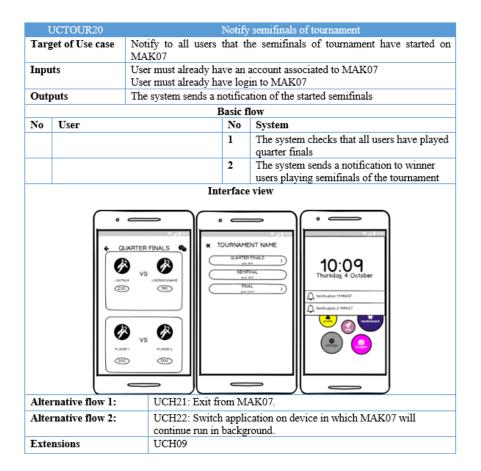


Figure 3.160: Use Case UCTOUR20

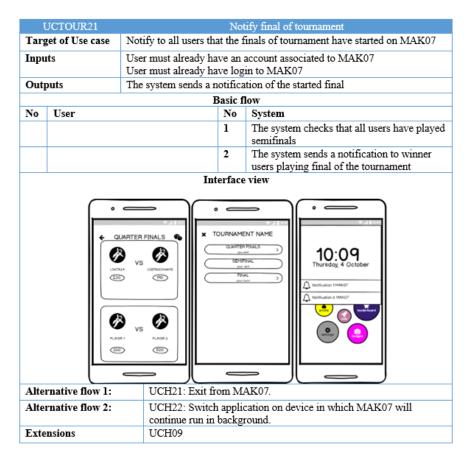


Figure 3.161: Use Case UCTOUR21

τ	UCTOUR22		Visualize the draw		
Targ	get of Use case	Allow to visualize th	the draw of tournament players in the quarter finals		
Inpu			t already have an account associated to MAK07 t already have login to MAK07		
Outj	puts	The system displays players in the quarter	system displays the interface where is shown the draw of tournamen ers in the quarter finals		
		I	Basic f	low	
No	User		No	System	
1	The user clicks button	on quarter finals			
			2	The system displays the interface where is shown the draw of tournament players in the	
		Inf	erface	quarter finals	
		Control of the second s		CUARTER FINALS	
Alte	rnative flow 1:	UCH21: Exit fr	om M.	AK07.	
Alte	Alternative flow 2: UCH22: Switch application on device in which MAK07 will continue run in background.				
Exte	ensions	UCH09			

Figure 3.162: Use Case UCTOUR22

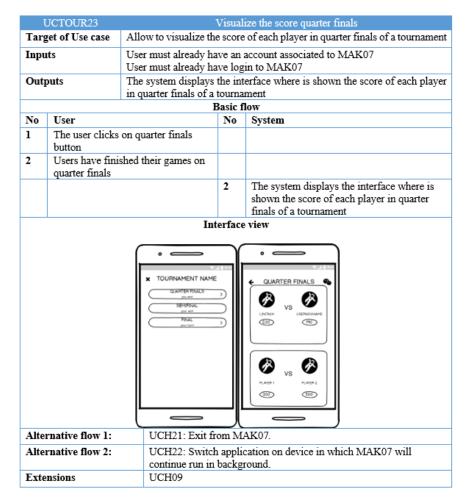


Figure 3.163: Use Case UCTOUR23

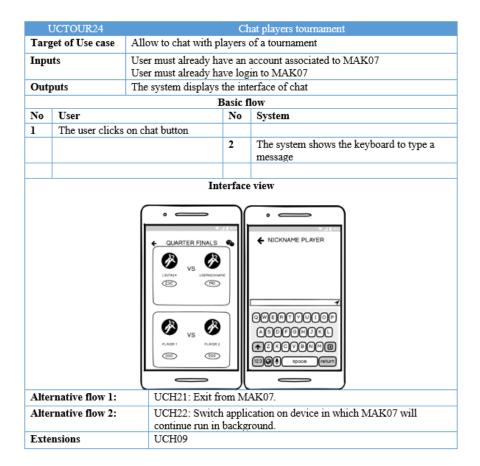


Figure 3.164: Use Case UCTOUR24

1	UCTOUR25		Acti	vate booster tournament	
Tar	Target of Use case Allow to activate and		d select the boosters for the tournament game		
Inpu	ıts	User must already ha User must already ha	ave an account associated to MAK07 ave login to MAK07		
Out	puts	The system shows th	e activ	e booster available in a game	
		E	Basic f	low	
No	User		No	System	
1	. The user starts a game of the tournament with the active boosters selected				
			2	The system shows all the boosters selected for a game	
		Int	erface	<u> </u>	
	Brain *			5 5 7 7 7 7 7 7 7 7 7 7 7 7 7	
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
Alte	rnative flow 2:	 UCH22: Switch application on device in which MAK07 will continue run in background. 			
Exte	ensions	UCH09			

Figure 3.165: Use Case UCTOUR25

τ	UCTOUR26	Return to	o tourn	ament waiting room for semifinals
Target of Use case Return to tournament		t waiting room for semifinals		
Inpu	ıts	User must already ha User must already ha	ave an account associated to MAK07 ave login to MAK07	
Out	puts	The system displays	the scr	een of tournament waiting room for semifinals
		I	Basic f	low
No	User		No	System
1	The user finishe semifinals	ed a game of		
			2	The system displays the screen of tournament waiting room for semifinals
			VS	
Alte	rnative flow 1:	UCH21: Exit fr		
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	ensions	UCH09		

Figure 3.166: Use Case UCTOUR26

Ţ	UCTOUR27	Return to t	tourna	ment waiting room for quarter finals	
Targ	Target of Use case Return to tourna		nament waiting room for quarter finals		
Inpu	ıts	User must already have an account associated to MAK07 User must already have login to MAK07			
Outj	puts			creen of tournament waiting room for quarter	
		E	Basic f	low	
No	User		No	System	
1	The user finishe finals	ed a game of quarter			
			2	The system displays the screen of tournament waiting room for quarter finals	
	interface view Interface view				
Alte	rnative flow 1:	UCH21: Exit from MAK07.			
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.			
Exte	nsions	UCH09			

Figure 3.167: Use Case UCTOUR27

τ	UCTOUR28	Return	n to to	urnament waiting room for final
Target of Use case Return to tournament		t waiti	ng room for final	
User must already ha		ve log	account associated to MAK07 in to MAK07 een of tournament waiting room for final	
	•		Basic f	
No	User		No	System
1	The user finishe	ed a game of final		
			2	The system displays the screen of tournament waiting room for final
	1	Int	erface	• 7
		Uan E R.M E	VS VS	ERRICOURE CO A.RIPL CO
Alte	rnative flow 1:	UCH21: Exit from MAK07.		
Alte	rnative flow 2:	UCH22: Switch application on device in which MAK07 will continue run in background.		
Exte	ensions	UCH09		

Figure 3.168: Use Case UCTOUR28

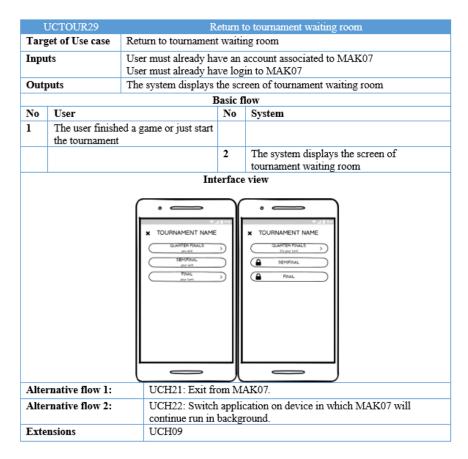


Figure 3.169: Use Case UCTOUR29

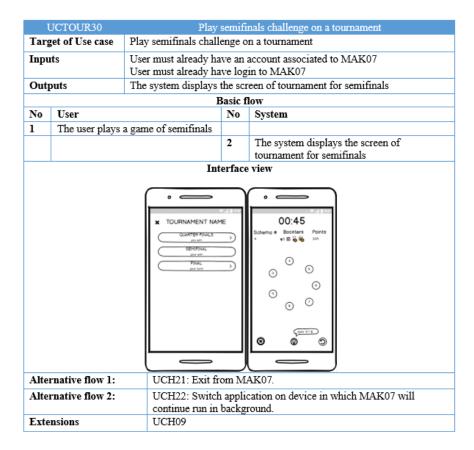


Figure 3.170: Use Case UCTOUR30

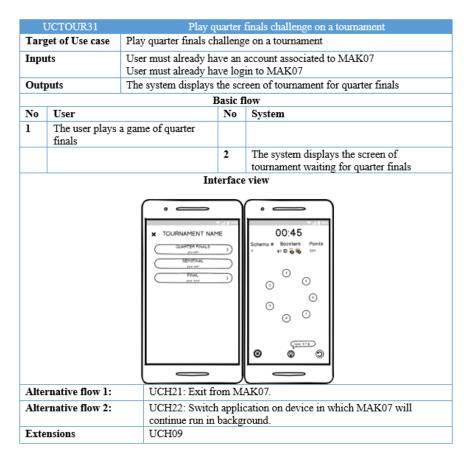


Figure 3.171: Use Case UCTOUR31

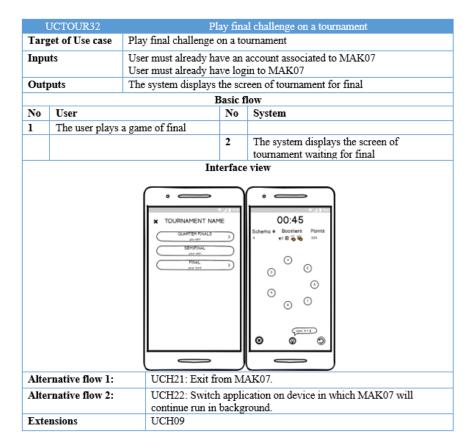


Figure 3.172: Use Case UCTOUR32

	UCLEAD01			Global ranking	
Target of Use case Show a list of the be		Show a list of the bes	st players in a global ranking with nickname and XP		
Inpu				account associated to MAK07 in to MAK07	
Out	puts	The system displays of MAK07	the scr	een the global ranking between the best players	
		Ι	Basic f	low	
No	User		No	System	
1	The user select	leaderboard			
			2	The system displays the screen the global ranking between the best players of MAK07	
		Int	erface	view	
		MAK07		USERNICKNAME Level 10	
				Nar 3 4450 USDNDONE 14400 Pager 6 4320 Pager 6 4320 Pager 7 550 Pager 7 550 Pager 1 550	
Alte	rnative flow 1:	UCH21: Exit fr	om M.	ние 1	
	rnative flow 1: rnative flow 2:		applio	cation on device in which MAK07 will	

Figure 3.173: Use Case UCLEAD01

UCLEAD02			Friends ranking	
Target of Use case Show a list of the best		t players in a friend ranking with nickname and XP		
Inputs User must already has User must already has		we an account associated to MAK07 we login to MAK07		
Out	puts	The system displays t of MAK07	the scre	een the friends ranking between the best players
		E	Basic f	low
No	User		No	System
1	The user select	leaderboard		
			2	The system displays the screen the friends ranking between the best players of MAK07
		Int	erface	
				CONTRACT CANAME Level 10 Contract Contexes Contract Contract Contract Con
Alternative flow 1: UCH21: Exit fr		UCH21: Exit fr	om M	AK07.
Alte	rnative flow 2:			cation on device in which MAK07 will
		continue run in		
Extensions UCH11, UCLE			AD (0	1,03)

Figure 3.174: Use Case UCLEAD02

UCLEAD03				Country ranking	
Targ	Target of Use case Show a list of the best		st players in a country ranking with nickname and XP		
Inpu	Inputs User must already I User must already I			account associated to MAK07 in to MAK07	
Out	puts	The system displays players of MAK07	the s	screen the country ranking between the best	
			Basic f	low	
No	User		No	System	
1	The user select	leaderboard			
			2	The system displays the screen the country ranking between the best players of MAK07	
		MAK07		USERNICKNAME Level 10 USERNICKNAME Level 10	
				00000000000000000000000000000000000000	
Alte	rnative flow 1:	UCH21: Exit fr	om M	AK07.	
Alte	Alternative flow 2: UCH22: Switch continue run in			cation on device in which MAK07 will round.	
Exte	ensions	UCH11, UCLE	AD (0	1,02)	

Figure 3.175: Use Case UCLEAD03

	UCB01			Show budgets	
Target of Use case Show a list of budge		ets available of MAK007			
Inpu	ıts		er must already have an account associated to MAK07 er must already have login to MAK07		
Out	puts			budgets available of MAK07	
		Ι	Basic f	low	
No	User		No	System	
1	The user select	s budgets			
			2	The system shows a list of budgets available of MAK07	
		Int	erface	view	
				Second	
Alte	rnative flow 1:	UCH21: Exit fr	om M	Acception Acception Acception Acception Secure Acception Acception Acception Acception Acception Acception Acception Acception Acception Acception Acception Acception Acception	
	rnative flow 1: rnative flow 2:	UCH21: Exit fr	applio	Image: Second	

Figure 3.176: Use Case UCB01

	UCB02		Show unblock budgets		
Target of Use case Show a list MAK007			a list of unblock budgets that a player already has collected on $^{\rm 007}$		
Inpu	uts			account associated to MAK07	
		User must already ha			
Out	puts	The system shows a l	list of ı	unlock budgets available of MAK07	
		F	Basic fl	low	
No	User		No	System	
1	The user select	s budgets			
			2	The system shows a list of unlock budgets available of MAK07	
		Int	erface	view	
		MAK07		Last Budge all budges all budges all pudges auroptan auroptan <	
Alte	ernative flow 1:	UCH21: Exit fr	om MA	AK07.	
Alternative flow 2: UCH22: Switch applica continue run in backgro			cation on device in which MAK07 will		
		continue run in	hackor	ound	

Figure 3.177: Use Case UCB02

UCB03			Show block budgets			
Target of Use case		Show a list of block budgets that a player already has collected on $\rm MAK007$				
Inputs		User must already have an account associated to MAK07				
			User must already have login to MAK07			
Out	puts	The system shows a l	ne system shows a list of block budgets available of MAK07			
		F	Basic fl	low		
No	User		No	System		
1	The user selects	s budgets				
			2	The system shows a list of block budgets available of MAK07		
	1	Int	erface	view		
		MAK07		Last Budge all budges all budges Sourgen Sourgen		
Alte	rnative flow 1:	UCH21: Exit fr	om MA	AK07.		
Alte	rnative flow 2:	UCH22: Switch	applio	cation on device in which MAK07 will		
		continue run in	continue run in background.			
Exte	ensions	UCH07, UCB0	1			

Figure 3.178: Use Case UCB03

UCB04			Show most recent budget			
Target of Use case		Show the most recent budget collected on MAK07				
Inputs		User must already have an account associated to MAK07 User must already have login to MAK07				
Outputs			he system shows the most recent budget collected on MAK07			
		E	Basic f	low		
No	User		No	System		
1	The user select	s budgets				
			2	The system shows the most recent budget collected on MAK07		
	-	Int	erface	view		
				al budges CDD III Colges securities Securities Securities		
				Source Source Source Source Source Source		
Alte	rnative flow 1:	UCH21: Exit fr				
	rnative flow 1: rnative flow 2:		applio	AK07.		

Figure 3.179: Use Case UCB04

UCB05			Show details of budget				
			ow the details of budget already won with date when was won, name scription, description and logo				
Inputs U		User must already ha	Jser must already have an account associated to MAK07				
- t		User must already ha	User must already have login to MAK07				
Outputs Th		-	e system shows the details of budget already won with date when was				
won, name			name description, description and logo				
				asic flow			
No			No	System			
1	The user selects details	s a budged to see					
			2	The system shows the details of budget			
				already won with date when was won, name			
			erface	description, description and logo			
		Lost Budge di budges di budges	Tarana Tarana Tarana Tarana Tarana	AMAZING!! AMAZING!! Discussion NAME DESCRIPTION Discussion			
Alte	rnative flow 1:	UCH21: Exit fr	UCH21: Exit from MAK07.				
	rnative flow 2:			cation on device in which MAK07 will			
		continue run in					
Exte	Extensions UCH07, UCB (
	Extensions CONTRA, COD (

Figure 3.180: Use Case UCB05

		Show details of budget blocked				
		Show the details of budget blocked with name description, description and				
T		logo				
Inputs		User must already ha		account associated to MAK07		
Outputs		description and logo	The system shows the details of budget blocked with name description,			
			Basic f	low		
No User		No	System			
1	The user selects	s a budged blocked to				
-	see details					
			2	The system shows the details of budget		
				blocked with name description, description		
				and logo		
		Int	erface	view		
		·	I.			
		← Last Budge	<1.545	÷		
	<u> </u>					
		all budges	_ ∭			
		😎 👖 🛇	3			
		description description desc	npton	NAME DESCRIPTION		
			🖌	NAME DESCRIPTION bulge's description		
			ration			
			╴║			
description description		description description desc	ription.			
			լր			
	rnative flow 1:	UCH21: Exit fr				
Alte	rnative flow 2:			cation on device in which MAK07 will		
			continue run in background.			
Extensions UCH07, UCB (07,08)			

Figure 3.181: Use Case UCB06

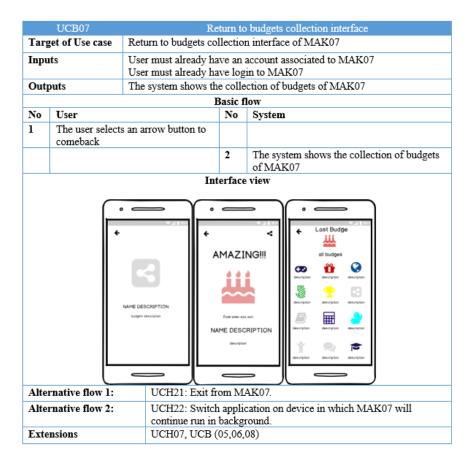


Figure 3.182: Use Case UCB07

UCB08				Share budge		
		Allow the user to share a budge in a chat of MAK07 or with another application installed in the phone				
Inputs		User must already ha	User must already have an account associated to MAK07			
_		~	ser must already have login to MAK07			
Outputs		The system shows a l	e system shows a list of application to share the budge			
		E	Basic fl	low		
No	User		No	System		
1	The user selects	s the share button				
			2	The system shows the list of application to share the badge		
		Int	erface	view		
		AMAZING!! AMAZING!! Dia dai: se set NAME DESCRIPTION deurgion		Q. Sarce: View Act cos sales of to Cost Level 2 If which and cost act		
Alte	rnative flow 1:	UCH21: Exit fr	UCH21: Exit from MAK07.			
Alte	rnative flow 2:		UCH22: Switch application on device in which MAK07 will			
			continue run in background.			
Exte	ensions	UCH07, UCB0	UCH07, UCB05			

Figure 3.183: Use Case UCB08

UCB09		S	Save data budge won			
Target of Use case Sav		Save the data when the	ave the data when the user has won the medal			
Inputs		User must already have an account associated to MAK07 User must already have login to MAK07				
		The system shows the	e system shows the collection of budges			
		F	Basic flow			
No	User		No	System		
1	The user won a	ı budge				
			2	The system saves the new achievement		
			3 erface	The system shows the collection of budges		
		AMAZING!!	v v !	Last Budge		
		Distributions and the NAME DESCRIPTION description	ON			
Alte	ernative flow 1:			Several for Several for Several for Several for		
	ernative flow 1: ernative flow 2:	UCH21: Exit fr	om M/	AK07.		

Figure 3.184: Use Case UCB09

			requirement of each budge			
Targ	get of Use case	Check requirement of each medal after having played a challenge, tournament or solo game in order to unblock a medal				
Inpu	ıts	User must already have an account associated to MAK07				
			User must already have login to MAK07			
-		e collection of budges				
		1	Basic flow			
No	User	1 1	No	System		
1	The user won a budge after having played a challenge / tournament or solo game					
	Joio game		2	The system saves the new achievement		
			3	The system shows the collection of budges		
			- V -	Cost Budge Cost Budge		
Alte	rnative flow 1: rnative flow 2:	continue run in	om M. n applie backgr	AK07. Cation on device in which MAK07 will round.		
Exte	Extensions UCH07, UCB (0			04,09)		

Figure 3.185: Use Case UCB10

3.2.2 Description of players of MAK07

Given that different types of players are found in the system, it is necessary to segment them so that the system is appropriate for more than one subgroup of players and to be able to offer them various game options according to the Bartles Classification [figure 3.186]:



Figure 3.186: Bartles players classification [5]

- 1. Killer: they like to impose themselves against others typically to beat them. MAK07 count the number of times a user win consecutively (challenge, solo, tournament) and award them with a medal.
- 2. Achiever: They like the thrill of leveling up or winning a medal. MAK07 give a different types of medals for actions that can be differentiated by the others.
- 3. Socializer: They like to socialize with friends. MAK07 count with a chat in which can be shared a great game. Also motivate other users to join MAK07 sending Facebook invitations and ranking MAK07 on shop.

4. Explorer: They want to find new content. Unlocking some functionalities of MAK07 progressively help to users to keep interested on MAK07. When they discover the medals unlocked that are available only if they completed some task also that generates attention and attraction to do it.

MAK07 has 3416 users, 599 female, 1779 male, 922 unknown. Since many years ago when the first game was developed, female gender hasn't been represented in characters, that causes less interest from woman point of view. Even throw new games that personificate beautiful woman in a video game, the culture and the tradition about playing is more for man than woman [13] [14] [15] [16].

3.2.3 Requirements of MAK07

The following are the non functional requirements [figure 3.187].



Figure 3.187: Non functional requirements

3.3 Architectural Analysis

3.3.1 Logic view of architecture of MAK07

MongoDB is a non relational database offering a flexible schema and designed in such a way that changes or updates could be handled easily. The following graphs are showing the AsIs database model and ToBe data base model, thinking that non relational data structures are difficult to represent.

AsIs MAK07 without gamification

This was the database for version 1 of MAK07 [figure 3.188].

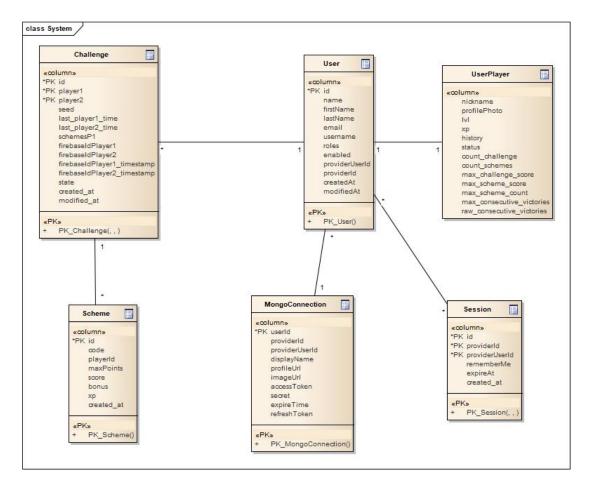


Figure 3.188: AS IS Database Model

ToBe MAK07 with gamification

The following graph shows the modifications and additions to do in order to implement gamifications, the purpure classes are new implementations and blue classes are ones needed to support gamification components [figure 3.189].

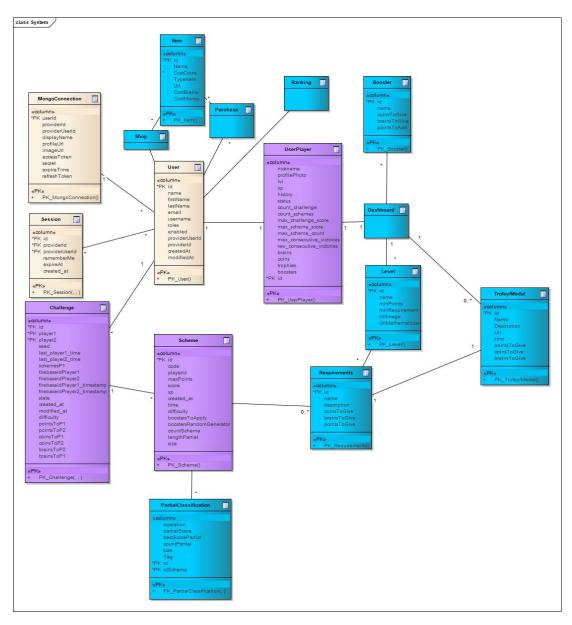


Figure 3.189: AS IS Database Model

3.3.2 Logic view MAK07 gamified

Levels

After an extensive study of timing and reaction of player for each movement of MAK07, that consist on tabulate the timing on seconds and milliseconds and results (points and actual bonus point) for each

movement, I could define the boundaries of each level. Each level can have a list of requirements that must be complete in order to move to the next level. Following there is define the list of requirements associate with the quantity of points that must be done and achieve as minimum for each level.

Level definitions: 0 Level

- 0 points Exp, user that have download the game without play any game or start a game but never finishes
- Input game difficulty 1
- Time 72000 milliseconds or 1,2 min or 72 seconds

1 Level:

- From 17 Points Exp
- 1 Solo Game Played or 1 challenge Game Played
- Input game difficulty 1
- Time 72000 milliseconds or 1,2 min or 72 seconds

2 Level:

- From 102 Points Exp
- 6 Solo Games Played or 6 challenge Games played
- Input game difficulty 1
- Time 72000 milliseconds or 1,2 min or 72 seconds

3 Level:

- From 323 Points Exp
- 19 Solo Games Played or 19 Battle Games played
- Input game difficulty 1
- Time 72000 milliseconds or 1,2 min or 72 seconds

- From 782 Points Exp
- 46 Solo Games Played or 46 Battle Games
- Input game difficulty 1
- Time 72000 milliseconds or 1,2 min or 72 seconds

5 Level:

- From 1547 Points Exp
- From 91 Solo Games Played or 91 Battle Games Played
- Input game difficulty 1
- Time 72000 milliseconds or 1,2 min or 72 seconds

6 Level:

- From 21888 Points Exp
- From 171 Solo Games Played and 5 battle games played or from 171 Battle Games played and 5 Solo Games played
- Input game difficulty 2
- Time 78000 milliseconds or 1,3 min or 78 seconds

7 Level:

- From 39808 Points Exp
- From 311 solo Games Played and 70 Battle Game played or from 311 Battle Games played and 70 Solo Game played
- Input game difficulty 2
- Time 78000 milliseconds or 1,3 min or 78 seconds

- From 62720 Points Exp
- From 490 Solo Games Played and 120 Battle Game played or from 490 Battle Games played and 120 Solo Game played
- Input game difficulty 2

• Time 78000 milliseconds or 1,3 min or 78 seconds

9 Level:

- From 88320 Points Exp
- From 690 Solo Games Played and 180 Battle Game played or from 690 Battle Games played and 180 Solo Game played
- Input game difficulty 2
- Time 78000 milliseconds or 1,3 min or 78 seconds
- 10 Level:
 - From 102400 Points Exp
 - From 800 Solo Games Played and 240 Battle Game played or from 800 Battle Games played and 240 Solo Game played
 - Input game difficulty 2
 - Time 78000 milliseconds or 1,3 min or 78 seconds
- 11 Level:
 - From 41000 Points Exp
 - From 1000 Battle Games played and 350 Solo Game Played and 1 tournament played
 - Input game difficulty 3
 - Time 84000 milliseconds or 1,4 min or 84 seconds
- 12 Level:
 - From 57400 Points Exp
 - From 1400 Battle Game played and 360 solo Games Played and 6 tournaments played
 - Input game difficulty 3
 - Time 84000 milliseconds or 1,4 min or 84 seconds

13 Level:

• From 82000 Points Exp

- From 2000 Battle Game played and 400 solo Games Played and 20 tournaments played
- Input game difficulty 3
- Time 84000 milliseconds or 1,4 min or 84 seconds

- From 106600 Points Exp
- From 2600 Battle Game played and 450 solo Games Played and 40 tournaments played
- Input game difficulty 3
- Time 84000 milliseconds or 1,4 min or 84 seconds

15 Level:

- From 127100 Points Exp
- From 3100 Battle Game played and 500 solo Games Played and 70 tournaments played
- Input game difficulty 3
- Time 84000 milliseconds or 1,4 min or 84 seconds

16 Level:

- From 159900 Points Exp
- From 3900 Battle Game played and 550 solo Games Played and 120 tournaments played
- Input game difficulty 3
- Time 84000 milliseconds or 1,4 min or 84 seconds

- From 192700 Points Exp
- From 4700 Battle Game played and 600 solo Games Played and 190 tournaments played
- Input game difficulty 3
- Time 84000 milliseconds or 1,4 min or 84 seconds

- From 246000 Points Exp
- From 6000 Battle Game played and 650 solo Games Played and 270 tournaments played
- Input game difficulty 3
- Time 84000 milliseconds or 1,4 min or 84 seconds

- From 282900 Points Exp
- From 6900 Battle Game played and 700 solo Games Played and 360 tournaments played
- Input game difficulty 3
- Time 84000 milliseconds or 1,4 min or 84 seconds
- 20 Level:
 - From 494100 Points Exp
 - From 8100 Battle Game played and 800 solo Games Played and 500 tournaments played
 - Input game difficulty 4
 - Time 90000 milliseconds or 1,5 min or 90 seconds
- 21 Level:
 - From 549000 Points Exp
 - From 9000 Battle Game played and 850 solo Games Played and 700 tournaments played
 - Input game difficulty 4
 - Time 90000 milliseconds or 1,5 min or 90 seconds
- 22 Level:
 - From 732000 Points Exp
 - From 12000 Battle Game played and 900 solo Games Played and 800 tournaments played

- Input game difficulty 4
- Time 90000 milliseconds or 1,5 min or 90 seconds

- From 854000 Points Exp
- From 14000 Battle Game played and 950 solo Games Played and 900 tournaments played
- Input game difficulty 4
- Time 90000 milliseconds or 1,5 min or 90 seconds

24 Level:

- From 1220000 Points Exp
- From 20 000 Battle Game played and 1000 solo Games Played and 1000 tournaments played
- Input game difficulty 4
- Time 90000 milliseconds or 1,5 min or 90 seconds

25 Level:

- From 1550000 Points Exp
- From 30 000 Battle Game played and 2000 solo Games Played and 2000 tournaments played
- Input game difficulty 5
- Time 96000 milliseconds or 1,6 min or 96 seconds

26 Level:

- From 1600000 Points Exp
- From 50 000 Battle Game played and 3000 solo Games Played and 3000 tournaments played
- Input game difficulty 5
- Time 96000 milliseconds or 1,6 min or 96 seconds

- From 1700000 Points Exp
- From 60 000 Battle Game played and 4000 solo Games Played and 4000 tournaments played
- Input game difficulty 5
- Time 96000 milliseconds or 1,6 min or 96 seconds
- 28 Level:
 - From 1900000 Points Exp
 - From 80 000 Battle Game played and 6000 solo Games Played and 6000 tournaments played
 - Input game difficulty 5
 - Time 96000 milliseconds or 1,6 min or 96 seconds

- From 2200 000 Points Exp
- From 90 000 Battle Game played and 7000 solo Games Played and 7000 tournaments played
- Input game difficulty 5
- Time 96000 milliseconds or 1,6 min or 96 seconds
- 30 Level:
 - From 3300 000 Points Exp
 - From 100 000 Battle Game played and 9 000 solo Games Played and 9000 tournaments played
 - Input game difficulty 6
 - Time 102000 milliseconds or 1,7 min or 102 seconds
- 31 Level:
 - From 4400 000 Points Exp
 - From 300 000 Battle Game played and 120 000 solo Games Played and 120 000 tournaments played
 - Input game difficulty 6

• Time 102000 milliseconds or 1,7 min or 102 seconds

32 Level:

- From 5500 000 Points Exp
- From 600 000 Battle Game played and 170 000 solo Games Played and 170 000 tournaments played
- Input game difficulty 6
- Time 102000 milliseconds or 1,7 min or 102 seconds

33 Level:

- From 9800 000 Points Exp
- From 800 000 Battle Game played and 300 000 solo Games Played and 300 000 tournaments played
- Input game difficulty 6
- Time 102000 milliseconds or 1,7 min or 102 seconds

34 Level:

- From 1600 000 Points Exp
- From 1200 000 Battle Game played and 700 000 solo Games Played and 700 000 tournaments played
- Input game difficulty 6
- Time 102000 milliseconds or 1,7 min or 102 seconds

35 Level:

- From 7 000 000 Points Exp
- From 5 000 000 Battle Game played and 1 000 000 solo Games Played and 1 000 000 tournaments played
- Input game difficulty 7
- Time 120 000 milliseconds or 2 min or 120 seconds

For each Mathematician there is an association with a level [tables 3.1, 3.2].

Web reference	Thetoptens.com [17]	Fabpedigree.com [24]
1st	Leonarhard Euler	Isaac Newton
2nd	Isaac Newton	Archimedes
3er	Srinivasa Ramanujan	Carl F. Gauss
4th	Aryabhatta	Leonard Euler
5th	Archimedes	Bernhard Riemann
6th	Euclid of Alexandria	Henri Poincare
7th	Gottfried W. Leibniz	Joseph-Louis Lagrange
8th	John Von Neumann	Euclid of Alexandria
9th	Rene Descartes	David Hilbert
10th	Bernhard Riemann	Gottfried W. Leibniz

Table 3.1: Matematicians

Web reference	Thetoptens.com [17]	Fabpedigree.com [24]	
11th	Augustin Cauchy Alexandre Grothend		
12th	Pierre Simone laplace	Pierre de Fermat	
13th	Pythagoras	Evariste Galois	
14th	Bhascar Acharya	John von Neumann	
15th	Henri Poincare	Niels Abel	
16th	Muhammad Al-Khowarizmi	Karl W. T Weierstrass	
17th	Georg Cantor	Rene Descartes	
18th	Chris Winterburn	Peter G. L. Dirichlet	
19th	Alan Turing	Srinivasa Ramanujan	
20th	Carl Friedrich Gauss	Carl G. J. Jacobi	
21th	Blaise Pascal	Brahmagupta	
22th	Pierre De Fermat	Georg Cantor	
23er	Joshep Louis Lagrange	Augustin Cauchy	
24th	Bertrand Russell	Hermann K. H. Weyl	
25th	Alexandre Grothendieck	Arthur Cayley	
26th	Niles Abel	Emmy Noether	
27th	Evariste Galois	Pythagoras of Samos	
28th	Kurt Godel	Aryabhata	
29th	David Hilbert	Leonardo 'Fibonacci'	
30th	Liu Hui	William R. Hamilton	
31th	Maryam Mirzakhani	Apollonius of Perga	
32th	Sir Andrew Wiles	Charles Hermite	
33th	Brahmagupta	Diophantus of Alexandria	
34th	Peter G. L. Dirichlet	Pierre-Simon Laplace	
35th	Nicolai Lobachevsky	Carl Ludwig Siegel	

Table 3.2: Matematicians cont. 2

Points

Mak07 will have 2 systems of points, Experience points that are the ones that the user gets for each interaction with the game, the other kind is the brain points which are the ones that are hard to get and Will be the concurrency of the game. If the user wants to buy brains, they can do it by paying with real money (euros, pounds, dollars). After many test, the following formula is the best one to calculate the experience points.

Experience Points = $\begin{cases} \sum \left(\frac{NoSchemeCompleted}{(1+(lefttimeonmilliseconds)*weight)))} + PointsOp \right) + 1\\ or0ifnolefttimeand0scenarioCompleted \end{cases}$

Awards

MAK07 will have a list of medals, the following table will show the details of each [tables 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10].

Type	Trophy	Description
	4 x 90	Solve 4 scheme in 90000 milliseconds on a challenge
speed	5 x 90	Solve 5 scheme in 90000 milliseconds on a challenge
	6 x 90	Solve 6 scheme in 90000 milliseconds on a challenge
	7 x 90	Solve 7 scheme in 90000 milliseconds on a challenge

Table 3.3: Medals/Trophy

Туре	Trophy	Description
	Challenge of the day x 3	Play at least 1 challenge each day
		for 3 days consecutive
Perseverance	Challenge of the day x 5	Play at least 1 challenge each day
		for 5 days consecutive
	Challenge of the day x 10	Play at least 1 challenge each day
		for 10 days consecutive
	Challenge of the day x 25	Play at least 1 challenge each day
		for 25 days consecutive
	Challenge of the day x 50	Play at least 1 challenge each day
		for 50 days consecutive
	Training of the day x 3	Play at least 1 training game each
		day for 3 days consecutive
Athletic	Training of the day x 5	Play at least 1 training game each
		day for 5 days consecutive
	Training of the day x 10	Play at least 1 training game each
		day for 10 days consecutive
	Training of the day x 25	Play at least 1 training game each
		day for 25 days consecutive
	Training of the day x 50	Play at least 1 training game each
		day for 50 days consecutive
	Tournament player x 3	Play at least 1 tournament each day
		for 3 days consecutive
Warrior	Tournament player x 5	Play at least 1 tournament each day
		for 5 days consecutive
	Tournament player x 10	Play at least 1 tournament each day
		for 10 days consecutive
	Tournament player x 25	Play at least 1 tournament each day
		for 25 days consecutive
	Tournament player x 50	Play at least 1 tournament each day
		for 50 days consecutive

Table 3.4: Medals/Trophy cont. 2 $\,$

Type	Trophy	Description		
	Winner challenge x 3	Play 3 consecutive challenge with-		
		out being defeated		
	Winner challenge x 5	Play 5 consecutive challenge with-		
		out being defeated		
Invincible	Winner challenge x 10	Play 10 consecutive challenge with-		
Invincible		out being defeated		
	Winner challenge x 25	Play 25 consecutive challenge with-		
		out being defeated		
	Winner challenge x 50	Play 50 consecutive challenge with-		
		out being defeated		
	Winner tournament x 3	Play 3 consecutive tournament		
		without being defeated		
	Winner tournament x 5	Play 5 consecutive tournament		
		without being defeated		
	Winner tournament x 10	Play 10 consecutive tournament		
		without being defeated		
	Winner tournament x 25	Play 25 consecutive tournament		
		without being defeated		
	Winner tournament x 50	Play 50 consecutive tournament		
		without being defeated		
	Hard player x 100	Play 100 challenge overall		
	Hard player x 500	Play 500 challenge overall		
Challenges	Hard player x 1000	Play 1000 challenge overall		
Chancinges	Hard player x 5000	Play 5000 challenge overall		
	Hard player x 1000 000	Play 1000 000 challenge overall		
	Hard player x 7 000 000	Play 7000 000 challenge overall		
	Invincible x 100	Play 100 tournament overall		
Tournaments	Invincible x 500	Play 500 tournament overall		
	Invincible x 1000	Play 1000 tournament overall		
	Invincible x 5000	Play 5000 tournament overall		
	Invincible x 1000 000	Play 1000 000 tournament overall		
Level	1 to 35	When an user reach new level, un-		
	block a trophy associated to			
		level		

Table 3.5: Medals/Trophy cont. 3 $\,$

Туре	Trophy	Description		
	Less than 10119 mil-	Solve a schema of difficulty 1 (level from		
	liseconds 1- 5) in less than 10119 millisecond			
		0,16856 seconds		
Chronometry	Less than 11135 mil-	Solve a schema of difficulty 2 (level from		
	liseconds	6 - 10) in less than 11135 milliseconds or		
		0,1855833 seconds		
	Less than 10489 mil-	Solve a schema of difficulty 3 (level from		
	liseconds	$11 \ \hat{a} \ 19$) in less than 10489 milliseconds or		
		0,17481667 seconds		
	Less than 8570 millisec-	Solve a schema of difficulty 4 (level from		
	onds	20 â 24) in less than 8570 milliseconds or		
		0,1428333 seconds		
	Less than 11591 mil-	Solve a schema of difficulty 5 (level from		
	liseconds	$25 \ \hat{a} \ 29$) in less than 11591 milliseconds or		
		0,19318333 seconds		
	Less than 9881 millisec-	Solve a schema of difficulty 6 (Level from		
	onds	30 - 34) in less than 9881 milliseconds or		
		0,1646833 seconds		
	Less than 10211 mil-	Solve a schema of difficulty 7 (Level 35) in		
	liseconds	less than 10211 milliseconds or $0,17018333$		
		seconds		
	1 Scheme In a challenge	Solve 1 scheme with the maximum points		
		in a challenge		
High quality	2 Scheme in a challenge	Solve 2 scheme with the maximum points		
		in the same challenge		
	3 Scheme in a challenge	Solve 3 scheme with the maximum points		
		in the same challenge		
	4 Scheme in a challenge	Solve 4 scheme with the maximum points		
		in the same challenge		
5 Scheme in a challer		Solve 5 scheme with the maximum points		
		in the same challenge		
draw	draw	First draw in a challenge		
Share Share the app		Share the app to friends		
Social	rank	Rank the app		

Table 3.6: Medals/Trophy cont. 4 $\,$

Type	Trophy	Description	
	Champion x 100	Play 100 solo game overall	
	Champion x 500	Play 500 solo game overall	
Solo game	Champion x 1000	Play 1000 solo game overall	
	Champion x 5000	Play 5000 solo game overall	
	Champion x 1000 000	Play 1000 000 solo game overall	
	Daring challenge x 5	Win 5 challenge against a higher-level player	
Daring	Daring challenge x 10	Win 10 challenge against a higher-level player	
Daring	Daring challenge x 25	Win 25 challenge against a higher-level player	
	Daring challenge x 50	Win 50 challenge against a higher-level player	
	Freeze	First time using freeze booster	
	skip	First time using skip booster	
Boosters	Multiply score	First time using multiply score booster	
	hint	First time using hint booster	
	poison	First time using poison booster	

Table 3.7: Medals/Trophy cont. 5 $\,$

Type	Trophy	Description
	3 x 72	Solve 3 scheme in 72000 milliseconds on a challenge
	4 x 72	Solve 4 scheme in 72000 milliseconds on a challenge
	5 x 72	Solve 5 scheme in 72000 milliseconds on a challenge
	6 x 72	Solve 6 scheme in 72000 milliseconds on a challenge
	3 x 78	Solve 3 scheme in 78000 milliseconds on a challenge
speed	4 x 78	Solve 4 scheme in 78000 milliseconds on a challenge
speed	5 x 78	Solve 5 scheme in 78000 milliseconds on a challenge
	6 x 78	Solve 6 scheme in 78000 milliseconds on a challenge
	4 x 84	Solve 4 scheme in 84000 milliseconds on a challenge
	5 x 84	Solve 5 scheme in 84000 milliseconds on a challenge
	6 x 84	Solve 6 scheme in 84000 milliseconds on a challenge
	7 x 84	Solve 7 scheme in 84000 milliseconds on a challenge

Table 3.8: Medals/Trophy cont. 6

Type	Trophy	Description		
	Morning 3 days in a row	Play Mak07 in the morning, between 8am and		
		10 am for 3 days consecutive		
	Morning 5 days in a row Play Mak07 in the morning, between 8a			
		10 am for 5 days consecutive		
	Morning 10 days in a row	Play Mak07 in the morning, between 8am and		
		10 am for 10 days consecutive		
	Morning 25 days in a row	Play Mak07 in the morning, between 8am and		
		10 am for 25 days consecutive		
	Morning 50 days in a row	Play Mak07 in the morning, between 8am and		
		10 am for 50 days consecutive		
Time	Afternoon 3 days in a row	Play Mak07 in the afternoon, between 3pm		
	and 5pm for 3 days consecutive			
	Afternoon 5 days in a row	Play Mak07 in the afternoon, between 3pm		
	and 5pm for 5 days consecutive			
	Afternoon 10 days in a row	Play Mak07 in the afternoon, between 3pm		
		and 5pm for 10 days consecutive		
	Afternoon 25 days in a row	Play Mak07 in the afternoon, between 3pm		
		and 5pm for 25 days consecutive		
	Afternoon 50 days in a row	Play Mak07 in the afternoon, between 3pm		
		and 5pm for 50 days consecutive		
	Evening 3 days in a row	Play Mak07 in the evening, between 7pm to		
	9pm for 3 days consecutive			
	Evening 5 days in a row	Play Mak07 in the evening, between 7pm to		
	9pm for 5 days consecutive			
	Evening 10 days in a row Play Mak07 in the evening, between 7			
		9pm for 10 days consecutive		

Table 3.9: Medals/Trophy cont. 7 $\,$

Type	Trophy	Description		
	Evening 25 days in a row	Play Mak07 in the evening, between 7pm to		
		9pm for 25 days consecutive		
	Evening 50 days in a row	Play Mak07 in the evening, between 7pm to		
		9pm for 50 days consecutive		
	Night 3 days in a row	Play Mak07 in the night, between 11pm to		
		1am for 3 days consecutive		
	Night 5 days in a row	Play Mak07 in the night, between 11pm to		
		1am for 5 days consecutive		
	Night 10 days in a row	Play Mak07 in the night, between 11pm to		
		1am for 10 days consecutive		
Time	Night 25 days in a row	Play Mak07 in the night, between 11pm to		
		1 am for 25 days consecutive		
	Night 50 days in a row	Play Mak07 in the night, between 11pm to		
		1am for 50 days consecutive		

Table 3.10: Medals/Trophy cont. 8

Boosters

MAK07 will have a list of boosters, the following table will show the details of each [Tables 3.11, 3.12].

Name	Type	Description	Price on shop	Level in which
				is given to users
Skip		Skip the schema	500 Brains	5, 10, 15, 20, 25,
		shown and re-		30
		place it for		
		another one of		
		the same level		
Hint		Give a suggestion	200 Brains	1, 10, 20, 29, 34
		to finish the game		
		with great score		

Table 3.11: Boosters

Name	Type	Description	Price on	Level in which
			shop	is given to users
	X 2 Seconds	Addition of 2 sec-	100 Brains	3
Freeze		onds more		
TIEEZE	X 3 Seconds	Addition of 3 sec-	500 Brains	6
		onds more		
	X 4 Seconds	Addition of 4 sec-	600 Brains	9
		onds more		
	X 5 Seconds	Addition of 5 sec-	700 brains	12
		onds more		
	X 2	Multiply the score	700 Brains	7,11,17
Multiply		gotten by 2		
	X 3	Multiply the score	800 Brains	8, 16, 24, 32
		gotten by 3		
	X 4	Multiply the score	900 Brains	13, 26, 33
		gotten by 4		
	1 / 4	Take $1/4$ of oppo-	700 Brains	7, 14,21
Poison		nent points		
	1 / 3	Take $1/3$ of oppo-	800 Brains	17,27
		nent points		
	1 / 2	Take $1/3$ of oppo-	900 Brains	31,32,33,34,35
		nent points		

Table 3.12: Boosters cont. 2

Dynamics, mechanics, components of gamification

The following table will describe the different dynamics related to MAK07 [Tables 3.13, 3.14, 3.15].

Dynamic	Description	Dynamics in system					
Narration	Tutorial	A short tutorial is available for the user					
		where the mechanic of the game explana-					
		tion is and how to achieve the points.					
Popup Awards	Popup when a user has	New medal/trophy.					
	achieved a new reward	New level.					
	achieved a new reward	New booster.					

Table 3.13: Dynamics, mechanics, components of gamification

Dynamic	Description	Dynamics in system
		A player can share the app using different apps
		installed on the device.
Relationships	Social	A player can ranking the app.
Relationships	interactions	A player can give a review or feedback of the
		app.
		A player can install other apps suggested by rec-
		ommendations.
		A player can follow the official web page of the
		app.
		User can share a battle/results of a battle to
		other friends.
		The progress bar will tell the player its own sta-
	Evolution of	tus on the game, how far is the player to achieve
Progression	players	the next level. It is shown in the profile of the
	players	player.
		On each game results will also see a progress bar
		that shows the relationship between its answer
		and the best solution so far.
		Level of experience will be differentiate by
		colours and names.
		Ranking will position the player in comparison
		with world player or his own friends.
		Dashboard will resume all the medal/trophy
		that a player has achieved so far.
		Having a new challenge.
	Notification	Challenge completed from opponent.
Notification	appear on the	After do not have playing for a while (1 day, a
Rotification	screen after some	week)
	actions done	Having a new message in chat.
		Having a new challenge to do.
		Having an invitation of tournament to partici-
		pate.

Table 3.14: Dynamics, mechanics, components of gamification cont. 2

Dynamic	Description	Dynamics in system
Limitations	System	Users only can play installing the app on the device.
	restrictions	User maximum will play with 7 digits because
		of the size of the screen and business logic
		Multiplayer battle only can be played with an
		internet connection
	Suggested	Motivation of a player in order of improve, learn,
Emotions	emotions to	or review math techniques.
	players	Competitiveness of a player in order to obtain
		and achieve points, medals/trophy, levels, brains
		or be in a better position in the ranking.
		Customization of the app.

Table 3.15: Dynamics, mechanics, components of gamification cont. 3

Mechanics: process to generate engagement

The Mechanics of MAK07 will be shown on the table Mechanics: the process to generate engagement [Table 3.16].

Mechanics	Description	Game mechanics			
	Task that	Challenge of the battle game.			
Challenge	requires some	Challenge of be part of the top 3 ranking (global			
	effort to solve	and friends)			
		Constant challenge of respond correctly to oper-			
		ations			
feedback	Information	Each operation will show at the end and can			
Teeuback	about what the	buy a booster in order to know one of the best			
	player is doing	solution operation .			
		Is possible to write to developers in order to sug-			
		gest/complain about the game.			
Competition	A player win or	With the ranking can show the position in the			
	lose	world or with friends			
Rewards	Rewards achieve	Depends on the boosters.			
	with an action or				
	purchase				

Table 3.16: Mechanics: process to generate engagement

Components: Specific instance of dynamics and mechanics

The Components of MAK07 will be shown on the table Components: Specific instance of dynamics and mechanics [Table 3.17].

Component	Description	Component of the game
Points	Numeric representation of game	Show points
	progress	
Medal/trophy	Graphic representation of achieve-	Show all medal/trophy that
	ments	the user have won
Levels	Levels defined for the progress of the	Show the level of the experi-
	player	ence
Ranking	Position between player (global or	Show the position on the
	friends)	ranking
Dashboard	Medal/trophy achieved	Gallery of medal/trophy
		achieved
Leader board	Graphical representation of progress	Progress bar
	and performance	

Table 3.17: Mechanics: process to generate engagement

3.3.3 Deployment view

Mak07 has been developed with a mobile environment architecture, focused as the majority of mobile applications on Android and iOS operating systems [figure 3.190]. Typically mobile applications need to connect to internet to exchange information about user progress, authentication and synchronization [25]. The [figure 3.191] shows the MAK07 client server architecture in which the server back end works with REST functionalities and it exposed outside their services throw an API connected by clients with HTTP methods. The API invocation is the principal method achieved for the client server communications, but also the Websocket mechanism in which users has been track into the system in a way that players have the game application in execution even if they are not playing any challenge. For notifications was used Google firebase.



Figure 3.190: Architecture

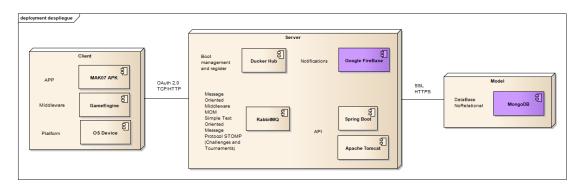


Figure 3.191: Deployment diagram

Technological dependencies

MAK07 count with few limitations to develop:

- Online multiplayer gaming
- Screen limitation of smart phones are until 7 balls for screen space
- Android version upper than 4.4

- iOS version upper than 9.0
- Users need wifi connection to play
- Users need to create a profile or use a Facebook or Google account to play
- Operative system of server: Linux kernel 3.13.0 and Ubuntu 14.04.5
- Database motor: MongoDB 2.6.11 port 27017
- GameServer: Spring Boot 1.5.7 and Apache Tomcat 8.5.20
- Google Firebase used for notifications
- RabbitMQ message broker in charge of sending the output messages to the correct message queue and forwarding the input messages to the correct messages endpoints
- Docker Hub Engine: Docker 0.9 libvirt, LXC o systemd-nspawn. port 443 to 8443
- Mak07 works with 4 containers but can be grow depending on future functionalities
- Server Domain: game.mak07.com
- Server CPU: Intel(R) Xeon(R) CPU E5-2620 v2 @2.10GHz
- Server memory: 40GB
- Server IP: 91.250.83.69

Chapter 4

Results

4.1 Designing solo game, starting from 3 ball until 7 ball

Gamification look forward to generate engagement loops and progression stairs to users in a way that MAK07 give motivations to user throw activities then user give a feedback response.

The main idea of solo game is to teach and training users to understand strategies of solving math operations while the difficult increase adding a new ball every time starting from 3 balls until 7 balls.

The following tables are the analysis of the user behaviour when they face a progression game starting with 3 balls until 7 balls using and testing the different formulas for pointing system.

arian dana

4.1.1 3 balls

		scenarios done													
	2	2	3	3	3	3	3	3	4	4	4	4	4	5	5
Formula 1	14188.5	11692.25	22063.5	27319	30585.1	22100.7	25738.1	25546.7	41860	42706	31290.75	36072	36681	45925	33511.8
Formula 2	14199.5	11705.25	22107.5	27333	30617.1	22100.7	25780.1	25590.7	41909	42789	31319.75	36121	36767	46074	33688.8
Formula 3	18.0004511	22.0005025	42.001356	30.0007792	42.0006865	14.0012294	50.000815	50.0008111	52.0009627	64.0009322	38.0016225	37.0014158	50.0013146	68.0019083	70.0024423
Formula 4	0.00323569	0.00406774	0.00973744	0.00373852	0.0049373	0.0028629	0.00697295	0.00706217	0.00584079	0.00763321	0.00672073	0.00667801	0.00781622	0.0101253	0.01236187
Formula 5	203550	258906.5	520522	508047.2	759489.6	170719.1	775956.8	767203.2	1127282	1442220	614645	791722.5	1090804	1863371	1838180.9
Formula 6	11544.6429	15370.75	17928.3889	67240.1667	20428.5893	69091.0833	15257.2778	12956.7083	39155.5179	37296.3214	122605.233	60246.5833	30956.8333	47145.5222	269998.046
Formula 7	0.00041021	0.00036047	0.00057341	0.00038635	0.00056802	0.00026446	0.00063738	0.00074451	0.00065587	0.00077292	0.00049097	0.00033577	0.00059207	0.00063202	0.00064395
Formula 8	9796.85714	13555.2917	10236.1667	26942.625	9948.10119	30134.6806	8216.51042	7087.56944	16377.5238	18534.3214	57446.8444	31468.7778	19633.1806	26148.8806	117317.862
Formula 9	0.00069606	0.00063566	0.00107756	0.00060632	0.00091114	0.00035742	0.00113153	0.00134203	0.00121939	0.00167501	0.00078214	0.0007857	0.00162505	0.00201982	0.00231014
Formula 10	445110.405	575608.735	1024437.65	1153748.04	1397783.9	637488.998	1436569.57	1315034.27	1762380.81	1906743.76	1408574.83	1364556.66	1347830.25	1935198.73	1775253.39
Formula 11	445110.405	575608.735	1024437.65	1153748.04	1397783.9	637488.998	1436569.57	1315034.27	1762380.81	1906743.76	1408574.83	1364556.66	1347830.25	1935198.73	1775253.39
Formula 12	445111.405	575609.485	1024438.9	1153749.34	1397785.3	637490.398	1436570.87	1315035.67	1762382.81	1906745.76	1408576.33	1364558.31	1347832.25	1935201.13	1775255.34
Formula 13	445110.405	575608.735	1024437.65	1153748.04	1397783.9	637488.998	1436569.57	1315034.27	1762380.81	1906743.76	1408574.83	1364556.66	1347830.25	1935198.73	1775253.39
Formula 14	237719.905	269624.985	418874.404	526763.643	542296.597	400150.398	497404.369	458541.872	701363.312	715379.257	675534.575	708479.159	614504.247	813786.929	760597.285
Formula 15	-28185.997	-31957.9408	-49582.6596	-62544.1283	-64292.2596	-47585.3532	-58875.1472	-54238.1472	-83158.7691	-84715.1004	-80210.2159	-84134.4549	-72799.5472	-96373.9442	-90003.4161
Formula 16	0.01155595	0.01184033	0.02325216	0.01091949	0.01623828	0.00620835	0.02181374	0.02422343	0.02077791	0.02909643	0.01562979	0.01639884	0.02905567	0.03768704	0.04437976
Formula 17	614.259418	492.402922	545.600038	1315.83595	556.480915	1649.30448	431.229235	400.253452	955.950971	1105.21089	1994.86662	1595.18952	1204.07809	1385.20366	3541.25744

Figure 4.1: 3 balls

The 4.1 shows the progression that a player can have solving in 20 seconds 2 schemes as minimum and 5 schemes as maximum. Notice that there is a drop down in the graph in which the behavior expected is different from the real one 4.2.

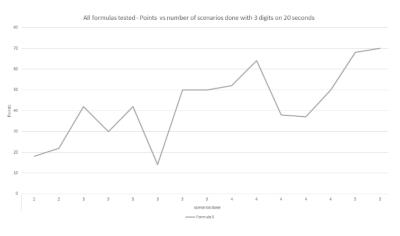


Figure 4.2: 3 balls graph

4.1.2 4 balls

	scenarios done														
	6	6	7	7	7	7	7	7	8	8	8	8	8	9	9
Formula 1	25288.69	22792.44	33204.89	33167.69	38423.19	36842.29	36650.89	41689.29	47789.19	52969.19	53815.19	36073	42399.94	57037.19	44623.99
Formula 2	26302.69	22848.44	34438.89	41132.69	39671.19	38118.29	37928.89	42955.29	49340.19	54486.19	55390.19	48703.19	43900.94	58882.19	46496.99
Formula 3	253.03707	257.03713	249.04441	277.04454	265.04396	285.044	285.04399	277.04387	285.05105	287.05083	299.0508	272.05144	273.05164	303.05821	305.05874
Formula 4	0.8994701	0.9003022	0.905655	0.9125295	0.9065306	0.9097651	0.9098543	0.9077294	0.917166	0.9153203	0.9171081	0.9163118	0.9163531	0.9260327	0.9282693
Formula 5	1477500.7	1532857.2	1758890.6	2108693.5	2096218.7	2364128.3	2355374.7	2347661.1	2993196.2	3060506.2	3568416.2	2725799.2	2545347.2	4079984	4054793.9
Formula 6	75237.493	79063.6	148687.15	97524.451	146836.23	94853.34	92552.771	100024.65	126456.11	142362.79	133937.45	162004.52	225182.01	158548.01	381400.53
Formula 7	0.0021432	0.0020935	0.0017345	0.0020435	0.0018564	0.0021074	0.0022146	0.0020381	0.00187	0.001923	0.0019779	0.0016004	0.0017572	0.0017629	0.0017749
Formula 8	25704.361	29462.796	46043.222	26144.708	42851.167	24125.052	22996.111	25856.643	35542.76	32287.603	34443.972	47378.802	73356.924	42059.498	133228.48
Formula 9	0.0105994	0.010539	0.0102558	0.0109759	0.0105047	0.0110299	0.0112404	0.0108095	0.0115184	0.0111128	0.0115683	0.0106791	0.0106755	0.0119082	0.0121986
Formula 10	2504914.9	2635413.3	2697294.2	3084242.8	3213553.2	3496374.8	3374839.5	3457589.1	3407636.1	3822187.2	3966550.1	3424362.8	3468380.9	3995005.3	3835059.9
Formula 11	4157187.9	4287686.3	4349567.2	4736515.8	4865826.2	5148647.8	5027112.5	5109862.1	5059909.1	5474460.2	5618823.1	5076635.8	5120653.9	5647278.3	5487332.9
Formula 12	2504917.3	2635415.4	2697296.9	3084245.4	3213555.9	3496377.4	3374842.2	3457591.8	3407639.5	3822190.5	3966553.5	3424365.8	3468383.8	3995009	3835063.2
Formula 13	2504917.8	2635416.2	2697297.8	3084246.4	3213556.8	3496378.3	3374843.1	3457592.7	3407640.4	3822191.4	3966554.4	3424367	3468385.2	3995010.2	3835064.9
Formula 14	700720.88	732625.96	863214.91	881938.91	989828.15	960468.88	921606.38	1005361.1	1077632.3	1164493.4	1178521.3	1171609.5	1138664.6	1259641.5	1206451.9
Formula 15	-81283.21	-85055.15	-100619	-102616.3	-115577.8	-111908.8	-107271.8	-117325.9	-125769.7	-136126.9	-137671.2	-137102.3	-133178.3	-149280.5	-142910
Formula 16	0.8013498	0.8016342	0.8158686	0.8329124	0.8205797	0.831474	0.8338836	0.8258985	0.8585822	0.8504342	0.8594987	0.8460852	0.8452976	0.8870799	0.8937727
Formula 17	856.64195	734.78545	1882.3773	778.67285	1548.9088	664.30205	633.32627	789.55373	1453.5618	1182.3457	1351.2742	1838.9443	2237.8719	1612.8185	3768.8723

Figure 4.3: 4 balls

The behaviour of players with 4 balls are more progressive 4.3. Increment of points are directly proportional to increment of schemes done in a 26 seconds 4.4.

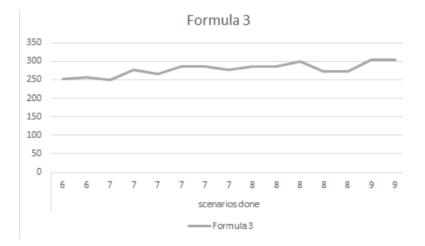


Figure 4.4: 4 balls graph

4.1.3 5 balls

		scenarios done													
	12	12	13	13	13	13	13	13	14	14	14	14	14	15	15
Formula 1	33876.825	30366.575	42040.425	41849.025	40978.825	46234.325	41016.025	49500.425	55837.325	61017.325	61863.325	50448.075	55229.325	65322.325	52909.125
Formula 2	33876.825	30422.575	45929.425	45740.025	48943.825	47482.325	42250.025	50766.425	57388.325	62534.325	63438.325	51949.075	56751.325	67167.325	54782.125
Formula 3	1048.08946	1052.08951	1126.6021	1126.6021	1118.60264	1106.60207	1090.60252	1118.60197	1173.11488	1175.11466	1187.11463	1161.11547	1160.11527	1237.62776	1239.62829
Formula 4	8231.53755	8231.53838	8278.05357	8278.05366	8278.05634	8278.05034	8278.04946	8278.05154	8324.5667	8324.56485	8324.56664	8324.56588	8324.56584	8371.08129	8371.08352
Formula 5	2076772.91	2132129.41	3025620.3	3016866.7	2770185.5	2757710.7	2420382.6	3009153.1	3716908.09	3784218.09	4292128.09	3269059.09	3449511.09	4865915.67	4840725.57
Formula 6	26894268.8	26898094.9	30501082	30498781.4	30503753.1	30553064.9	30554915.8	30506253.3	34119882.1	34135788.8	34127363.5	34218608	34155430.5	37739171.4	37962023.9
Formula 7	0.29784693	0.29779719	0.27506463	0.27517175	0.27500065	0.27481359	0.27469171	0.27499526	0.25533023	0.25538321	0.25543809	0.25521735	0.25506061	0.23832573	0.23833767
Formula 8	3613394.96	3617153.39	3611879.73	3613415.73	3613899.39	3630605.85	3633797.9	3613611.32	3623361.52	3620106.36	3622262.73	3661175.69	3635197.56	3629942.34	3721111.32
Formula 9	0.2835994	0.283539	0.26453327	0.26474377	0.2644793	0.26400806	0.26375916	0.26431288	0.24812475	0.24771907	0.24817465	0.24728182	0.24728538	0.2337296	0.23401992
Formula 10	6873064.54	7003562.87	7864524.52	7742989.22	7452392.6	7581702.99	7065443.95	7825738.85	7775786.01	8190337.07	8334700.02	7836530.84	7792512.67	8363155.3	8203209.96
Formula 11	13983671.5	14114169.9	14975131.5	14853596.2	14562999.6	14692310	14176050.9	14936345.8	14886393	15300944.1	15445307	14947137.8	14903119.7	15473762.3	15313817
Formula 12	6873067.3	7003565.38	7864527.58	7742992.38	7452395.61	7581706.05	7065447.11	7825742	7775789.76	12558491.1	8334703.78	7836534.09	7792516.08	8363159.46	8203213.66
Formula 13	6873070.07	7003568.4	7864530.99	7742995.69	7452399.07	7581709.46	7065450.42	7825745.32	7775793.42	12558497.5	8334707.43	7836538.25	7792520.09	8363163.66	8203218.32
Formula 14	2561563.63	2593468.71	2821455.07	2782454.19	2742786.72	2850675.96	2724062.72	2866208.91	2938485.16	4886199.09	3039374.17	2999517.49	3032462.32	3120499.44	3067309.8
Formula 15	-301166.822	-304938.766	-331776.73	-327154.43	-322484.243	-335445.712	-320486.936	-337193.843	-345621.889	-575831.32	-357523.442	-353030.557	-356954.546	-369117.044	-362746.516
Formula 16	1347.75349	1347.75378	1358.42892	1358.43133	1358.43036	1358.41802	1358.41331	1358.42334	1369.10133	2737.33593	1369.10225	1369.08804	1369.08883	1379.77513	1379.78182
Formula 17	9027.17186	8905.31537	8769.36322	8738.38744	8883.73403	9653.96994	9987.43847	8894.6149	9494.359	17263.9401	9392.07142	10278.6691	9879.74148	9590.52016	11746.5739

Figure 4.5: 5 balls

The behaviour of players with 5 balls are more progressive 4.5. increment of points are directly proportional to increment of schemes done in a 26 seconds 4.6.

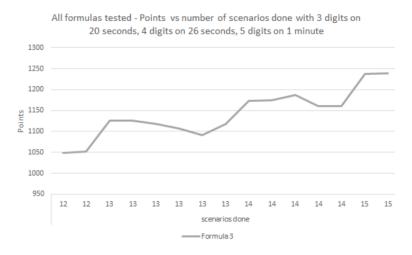


Figure 4.6: 5 balls graph

This is the pseudo code of how the input data of MAK07 was found.

Algorithm 1: Algorithm to find input values of MAK07

1 V	vhile Combinatorial Of Number Of Digits do
2	if hasSolution then
3	saveIt;
4	else
5	descarted it;
6	end
7 e	nd
8 V	vhile all solutions found do
9	Find Best Solution And Save it;
10 e	nd

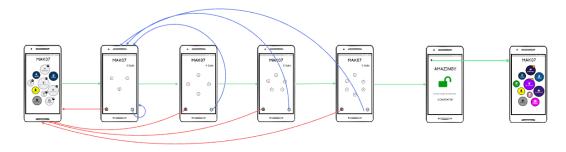


Figure 4.7: 3-7 balls

4.2 Classification of input game

The figure 4.8 will illustrate the 3 criteria of classification, each has different weight to assign that will increase the difficulty of each schema combination.

4.2.1 Aspects to take in count

If the initial number (7 digits) is composed of a sextuplet, example 2222229 then the weight will be increase by 4.

If the initial number (7 digits) is composed of a quintuple and a pair, example 2222233 then the weight will be increase by 4.

If the initial number (7 digits) is composed of a quintuple, example 2222213 then the weight will be increase by 4.

If the initial number (7 digits) is composed of a quadruple, example 2222345 then the weight will be increase by 4.

If the initial number (7 digits) is composed of a pair and a triplet, example 2233345 then the weight will be increase by 4.

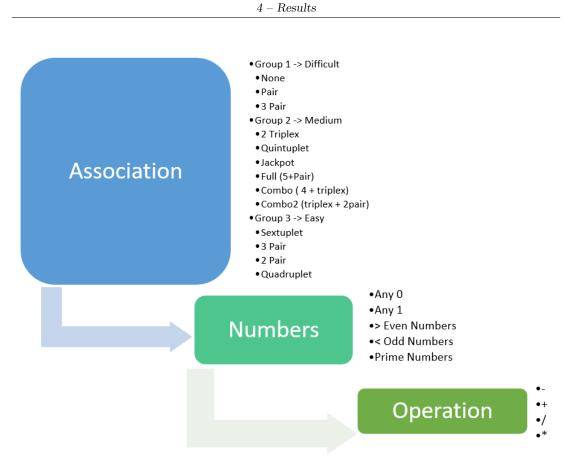


Figure 4.8: Classification criteria

If the initial number (7 digits) is composed of 2 pair only that has same number, example 11223456 then the weight will be increase by 8 OR If the initial number (7 digits) is composed by 4 digits of the same number, example 2222456 then the weight will be increase by 8.

If the initial number (7digits) is composed of 3 pair that has the same number only, example 1122334 then the weight will be increase by 14.

If the initial number (7 digits) is composed of 1 pair only of same number, example 2234578, the weight will be increase by 14.

4.2.2 Subcategory of 1 level to take in count

If the initial number (7 digits) is composed of any 0 then weight will be + 1.

If the initial number (7 digits) is composed of any 1 then weight will be + 1.

4.2.3 Subcategory of 2 level to take in count

For each number from op check if it is composed by a number bigger than 9 and between 100 then the weight will be multiplied by 10.

For each number from op check if it is composed by a number bigger than 99 and between 1000 then the weight will be multiplied by 100.

4.2.4 Subcategory of 2 level to take in count

If the op is a - then increment +1.

If the op is a + increment +4. If the op is a / increment +8.

If the op is * increment +12.

4.2.5 Process description

The 4.9 shows the data process done for doing the clusterization.

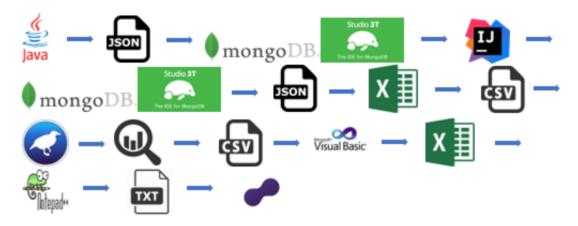


Figure 4.9: Process Description

1. The initial input data was done in java and was visualized as a Json objects in which has the following structure:

2. Migration of this data to mongoDB In order to generate 2 new objects to consider

4 - Results

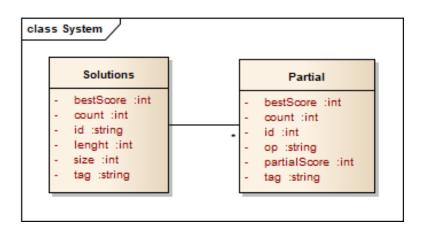


Figure 4.10: Json Objects

for the classification.

Α	lgori	ithm	2 :	Al	gorithm	clusterization
---	-------	-----------------------	------------	----	---------	----------------

	gorithm 2. Algorithm clusterization
1 fc	\mathbf{pr} each solutions of 7 digits sol \mathbf{do}
2	initialize flags anyZero, Prime, Odd, Even, anyOne;
3	initialize array ops;
4	for each PartialSolution do
5	add on ops each operation symbol;
6	end
7	declare and initialized the flag ToVerify $=$ true;
8	String rev="";
9	Integer review=-1;
10	for each PartialSolution par do
11	rev = par.operation + par.BestScore;
12	review=par.Count;
13	for each PartialSolution aux do
14	if $rev == (aux.Operation + aux.BestScore)$ then
15	if review!=aux.Count then
16	ToVerify=false;
17	end end
18	end
19	end
20	if review then
21	add on parcialcounting hashmap <par.operation, par.count="">;</par.operation,>
22	add on bestScorePartials hashmap <par.operation, par.bestscore="">;</par.operation,>
23	end
24	review=-1;
25	rev="";
26	ToVerify=true;
27	MediaCalculation;
28	standardDeviation;
29	weightAssign;
30	
31	end
32 ei	nd

Algorithm 3: Algorithm for calculate the media and the standard deviation

1 declare and give memory to HashMap distance;	
2 declare an Iterator iteradistance;	
3 while iteradistance has next do	
4 declare string save operator read;	
5 if operator is equal to - then	
6 sum= abs(1-media) and val = Math.pow(2,sum) and save in distance HashMap the key and	l
val;	
7 end	
s if operator is equal to + then	
9 sum= abs(1-media) and val = Math.pow(2,sum) and save in distance HashMap the key and	l
val;	
10 end	
11 if operator is equal to * then	
12 sum= abs(1-media) and val = Math.pow(2,sum) and save in distance HashMap the key and	l
val;	
13 end	
14 if operator is equal to / then	
15 sum= abs(1-media) and val = Math.pow(2,sum) and save in distance HashMap the key and	l
val;	
16 end	
17 end	

Algorithm 4: Algorithm media calculation and weightAssign

1 int weight=0; **2** float media =0.0; 3 for each partial Solutions, count the repetitions of the same operation and give weight for each $operation \ \mathbf{do}$ if - then 4 | current weight + 1; $\mathbf{5}$ end 6 7 $\mathbf{if} \ + \mathbf{then}$ current weight + 10; 8 end 9 10 if * then current weight + 30; 11 end 12 13 if / then current weight + 20; $\mathbf{14}$ $\mathbf{15}$ \mathbf{end} add the weight to sol. 16 17 \mathbf{end} 18 media = weight / internalOperations.Size; 19 calculate the media and the standard deviation; $\mathbf{20}$ if Associate numbers classifying 3 groups by searching single pairs, double pairs, triple pairs, single triplex, double triplex, jackpot, quadruplet, quintuplet, sextuplet, full, combo 1 or combo 2 then $\mathbf{21}$ $\mathbf{if} \ group \ 1 \ \mathbf{then} \\$ 22 current weight + 40; end 23 $\mathbf{24}$ if group 2 then current wight + 100; $\mathbf{25}$ end $\mathbf{26}$ 27 $\mathbf{if} \ group \ 3 \ \mathbf{then}$ current weight + 200; $\mathbf{28}$ 29 end and analyze the number composition; 30 $if {\it any prime then} \\$ 31 32 current weight + 40; end 33 34 if any 0 and odd then 35 current weight + 10 else + 30; end 36 37 if any 1 and even then 38 current weight + 1 else + 20; 39 end 40 end 41 clear variables;

Algorithm 5: Algorithm of Combo 2

	6
1	int countPair = 0, countTriple = 0, fisrtPair=-1, truple =-1;
2	, 1
3	Create a list of integers positionReferenced;
4	
5	for $j=0$; $j < data.length; j+t$ do
6	if $data[i] = = data[j]$ i $! = j$ then
7	countTriple++ and save position referenced j;
8	if countTriple == 2 then
9	foundTripOnJack=true and i is saved on positionReferenced and triple=data[j] and
	break;
10	end
11	end
12	if $j == data.length-1$ then
13	clear positionReferenced and make countTriple =0;
14	end
15	end
16	if foundTripOnJack then
17	break;
18	end
19	end
20	for $i=0$; $i < data.length; i++ do$
21	if positionReferenced not contains i then
22	for j=0; j <data.length; do<="" j++="" td=""></data.length;>
23	if $data[i] == data[j]$ i $!= j$ positionReferenced not contains j triple $!= data[j]$ then
24	countPair++ and j is saved on positionReferenced;
25	if $countPair==1$ then
26	i is saved on positionReferenced and countSndPair = true and firstpair = data[j];
27	end
28	end
29	end
30	end
31	if countSndPair then
32	break;
33	end
34	end
35	countPair=0;
36	declare terzo = false;
37	for $i=0$; $i < data.length; i++$ do
38	if positionReferenced not contains i then
39	for $j=0$; $j do$
40	if $data[i] == data[j]$ i $!= j$ positionReferenced not contains j firstpair $!=j$ triple $!= data[j]$
	first pair!=triple then
41	countPair++ and j is saved on positionReferenced;
42	if $countPair = 1$ then
43	i is saved on positionReferenced;
44	if countSndPair foundTripOnJack then
45	return true;
46	end
47	end end
48	end
49	end
50	end
	end
	return false;
	-

-	Algorithm 6: Algorithm of Combo
	1 int count $4 = 0$, countTriple = 0;

1	int count $4=0$, countTriple = 0;		
2	boolean foundTripOnJack=false;		
3	Create a list of integers positionReferenced;		
4	for $i=0$; $i do$		
5	for $j=0$; $j do$		
6	if $data[i] = -data[j]$ i $i = j$ then		
7	countTriple++ and save position referenced j;		
8	if $countTriple == 3$ then		
9	foundTripOnJack=true and i is saved on positionReferenced and triple=data[j] and		
	break;		
10	end		
11	end		
12	if $j==data.length-1$ then		
13	clear positionReferenced and make countTriple =0;		
14	end		
15	end		
16	if foundTripOnJack then		
17	break;		
18	end		
19	end		
20	for $i=0$; $i do$		
21	if positionReferenced not contains i then		
22	for $j=0$; $j do$		
23	if $data[i] == data[j]$ i $!= j$ positionReferenced not contains j then		
24	count4++ and j is saved on positionReferenced;		
25	if $count_4 = 2$ then		
26	i is saved on positionReferenced and return foundTripOnJack;		
27	end		
28	end		
29	end		
30	end		
31	end		
32	return false;		

Algorithm	7:	Algorithm	of full

1	int countPair= 0, count5 = 0;		
2	boolean foundTripOnJack=false;		
3	Create a list of integers positionReferenced;		
4	for $i=0$; $i do$		
5	for $j=0$; $j do$		
6	if $data[i] = = data[j]$ i != j then		
7	count5++ and save position referenced j;		
8	if $count4 == 4$ then		
9	foundTripOnJack=true and i is saved on positionReferenced and triple=data[j] and		
	break;		
10	end		
11	end		
12	if $j == data.length-1$ then		
13	clear positionReferenced and make count5 =0;		
14	end		
15	end		
16	if foundTripOnJack then		
17	break;		
18	end		
19	end		
20	for $i=0$; $i do$		
21	if positionReferenced not contains i then		
22	for j=0; j <data.length; do<="" j+t="" th=""></data.length;>		
23	if $data[i] == data[j]$ i $!= j$ positionReferenced not contains j then		
24	countPair++ and j is saved on positionReferenced;		
25	if $countPair==1$ then		
26	i is saved on positionReferenced and return foundTripOnJack;		
27	end end		
28	end end		
29	end		
30	end		
31	end		
32	return false;		

Algorithm 8: Algorithm of sextuplet

1 i	nt count= 0;	
2 f	for $i=0$; $i < data.length; i++ do$	
3	for $j=0$; $j < data.length; j++$ do	
4	if $data[i] = = data[j]$ i $! = j$ then	
5	count++;	
6	if count==5 then	
7	return true;	
8	end	
9	end	
10	if $j == data.length-1$ then	
11	make count $= 0;$	
12	end	
13	end	
14 €	end	
15 return false;		

-				
Algorithm 9: Algorithm of quintuplet				
1	1 int count= 0;			
2	2 for $i=0$; $i < data.length; i++$ do			
3	for $j=0$; $j < data.length; j++$ do			
4	if $data[i] = = data[j]$ i $! = j$ then			
5	count++;			
6	if $count = = 4$ then			
7	return true;			
8	end			
9	end			
10	if $j == data.length-1$ then			
11	make count $= 0;$			
12	end			
13	end			
14	14 end			
15 return false;				

Al	gorithm 10: Algorithm of quadruplet		
1 ir	1 int count = 0;		
2 fc	or $i=0$; $i < data.length; i++ do$		
3	3 for $j=0$; $j < data.length; j + do$		
4	if $data/i = data/j$ $i != j$ then		
5	count++;		
6	if $count==3$ then		
7	return true;		
8	end		
9	end		
10	if $j = = data.length-1$ then		
11	make count $= 0;$		
12	end		
13	end		
14 e	nd		
15 re	eturn false;		

Algorithm 11: Algorithm of jackpot			
int countPair = 0, countTriple = 0, numRefPair=-1, numRefTrip =-1;			
boolean foundTripOnJack=false;			
3 Create a list of integers positionReferenced;			
4 for $i=0$; $i < data.length; i++$ do			
5 for $j=0; j < data.length; j++ do$			
6 if $data[i] = -data[j]$ i $! = j$ then			
7 countTriple++ and save position referenced j;			
s if $countTriple == 2$ then			
9 foundTripOnJack=true and i is saved on positionReferenced and break;			
10 end			
11 end			
12 if $j = data.length-1$ then			
13 clear positionReferenced and make countTriple =0;			
14 end			
15 end			
16 if foundTripOnJack then			
17 break;			
18 end			
19 end			
20 for $i=0$; $i do$			
21 if positionReferenced not contains i then			
22 for $j=0$; $j do$			
23 if $data[i] = = data[j]$ i $! = j$ positionReferenced not contains j then			
24 countPair++ and j is saved on positionReferenced;			
25 if $countPair==1$ then			
26 i is saved on positionReferenced and return foundTripOnJack;			
27 end			
28 end			
29 end			
30 end			
31 end			
32 return false;			

Algorithm 12: Algorithm of DoubleTriplex

Algorithm 12: Algorithm of Double Triplex			
1 int positionRef = -1, numRef1=-1, numRef2 = -1, cointFirstTriplex=0,countSecondTriplex=0;			
boolean foundfirstTriplex=false;			
Create a list of integers positionReferenced;			
4 for $i=0$; $i < data.length; i+do$			
5 for $j=0$; $j < data.length; j++ do$			
6 if $data[i] = -data[j]$ then			
7 countFirstTriplex++ and save position referenced j;			
8 if $countFirstTriplex == 3$ then			
9 numRef1 = data[i] and foundFirstTriplex = true and positionRef = j and i is saved			
on positionReferenced;			
10 if $j = = data.length-1$ then			
11 make countFirstTriplex = 0 ;			
12 end			
13 break;			
14 end			
15 end			
16 if $j = = data.length-1$ then			
17 make countFirstTriplex = $0;$			
18 end			
19 end			
20 if foundTripOnJack then			
21 break;			
22 end			
23 end			
24 for $i=0$; $i < data.length; i+do$			
25 if positionReferenced not contains i then			
26 for $j=0; j$			
27 if $data[i] = = data[j]$ positionReferenced not contains j positionReferenced not contains i			
then			
28 if $numRef2!=data[i]$ then			
29 countSecondTriplex++;			
30 if $countSecondTriplex == 3$ then			
31 numRef2=data[i] and return foundFirstTriplex;			
32 end			
33 end			
34 end			
35 end			
36 if $j = = data.length-1$ then			
37 countSeconddTriplex=0;			
38 end			
39 end			
40 end			
41 return false;			

Algorithm 13: Algorithm of SingleTriplex

Algorithm1 int count3=0;2 for i=0; i < data.length;i++ do3 | for j=0; j < data.length;j++ do4 | if data[i]==data[j] i!=j then5 | | count3++;:f count3+= 2 then 7 return true; $e^{\mathbf{n}}\mathbf{d}$ 8 9 \mathbf{end} $\mathbf{if} \ j{=}{=}data.length{\text{-}1} \ \mathbf{then}$ 10 11 make count3 = 0; $\mathbf{12}$ \mathbf{end} \mathbf{end} $\mathbf{13}$ 14 end 15 return false;

```
Algorithm 14: Algorithm of TriplePair
```

1 int countFirstPair=0,countSecondPair=0, countThirdPair=0, refFirstPair = -1, refSecondPair=-1; **2** boolean foundFirstPair = false, foundSecondPair=false; whole=false; 3 Create a list of integers positionReferenced; 4 for i=0; i < data.length; i++ do for j=0; j < data.length; j++ do5 if data[i] = = data[j] i!=j then 6 countFirstPair++ and j is saved on positionReferenced; 7 if countFirstPair == 1 then 8 refFirstPair=data[i] and i is saved on positionReferenced and foundFirstPair = true 9 and break; 10 \mathbf{end} 11 \mathbf{end} end 12 if foundFirstPair then 13 break; $\mathbf{14}$ 15end end 16 $\mathbf{for}~i{=}0;~i < \mathit{data.length}; i{+}{+}~\mathbf{do}$ 17 $if \ i \ is \ not \ on \ position Referenced \ then \\$ 18 $\mathbf{for} \ j{=}0; \ j < \mathit{data.length}; j{+}{+} \mathbf{do}$ 19 if data[i] = = data[j] i!=j j is not on positionReferenced then 20 countSecondPair++ and j is saved on positionReferenced; $\mathbf{21}$ if countSecondPair == 1 then 22 23 refSecondPair=data[i] and i is saved on positionReferenced and foundSecondPair = true and break; \mathbf{end} $\mathbf{24}$ $\mathbf{25}$ end end 26 \mathbf{end} 27 $if {\it foundSecondPair then} \\$ 28 29 break; 30 end 31 \mathbf{end} for i=0; i < data.length;i++ do $\mathbf{32}$ 33 ${\bf if} \ i \ is \ not \ on \ position Referenced \ {\bf then} \\$ 34 for j=0; j < data.length; j++ do if j!=i j is not on positionReferenced then 35 36 if data[i] == data[j] j!=i then countThirdPair++ and j is saved on positionReferenced; 37 if countThirdPair == 1 then 38 whole = (foundFirstPair foundSecondPair) and i is saved on 39 positionReferenced; end 40 41 \mathbf{end} \mathbf{end} 42 \mathbf{end} 43 \mathbf{end} 44 45 end 46 return whole;

Algorithm 15: Algorithm of DoublePair			
int countFirstPair=0,countSecondPair=0, refFirstPair = -1;			
· · ·	3 Create a list of integers positionReferenced;		
4 for $i=0$; $i < data.length; i++$ do			
5 for $j=0$; $j < data.length; j++$ do			
$6 \qquad \mathbf{if} \ data[i] == data[j] \ i! = j \ \mathbf{then}$	- f		
 countFirstPair++ and j is saved on positionRe if countFirstPair == 1 then 	elerencea;		
	tion Defense and soul from JEinst Dain tour		
9 refFirstPair=data[i] and i is saved on posi and break;	tionReferenced and foundFirstPair = true		
10 end			
11 end			
12 end			
13 if foundFirstPair then			
14 break;			
15 end			
16 end			
17 for $i=0$; $i < data.length; i++$ do			
18 if <i>i</i> is not on positionReferenced then			
19 for $j=0; j < data.length; j++ do$			
20 if $data[i] == data[j]$ $i!=j$ j is not on position!	Referenced then		
21 countSecondPair++ and j is saved on pos	itionReferenced;		
if $countSecondPair == 2$ then			
23 return foundFirstPair;			
24 end			
25 end			
26 end			
27 end			
28 end			
29 return false;			

Algorithm 16: Algorithm of SinglePair

1	int co	unt=	0;
2	for $i=$	=0; i	< data.length; i++ do
3	fo	or $j=$	=0; $j < data.length; j++$ do
4		if	data[i] = data[j] $i! = j$ then
5			$\operatorname{count}++;$
6			if $count == 2$ then
7			return true;
8			end
9		e	nd
10	e	nd	
11	end		
12	12 return false;		

Algorithm 17: Algorithm of AnyZero

11	boolean foundAny=false;
2 1	for $i=0$; $i < data.length; i++$ do
3	if $i==0$ then
4	foundAny=true;
5	end

6 end

7 return foundAny;

Algorithm 18: Algorithm of AnyOne

1 boolean foundAny=false;

- 2 for i=0; i < data.length; i++ do
- 3 | if i==1 then
- 4 | foundAny=true;
- 5 end
- 6 end
- 7 return foundAny;

Algorithm 19: Algorithm of EvenNumbers

boolean foundAny=false;
 int count=0;
 for each number do
 if i % 2 == 0 then
 | count++;
 end
 end
 for count >= 4 then
 foundAny=true;
 end
 return foundAny;

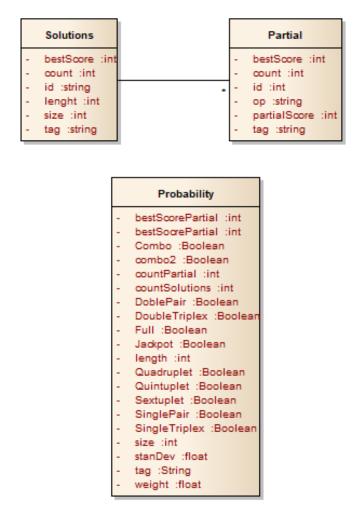
Algorithm 20: Algorithm of OddNumbers

1 boolean foundAny=false; 2 int count=0; 3 for each number do 4 | if i % 2 != 0 then 5 | count++; 6 | end 7 end 8 if count >= 4 then 9 | foundAny=true; 10 end 11 return foundAny;

Algorithm 21: Algorithm of OddNumbers

1 boolean foundAny=false, filter1=true, filter2=true; $\mathbf{2}$ int count=0; $\mathbf{3}$ for each number num do if num > 2 num % 2 == 0 num!=0 num!=1 then 4 filter1=false; $\mathbf{5}$ end 6 int top = Math.sqrt(num) + 1;7 for i=3; i < top; i+=2 do 8 if num % 1 == 0 num!=0 num!=1 then 9 filter2=false; 10 11 end \mathbf{end} $\mathbf{12}$ if filter2 filter1 then 13 | count++ and filter1=true and filter2=true; end $\mathbf{14}$ $\mathbf{15}$ filter1=true and filter2=true; 16 17 end 18 if count >= 4 then **19** | foundAny=true; 20 end ${\bf 21} \ \ return \ foundAny;$

3. Mapping data from mongoDB to java on IntelliJ IDA [Figure 4.11].



Data MongoDB.png

Figure 4.11: Mapping data MongoDb

4. Generate new object on mongo that represents Probability object. 5. Export probability object to json file. 6. From excel read the json file and make a csv file. In order to do not lose floating digits each number of probability was multiplied by 10.000.000 7. On weka take as input the csv file. On weka was applied the algorithm no supervised of clustering k-means, simpleKmeans, distance function of Euclidean-Distance. In order to see the results, first weka let you analyze each of values that represent the criteria for found the best classification clusters.

weka.gui.Gener	ricObjectEditor		
weka.clusterers.SimpleKMeans			
About		weka.gui.Generi	cObjectEditor
Cluster data using the k means algorithm	1. More	weka.clusterers.SimpleKMeans	
	Capabilities	canopyT1	-125
canopyMaxNumCanopiesToHoldInMemor	y 100	canopyT2	-1.0
		debug	False
canopyMinimumCanopyDensit	y 2.0	displayStdDevs	False
canopyPeriodicPruningRate	10000	distanceFunction	Choose EuclideanDistance -R fr
canopyT	1 -1.25	doNotCheckCapabilities	False
canopyT2	2 -1.0	dontReplaceMissingValues	False
debu	False	fastDistanceCalc	False
displayStdDevt	False	initializationMethod	Random
distanceFunction	Choose EuclideanDistance -R fr	maxiterations	500
doNotCheckCapabilities	False	numClusters	7
		numExecutionSlots	1
dontReplaceMissingValue:		preserveinstancesOrder	False
fastDistanceCal	C False	reduceNumberOfDistanceCalcsViaCanopies	False
initializationMethod	f Random	seed	10
Open Save	OK Cancel	Open	OK Cancel

The configuration on weka was the following:

Figure 4.12: Weka Configuration

=== Run information ===

Scheme:weka.clusterers.SimpleKMeans -init 0 -max-candidates 100 -periodic-pruning 10000 -min-density 2.0 -t1 -1.25 -t2 -1.0 -N 7 -A "weka.core.EuclideanDistance -R first-last" -I 500 -num-slots 1 -S 10

Relation:NoDuplicatesBestScoreWeight

Instances: 10850

Attributes: 20: tag, bestScore, countSolutions, length, countPartial, bestScorePartial, SinglePair, DoublePair, SingleTriplex, DoubleTriplex, Jackpot, Quadruplet, Quintuplet, Sextuplet, Full, Combo, Combo2, size, weight, stanDev.

Test mode: evaluate on training data

=== Clustering model (full training set) ===

 ${\rm kMeans} =====$

Number of iterations: 15

Within cluster sum of squared errors: 15775.41157711805

Initial starting points (random):

Cluster 0: '0,1,5,5,9,9,9', 940, 160880, 7, 8556, 940, TRUE, TRUE, TRUE, FALSE, TRUE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, 32, 487, 42.148838.

Cluster 1: '0,1,2,3,5,6,9', 436, 1347404, 7, 8256, 436, FALSE, FA

Cluster 2: '4,6,6,7,7,9,9', 1596, 208870, 7, 3626, 1596, TRUE, TRUE, FALSE, FAL

Cluster 3: '0,2,2,2,2,6,9', 224, 82408, 7, 3724, 224, TRUE, TRUE, TRUE, FALSE, FALSE, TRUE, FALSE, FALSE, FALSE, FALSE, FALSE, 24, 347,32.62138.

Cluster 4: '3,3,3,5,5,6,7', 1094, 252291, 7, 8826, 1094, TRUE, TRUE, TRUE,
FALSE, TRUE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, 39, 678, 94.31635.
Cluster 5: '0,3,3,5,5,7,7', 1330, 541164, 7, 19136, 1330, TRUE, TRUE, FALSE,
FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, 34, 490, 38.76335.
Cluster 6: '1,2,4,5,5,6,8', 1246, 1642540, 7, 15600, 1246, TRUE, FALSE, FALSE,
FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, FALSE, 88, 1516, 104.57286.
Missing values globally replaced with mean/mode Final cluster centroids:

Attribute	Full Data	Cluster 0	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
	(10850.0)	(1438.0)	(120.0)	(1979.0)	(1477.0)	(2070.0)	(1294.0)	(2472.0)
tag	0, 0, 0, 0, 0, 0, 1, 1	0,0,0,0,0,2,2	0, 1, 2, 3, 4, 5, 6	0,0,1,1,2,3,6	0, 0, 0, 0, 0, 0, 1, 1	0, 1, 1, 6, 6, 6, 7	0,0,0,1,2,5,8	0,0,0,1,2,3,4
bestScore	1003.644	364.662	906.3083	1284.4068	1057.0169	1579.4232	457.534	927.1383
count Solu-	402336.5409	99585.2768	1771114.95	597236.7196	100607.2221	233813.2903	306530.9946	727524.7144
tions								
length	7	7	7	7	7	7	7	7
countPartial	10808.6914	6861.758	16734.7	13657.2577	6398.9045	9374.5246	11128.5595	14204.8596
bestScore	1003.644	364.662	906.3083	1284.4068	1057.0169	1579.4232	457.534	927.1383
Partial								
SinglePair	Т	Т	F	Т	Т	Т	Т	Т
DoublePair	Т	Т	F	Т	Т	Т	Т	F
Single	Т	Т	F	F	Т	Т	F	F
Triplex								
Double	F	F	F	F	F	F	F	F
Triplex								
Jackpot	F	Т	F	F	F	Т	F	F
Quadruplet	F	F	F	F	Т	F	F	F
Quintuplet	F	F	F	F	F	F	F	F
Sextuplet		F	F	F	F	F	F	F
Full	F	F	F	F	F	F	F	F
Combo	F	F	F	F	F	F	F	F
Combo2	F	F	F	F	F	F	F	F
size	41.6718	19.9645	98.9417	55.7665	25.2322	35.3903	33.7736	59.4523
weight	579.5288	290.9159	1535.775	929.8454	421.1266	612.2227	441.7303	559.9474
stanDev	69.9799	35.9138	67.0109	92.8821	82.0734	94.5385	28.0141	65.7829

Table 4.1: Weka results

Time taken to build model (full training data) : 1.64 seconds. === Model and evaluation on training set === Clustered Instances

Difficulty	Cluster	Instances	Percentage
2	0	1438	(13%)
7	1	120	(1%)
5	2	1979	(18%)
1	3	1477	(14%)
6	4	2070	(19%)
4	5	1294	(12%)
3	6	2472	(23%)

Table 4.2: Weka results 2

2	Weka Explorer		_ _ X
Preprocess Classify Cluster Associate Select attributes Visualiz	•]		
Open fileOpen URL	Open DB Generate]	Undo Ed	Save_
itter			
Choose None			Apply
Current relation	Selected attribute		
Relation: NoDuplicatesBestScoreWeight Instances: 10850	Attributes: 20 Name: bestSc Sum of weights: 10850 Missing: 0 (0%)		Type: Numeric Unique: 443 (4%)
No. None Invert 1 Funda 1 Funda 2 Exclusion 2 Exclusion 3 Holdshift 4 Holdshift	Patern Basic School Sch	V Value 10 19396 10033 960.01	
6 Confidential 6 Description 7 Description 9 Biographics 10 Description 11 January 11 January 11 Description 12 Description 13 Description 14 Description 15 Description 16 Description 17 Description 18 Descri			347 7 4 4 4 6 4 1 2 6 3 6 4 6 6 1 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
Status		(ý)	
OK			Log

Figure 4.13: Tag Weka Configuration

2	Weka	Explorer		_ 0 X
Preprocess Classify Cluster Associate Select attributes Visualize				
Open tile	n DB	rateUnd	to Edt.	Save
Filter				
Choose None				Apply
Current relation		Selected attribute		
Relation: NoDuplicatesBestScoreWeight Instances: 10850	Attributes: 20 Sum of weights: 10850	Name: bestScore Missing: 0 (0%)	Distinct 1684	Type: Numeric Unique: 443 (4%)
Attributes		Statistic	Value	
		Minimum	10	
All None Invert	Pattern	Maximum Mean	9396	
		StdDev	950.059	
No. Name 1 Liptap 2 bdtstbccc 3 countbulkens 4 Height		Class: bestScore (Num)		Visualize /
5 cumPortal 6 bestorePartal 7 BrightPart 8 CouldePart 9 BrightPart 9 BrightPart 10 DoublePart 11 Jukeptor	ļ			
Ramove				<u>2 21555001202000000000000000000000000000</u>
OK				Log 🛷

Figure 4.14: bestScore Weka Configuration

5	Weka	Explorer				- 0 X
Preprocess Classify Cluster Associate Select attributes Visual	ze					
Open file Open URL	Open DB Gen	erate Und	0	Edt.	S	ve
filter						
Choose None						Apply
Current relation		Selected attribute				
Relation: NoDuplicatesBestScoreWeight Instances: 10850	Attributes: 20 Sum of weights: 10850	Name: countSolutions Missing: 0 (0%)	Distinct 10009		Type: Numeric Unique: 9567 (89%)	
Attributes		Statistic		Value		
		Minimum		44		
All None Invert	Pattern	Maximum Mean		3217366 402338.541		
		StdDev		402335.541		
No. Name		UNAL TY		400101.400		
1 1+2140						
2 bestScore	0					
3 countSolutions		Class: countSolutions (Num)				Visualize Al
4 tength 5 countPartial						
6 bestScorePartial						
7 🛄 SinglePair	r I					
8 DoublePair 9 SingleTriplex						
10 DoubleTriplex						
11 Jackpot	5	l IIIb				
Remove			_			
			0 Three		8766434132	
Status		44	1	06708		3217366
OK					Log	100

Figure 4.15: countSolutions Weka Configuration

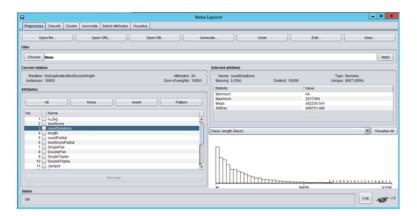


Figure 4.16: Length Weka Configuration

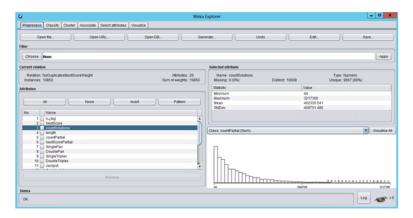


Figure 4.17: CountPartial Weka Configuration

G Weka	Explorer	- 0 ×
Preprocess Classify Cluster Associate Select attributes Visualize		
Open file	verate	a
Rer		
Choose None		Apply
Current relation	Selected attribute	
Relation: NoDuplicatesBestScoreWeight Athrbutes: 20 Instances: 10850 Sum of weights: 10850	Name: countSolutions Type: Numeric Missing: 0 (0%) Distinct: 10009 Unique: 9667 (89%)	
Attributes	Statistic Value	
All None Invet Patern No. Name I Invet I 1 Invet I Invet I 2 besticize I I	Matem 3217366 Matem 4023561 98Dev 409751486	
3 Control field Advance 4 Integration 5 Control field Advance 7 Docuse Field 9 Docuse Field		
Status	44 Holiton	3217366
ок	Log	11 AN 1

Figure 4.18: Best Score Partial Weka Configuration

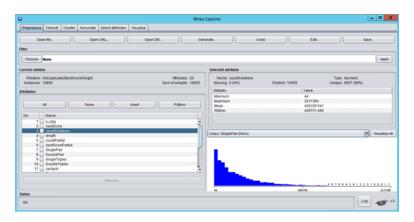


Figure 4.19: Single Pair Weka Configuration

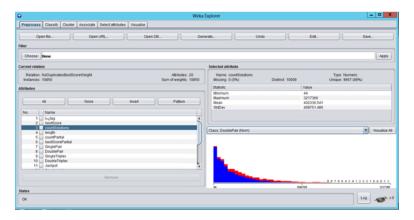


Figure 4.20: Double Pair Weka Configuration

Weka I Preprocess Classify Cluster Associate Select attributes Visualize	Explorer
(Proprocess Classify Custor Associate Select amounts I versaciate Open Ite Open URL Open DB Gen	erate
Choose None	Apply
arrent relation	Selected attribute
Relation: NoDuplicatesBestScoreWeight Attributes: 20 Instances: 10850 Sum of weights: 10850	Name: countSolutions Type: Numeric Missing: 0 (0%) Distinct: 10009 Unique: 9687 (89%)
MirButes	Statistic Value
Al None Invest Patern No. Name	Monisum 44 Maximum 32:2756 Baan 42:235.541 DoDry 400751.405
3 PostGAG00 4 Ling% 5 CostR*ptal 6 CostR*ptal 7 Social Participant 8 Double Trains 9 Double Trains 10 Double Trains 11 Josoph	(Class EngleTripler, Nom)
Remove	
latus	44 Hobi706 2217268
ok	L19 🛷 1

Figure 4.21: Single Triplex Weka Configuration

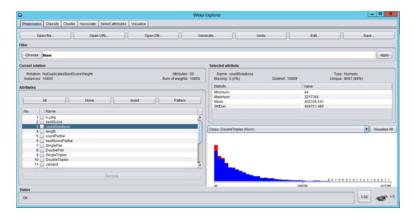


Figure 4.22: Double Triplex Weka Configuration

9	Weka	Explorer			
Preprocess Classify Cluster Associate Select attributes Visua	128				
Open file Open URL	Open DB Ger	erateUnd	6 C	Edt.	Save
filter					
Choose None					Apply
arrent relation		Selected attribute			
Relation: NoDuplicatesBestScoreWeight Instances: 10850	Attributes: 20 Sum of weights: 10850	Name: countSolutions Missing: 0 (0%)	Distinct 10009		Type: Numeric Unique: 9667 (89%)
Attributes		Statistic		Value	
		Minimum		44	
All None Invert	Pattern	Maximum Mean		3217366 402338.541	
		StdDev		402335.541	
No. Name 1 i+dag					
2 bestScore 3 countSolutions]	Class: Jackpot (Nom)			Visualize A
4 📃 length		Class: Jackpot (Nom)			 Visualize A
5 countPartial 6 bestScorePartial					
7 SinglePair					
8 DoublePair					
9 SingleTriplex					
10 DoubleTriplex 11 Jackpot	5				
L DRIMMIN	*				
Remove					
					1.67664341323100011
Status		4	11	00705	3217266
OK					Log 🛷 1

Figure 4.23: Jackpot Weka Configuration

Preprocess Classify Cluster Associate Select attributes Visualize	Weka Expl	orer			l	- 0 X
Open file	B Generate	L Und	•	Edt.	Sa	۰
itter						
Choose Name						Apply
Surrent relation	Se	lected attribute				
Relation: NoDuplicatesBestScoreWeight Instances: 10850	Attributes: 20 Sum of weights: 10850	Name: countSolutions Missing: 0 (0%)	Distinct 10009		Type: Numeric Jnique: 9667 (89%)	
Attributes		Statistic		Value		
Al None Invert	Patern	Minimum Maximum Mean StdDev		44 3217366 402335.541 409751.486		
No. Name 1 Inclag	*	SIGLARY		409/01/480		
2 bestScore 3 countSolutions 4 length		ass: Quadruplet (Nom)				Visualize A
5 countPartsal 6 bestScorePartsal 7 bestScorePartsal 8 DoublePair						
9 SingleTriplex 10 DoubleTriplex 11 Jackpot	ų.					
Remove						
		64	162	6756		2217366
OK .					Log	~

Figure 4.24: Quadruplet Weka Configuration



Figure 4.25: Quintuplet Weka Configuration

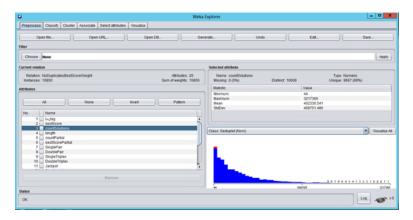


Figure 4.26: Sextuplet Weka Configuration

Preprocess Classity Cluster Associate Select attributes Visualize	Weka Explorer
Open file	Generals
Choose None	Apply
Current relation	Selected attribute
Relation: NoDuplicatesBestScoreWeight Attributes: 20 Instances: 10850 Sum of weights: 10	
Attributes	Statistic Value
All None Invert Patern Na Name 1 Indag 2 Substrate 2 Substrate 2 Substrate 2 Substrate 3 Substrate Substrate Substrate 3 Substrate Substrate <t< td=""><td>Marnum 44 Maimum 227354 Nean 42235 44 Solow 40075 485</td></t<>	Marnum 44 Maimum 227354 Nean 42235 44 Solow 40075 485
3 Control Autor 4 Long Autor 5 Long Autor 6 Long Autor 7 Long Autor 8 Long Autor 9 Long Autor	Case ful plant)
	44 100206 221726
Status OK	

Figure 4.27: Full Weka Configuration

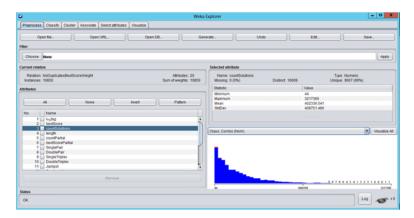


Figure 4.28: Combo Weka Configuration

Preprocess Classify Cluster Associate Select attributes Visualize	1				
Open file	Open DB	erate	•	Edt.	Save
ilter					
Choose None					Apply
urrent relation		Selected attribute			
Relation: NoDuplicatesBestScoreWeight Instances: 10850	Attributes: 20 Sum of weights: 10850	Name: countSolutions Missing: 0 (0%)	Distinct 10009		e: Numeric e: 9667 (89%)
Attributes		Statistic	V	alue	
		Minimum Maximum		4	
All None Invert	Pattern	Mean		02336.541	
		StdDev	4	09751.485	
No. Name					
1 isidag 2 bestScore	-				
3 countSolutions		Class: Combo2 (Nom)			Visualize
4 elength 5 countPartial		Course Compare (Horn)			- House
6 bestScorePartial	U.				
7 SinglePair 8 DoublePair	T I				
9 SingleTriplex					
10 DoubleTriplex					
11 Jackpot	1				
Remove					
Remove					
		*	190675	6	321736
Status					
OK					Log A

Figure 4.29: Combo2 Weka Configuration

2	Weka Er	plorer				- 0 X
Preprocess Classify Cluster Associate Select attributes Visual	20					
Open tile	Open DB Gener	ate	50	Edt.	50	e
Ther						
Choose None						Apply
urrent relation		Selected attribute				
Relation: NoDuplicatesBestScoreWeight Instances: 10850	Attributes: 20 Sum of weights: 10850	Name: countSolutions Missing: 0 (0%)	Distinct 10009		Type: Numeric Unique: 9567 (89%)	
All Hone Invert No. Name Invert Invert 1	Patem	Statistic Minimum Maximum Mean StdDev		Value 44 3217366 402335.541 409751.486		
Controllation Control	Ę		<u></u>		• •	Visualize A
Status						
ок					Log	100

Figure 4.30: Size Weka Configuration

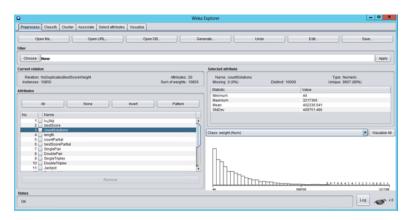


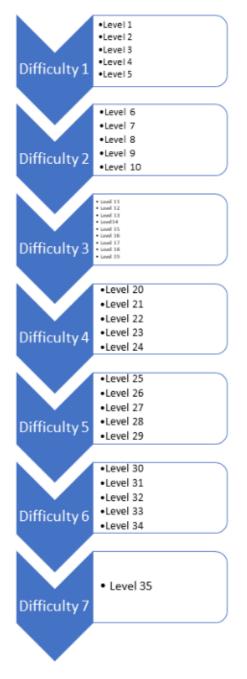
Figure 4.31: Weight Weka Configuration

Weka Preprocess Classify Cluster Associate Select attroutes Visualize	Explorer
Open file	erate
Choose None	Apply
urrent relation	Selected attribute
Relation: NoDuplicatesBestScoreWeight Attributes: 20 Instances: 10850 Sum of weights: 10850	Name: countSolutions Type: Numeric Missing: 0 (0%) Distinct: 10009 Unique: 9657 (89%)
Mributes .	Statistic Value
All None Invert Pattern No. Name	Mannum 44 Mashum 32:1796 Maan 42:235.541 StdDw 400751.465
2 - SetScore 3 - SetScore 4 - SetScore 5 - SetScore 6 - SetScore 7 - SetScore 7 - SetScore 8 - S	Casas stateDav (Rum)
Remove	
OK .	

Figure 4.32: Standard Deviation Weka Configuration

bestScore (Num)	 Y: weight (Num) 	
olour. Cluster (Nom)	Select Instance	
Reset Clear	Open Save Jitter	
t NoDuplicatesBestScoreWeight_cluster		
m P P P P P P P P P P P P P P P P P P P		
iss colour		

Figure 4.33: Results after apply algorithm



 $Figure \ 4.34: \ Subdivision$



Figure 4.35: Relationship between Difficulty and Clusters

4.3 Design of point system and levels

For each difficulty was created an .apk in order to search the timing and speed of users on solving a schema related to the difficulty. The process consist on tabulate the results of different games, the data tabulated was related to number of games done, points get on each schema, experience points given with the previous point system, tag given random from the input separated by difficulty, operation done by the user, points gotten, bonus given, time in milliseconds left, time in seconds left, time in milliseconds spend, time in seconds spend.

Then for each schema solved, I had test 17 different formulas in order to find the best one. Those are the 17 formulas tested:

- 1. Points= $\sum((leftTimeonmillisenconds*\%weight) + #ScenarioCompleted + PointsOp)$
- 2. $Points = \sum ((leftTimeonmillisenconds * \% weight) + (ScenarioCompleted * PointsOp))$
- 3. Points= $\sum(\frac{\#schenarioCompleted}{1+(leftTimeonmilliseconds)*\%Weight)} + PointsOp) + 1or0idnoleftTimeand0ScenarioCompleted$

4. Points= $\sum (\frac{\#schenarioCompleted+PointsOp}{1+(leftTimeonmilliseconds)*\%Weight)})$

- 5. Points= $\sum((lefttime * \#scenario) * (PointsOp * \%Weight))$ + 1or0ifnoleftTimeand0scenarioCompleted
- 6. Points= $\sum \left(\frac{leftTimeonmilliseconds*\#scenarioCompleted}{1+(PointsOp*\%Weight)}\right)$
- 7. Points= $\sum (\frac{PointsOp*\%Weight}{1+(leftTimeonmilliseconds*\#scenarioCompleted)})$
- 8. Points= $\sum \left(\frac{leftTimeonmilliseconds + \#scenarioCompleted}{1 + (PointsOp*\%Weight)}\right)$
- 9. Points= $\sum (\frac{PointsOp*\%Weight}{1+(leftTimeonmilliseconds+\#scenarioCompleted)})$
- 10. Points= $\sum (leftTimeonmilliseconds^2 + PointsOp * leftTimeonmilliseconds + #scenarioCompleted)$
- 11. Points= $\sum (lefTtimeonmilliseconds^2 + PointsOp * leftTtimeonmilliseconds * difficulty + #scenarioCompleted * %Weight)$
- 12. Points= $\sum (leftTimeonmilliseconds^2 + PointsOp * leftTimeonmilliseconds + ((#scenarioCompleted + difficulty)) * %Weight)$
- 13. Points= \sum (PointsOp² + (PointsOp * leftTimeonmilliseconds) + (#scenarioCompleted * difficulty * %Weight))

- 14. Points= $\sum(PointsOp^2 + (PointsOp * \#scenarioCompleted * difficulty * %Weight) + leftTimeonmilliseconds)$
- 15. Points= \sum (PointsOp² + (PointsOp * #scenarioCompleted * difficulty * %Weight) - leftTimeonmilliseconds)
- 16. $Points = \sum \left(\frac{PointsOp^2 + (PointsOp*\#scenarioCompleted*difficulty*\%Weight}{1 + leftTimeonmilliseconds}\right)$
- 17. Points= $\sum(\frac{leftTimeonmilliseconds}{1+(PointsOp^2+(PointsOp*#scenarioCompleted*difficulty*\%Weight)})$ The red formula was discarded immediately because generate negative values. the

formula number 3 was the chosen one.

Also for Brains points were proposed 6 different ways to obtain them on each game.

- 1. Brains = PointsOp (more understandable for players)
- 2. Brains = possiblePointsOp
- 3. Brains = $\sum (leftime)Brains = (\#scenariosolved)$
- 4. Brains = bonus calculated on previous version
- 5. Brains = #scenario solved * difficulty of the input

Mak07 will have a database that will keep the pre calculated values of wight and standard deviation for each tag.

4.3.1 Difficulty 1

The following table is the data obtained by playing on the difficulty 1 found by clustering.

Each color represent the number of schemas done in 1 game [figure 4.36]. In this case the users played 11 games, but they had solve different number of schemas each time.

After of having all the data tabulated, I summarized the data grouped by number of games and number of schemas solved on each game in order to graphic the results[figure 4.37].

Data Graphically shows in this case that the number or schemas solved in one game of 2 seconds are 3 [figure 4.38].

This is the behaviour of players playing a game of difficulty 1 [figure 4.39].

The chosen formula have a incremental behaviour [figure 4.40] [figure 4.41].

The following graph shows the relationship between games and points obtained by the new point system, Formula 3 the chosen one [figure 4.42].

The following image represents the relationship between games vs time average: 261526 Total games: 11 [figure 4.43].



Figure 4.36: Data obtained by playing difficult 1 found by clustering

TF1	TF2	TF3	TF4	TF5	TF6	TF7	TF8	TF9	TF10	TF11	TF12	TF13	TF14	TF15	TF16	TF17	games	time	ехр
229066552	36781842	25	0.000001379	719256518	18	0.655	10	0.7151	1069460	5668784	1081157	783580	194992	113656	5.86	0.831	2	40668	23
59253660	192284714	11	0.000000712	584867264	92571	0.049	92152	0.1742	2242244	4112360	2262551	359303	377949	-142757	4.58	91930.30	4	260353	7
159935708			0.000000430	655928767	387	0.040	171	0.0614	2408334	6778842	2422348		285360	-168396	0.78	13.23		226878	
	387425657	18	0.000000658	2627671998	291395	0.037	197299	0.1746	4142301	8909145			777645	-123023	6.13			450334	
	241614099	7	0.000001191		150793	0.053	50341	0.1578	1881366	2955714	1907623		276952	-181540	3.93	50204.61		229246	
163129041	163129083		0.000006140		483	0.116	274	0.4599	2559625	6923005	2577531	773110	435196		14.09	27.59		247104	
437751713	437751783		0.000009410		444436	0.115	158939	0.7028	4048586	8884670	4095570	989345	997562	126976	31.28	158312.40	7	435293	21
39198305	39198302		0.000001030				5754		1189798	5979412					1.91				
132313354			0.000003476				89737	0.5616	2190471	4002285	2210771	368599	387669	-120919	18.75			254294	
188014823	188014821		0.000000279	1050793791	315	0.054	143	0.0919	2399625		2416474		319730	-132192	124	11.90		225961	
339292729	339292747	18	0.000001427	1879338783	295035	0.028	200795	0.1099	4164024	8934240	4194698	898417	654816	-253076	3.29	200601.31	6	453946	12

Figure 4.37: Data summarized by playing difficult 1 found by clustering

The following is a pivot table that shows points vs total of points for each game. the ? value means that the user did a mistake but the time was count for the test [figure 4.44].

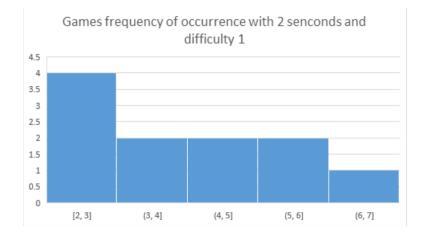


Figure 4.38: Games frequency of occurrence with 2 seconds and difficulty 1

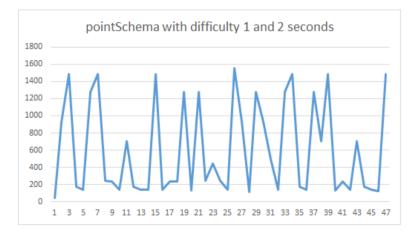


Figure 4.39: pointSchema with difficulty 1 and 2 seconds



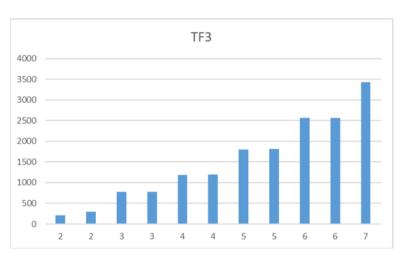


Figure 4.40: Graph of formula 3

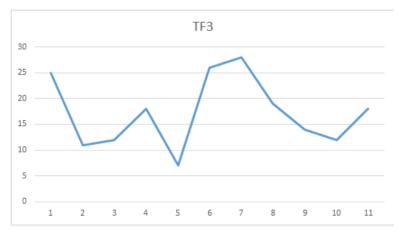


Figure 4.41: Graph of formula 3 line

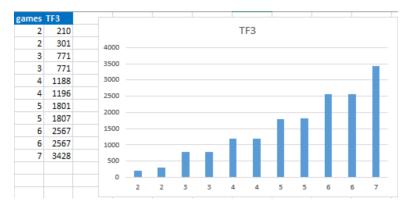


Figure 4.42: Relationship between games and points of formula 3

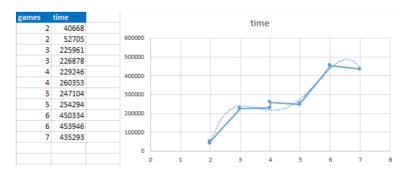


Figure 4.43: Relationship between games and time of formula 3

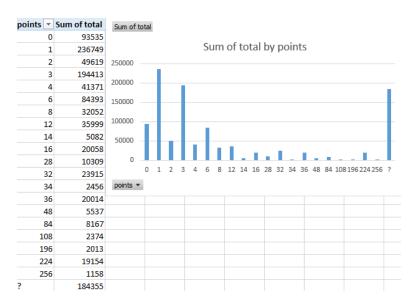


Figure 4.44: Sum of total by points

4.3.2 Difficulty 2

The following table is the data obtained by playing on the difficulty 2 found by clustering [figure 4.45]. Each color represent the number of schemas done in 1 game. In this case the users played 15 games, but they had solve different number of schemas each time.

XXXXX 2 3 5 <th></th> <th>formula 8 fe</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>mola 17</th>																	formula 8 fe									mola 17
1 1 0	8777680	1	1	1 50	361	413	834	26.601496	51952	49523219	48523218	51	0.000001051	2426159461	1.112	0.899	1.112	0.899	2992410	10568010	2900948	2604507	378221	275317	6.30	0.758
2 3 5	0.0.5.5.5.4.0	2	1			441		4.0095426	1966																	0.071
C C	222180	2			53																					1,059
X 1 0	622280	4	3	1 15		107	1276	52,43146	55545	122425836	122425835	16	0.000000131	1036387361	5.013	0.799	5.013	0.199	2145234	10784444	2758328	1446238	230036	38145	140	0.7%
1 1 0	772880	5	3	2 29	34	128	235			16427462							14.870	0.067			1916720		135852	-3956		1.060
3 3 3 5 5 5 6 5 6	2555230	8		1 94	490	523	1026	29.901252	29068	20194522	20114522	95	0.000002923	2529613622	0.224	2.994	0.234	2.994	2657522	17207905	2994795	2449595	\$20057	580721	20.98	0.048
X X X X X X X X X X X X X X X X X X X	4222111	Ť	5	1 50	50	156	266	49,050000	97429	35651745	25652744	51	0.000001431	1702504701	5.323	0.300	5.323	0.100	5590577	34013277	5592129	4972291	225078	21060	132	0.758
1 1 1 1 0	9.8.4.4.8.0	8	5	2 70	344	387	764	94.12237	20234	14244808	14244876	71.00000001	0.000005054	1994263041	0.821	1218	0.411	2,435	1567298	10065578	1572226	1426753	710671	\$70283	34.12	0.025
C C C C C C C C C C C C C C C C C C C	7777680		5	3 57	292	497	235	29.96811	5838	1195020	1295221	58.0000022	0.0000430\$2	23853861	1328	0.752	0.443	2.255	262318	2413020	224562	343208	237652	275783	47.45	0.021
3 5 7 <th7< th=""> 7 7 7</th7<>	4.4.21110	30	6	1 81	106	290	266	45,909636	102965	20058272	28059271	82	0.000002155	2082546251	2.507	0.205	2.507	0.295	202724	59716724	5832296	9424326	212095	104/06	2.00	0.500
SALE SALE <th< td=""><td>9.9.02220</td><td>n -</td><td>é.</td><td>2 10</td><td>56</td><td>160</td><td>292</td><td>40.19799</td><td>55040</td><td>55457076</td><td>55457004</td><td>1</td><td>0.000000236</td><td>1000141281</td><td>11,247</td><td>0.002</td><td>5.524</td><td>0.178</td><td>972120</td><td>4024030</td><td>200001</td><td>572456</td><td>124942</td><td>03246</td><td>2.49</td><td>0.402</td></th<>	9.9.02220	n -	é.	2 10	56	160	292	40.19799	55040	55457076	55457004	1	0.000000236	1000141281	11,247	0.002	5.524	0.178	972120	4024030	200001	572456	124942	03246	2.49	0.402
SALE SALE <th< td=""><td>5533080</td><td>12</td><td>7</td><td>1 52</td><td>110</td><td>218</td><td>448</td><td>30742881</td><td>87824</td><td>43674362</td><td>43874381</td><td>58</td><td>0.000000328</td><td>2485423528</td><td>3.852</td><td>0.260</td><td>3.852</td><td>0.268</td><td>6105620</td><td>39795628</td><td>6308882</td><td>5505211</td><td>276298</td><td>20452</td><td>182</td><td>0.545</td></th<>	5533080	12	7	1 52	110	218	448	30742881	87824	43674362	43874381	58	0.000000328	2485423528	3.852	0.260	3.852	0.268	6105620	39795628	6308882	5505211	276298	20452	182	0.545
1 1 0	4422280	13	ż.	2 35	24		268	32 338882	27195	\$953407	3953440	36,0000002	0.000003717	696235961	4.246		2.123		153502		1256064	957208	206754	152464		0.22
MIL A C <thc< th=""> C <thc< th=""> <thc< th=""></thc<></thc<></thc<>	777100	14	2	3 53	420	526	225	32,939772	12252	207776	2122879	54.000001	0.000017847	499227451	3.2%	0.211	1872	0.922	807820	5052956	909665	7(2992)	275299	240535	12.62	0.052
	5.6.6.6.2.2.0	15	8	1 66	672	773	129	29.69621	106079	14745040	14745047	67.0000001	0.000004544	973950747	11.562	0.000	1.562	0.005	7705177	49792461	7796159	7002575	170785	-41373	0.61	1639
	7.6.1.1.1.1	10		1 12	12	520	175	40.25522	102457	17929968	12829887	13.00000001	0.00000225	25553761	43766	0.020	48,788	0.028	1988220	8363624	1887945	1236288	117248	.479.68	0.14	6.928
ALALA B C F D F D F D F D F D F D F D F D F D F D F D F D F D F D F D F D F D F D F D <thd< th=""> D <thd< th=""> <thd< th=""></thd<></thd<></thd<>	7711110	17	â.	2 83	12		128	55 1806.37	88273	12409022	12405113	84.0080002	0.000006850	2058885283	15.475	0.055	7 237	0.129	8069590	52522534	8070553	7612218	251404	72958		0.552
11110 10 <th1< td=""><td>744444</td><td>10</td><td>÷.</td><td>3 59</td><td>229</td><td>207</td><td>129</td><td>46,20924</td><td>56227</td><td>79/56/5</td><td>79/5720</td><td>60.0000004</td><td>0.000007922</td><td>1202252002</td><td>20.566</td><td>0.049</td><td>6.856</td><td>0.146</td><td>2722274</td><td>23627622</td><td>2724247</td><td>2220749</td><td>220004</td><td>1994.20</td><td>2.07</td><td>0.228</td></th1<>	744444	10	÷.	3 59	229	207	129	46,20924	56227	79/56/5	79/5720	60.0000004	0.000007922	1202252002	20.566	0.049	6.856	0.146	2722274	23627622	2724247	2220749	220004	1994.20	2.07	0.228
11110 10 <th1< td=""><td>9.6.62220</td><td>73</td><td></td><td>4 23</td><td>21</td><td>162</td><td>1228</td><td>615(0)73</td><td>25807</td><td>32929759</td><td>32929824</td><td>24.0000000</td><td>0.000000020</td><td>0029505145</td><td>3507</td><td>0.254</td><td>0.823</td><td>1132</td><td>789354</td><td>4158720</td><td>230266</td><td>625650</td><td>847721</td><td>290/07</td><td>3165</td><td>0.001</td></th1<>	9.6.62220	73		4 23	21	162	1228	615(0)73	25807	32929759	32929824	24.0000000	0.000000020	0029505145	3507	0.254	0.823	1132	789354	4158720	230266	625650	847721	290/07	3165	0.001
A + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 +	4431110	20	ā.	5 82	116		388	26,295004	6890		2522145	82 000002	0.000034333	1021304701	1952											0.002
MALE V	9544480	21	10	1 68	208		\$278	105.54664	88230	122219549	22225548	69	0.000000622	7696924641		0.978	1822	0.978	6690547	42992297	6639479	8042874	\$366.02	522142		0.946
Addition S V F C V F C V F C F< F F F	\$444220	22	10	2 26	97	177	446	29.69621	40062	20792926	21792970	37.0060001	0.000001744	1569090657	6.006	0.304	2.542	0.229	2121011	12675419	2124122	1765570	272992	176/87	4.61	0.207
		23	11	1 127	500	601	1276	00.94412	26157	33376460	23376459	120	0.000003835	4230734165	0.80	6.135	0.161	6.195	25%421	23441125	2525423	2221929	161453	1022145	43.40	0.023
		24	12	1 12	432		128	44.398177	106826	11712032	16732831				44,050		44 551		25568313		2506568		122683			6.361
Alter T S <td>\$552220</td> <td>25</td> <td>12</td> <td>2 18</td> <td>44</td> <td></td> <td>446</td> <td>29,69621</td> <td>74473</td> <td>22256976</td> <td>22214830</td> <td>17.0000001</td> <td>0.000000542</td> <td>1062379657</td> <td>20.870</td> <td>0.048</td> <td>10.435</td> <td>0.096</td> <td>1742745</td> <td>8892153</td> <td>1745667</td> <td>1297830</td> <td>174495</td> <td>25543</td> <td></td> <td>0.745</td>	\$552220	25	12	2 18	44		446	29,69621	74473	22256976	22214830	17.0000001	0.000000542	1062379657	20.870	0.048	10.435	0.096	1742745	8892153	1745667	1297830	174495	25543		0.745
XI.10 X V <td>662210</td> <td>29</td> <td>12</td> <td>2 10</td> <td>50</td> <td>160</td> <td>129</td> <td>29,69621</td> <td>56642</td> <td>7973251</td> <td>7972269</td> <td>1L0000004</td> <td>0.00000%51</td> <td>226197141</td> <td>122.161</td> <td>0.000</td> <td>40,723</td> <td>0.025</td> <td>905360</td> <td>4202000</td> <td>205241</td> <td>569412</td> <td>95906</td> <td>-27278</td> <td>0.52</td> <td>1925</td>	662210	29	12	2 10	50	160	129	29,69621	56642	7973251	7972269	1L0000004	0.00000%51	226197141	122.161	0.000	40,723	0.025	905360	4202000	205241	569412	95906	-27278	0.52	1925
3.131 0 <td>4.4.4.110</td> <td>27</td> <td>12</td> <td>4 17</td> <td>22</td> <td>122</td> <td>1228</td> <td>15420236</td> <td>26433</td> <td>33680248</td> <td>13050236</td> <td>13 0000000</td> <td>0.000000623</td> <td>2290335505</td> <td>4.068</td> <td>0.205</td> <td>1217</td> <td>0.821</td> <td>645048</td> <td>3342554</td> <td>657903</td> <td>484205</td> <td>\$33905</td> <td>533093</td> <td>23.00</td> <td>0.043</td>	4.4.4.110	27	12	4 17	22	122	1228	15420236	26433	33680248	13050236	13 0000000	0.000000623	2290335505	4.068	0.205	1217	0.821	645048	3342554	657903	484205	\$33905	533093	23.00	0.043
			12	5 62	42	165	666	109,25549	9948		6605823				1584											0.009
	8887779	29	12	1 26	454	482	14.61	119.00055	78541	15726956	105728855	25	0.000000332	283471895		0.644	1552	0.644	2225662	19/76427	2246020	2667412	430878	274588	4.51	0.222
MALLIN 2 0 4 0 4 0 8 10 10.201	0.022222	20	12	2 4	19		764	92,27239	61555	42234726	43334720	5.00000005	0.000000130	246677761	42,702	0.022	21,852	0.046	702461	2179701	707209	256306	121009	-22101	0.64	1566
MALLIN 2 0 4 0 4 0 8 10 10.201	553330	31	13	3 12	62	165	1016	103 23348	44052	456.12852	#5612323	13 0000001	0.000000433	2322531423	7 503	0 133	2 581	0.400	1077495	6523299	1034747	770266	414030	3255528	840	0.18
		32	13	4 30	48		14.52		25417	37622800	37622887	310000001	0.000000904	45(533204)					955952		866235	803800				0.021
ALLIA 20 P 2 D 64 2 10 64 2 10 64 54 10 10000 1000 1000 1	2111100		12	5 100	28		224		5906	2041509	2041904	101.000002	0.000024524	1520702001	1262	0.734	0.273	2.665	979555	6443255	999993	922829	1720945	1960622	129.44	0.005
ALLIA 20 P 2 D 64 2 10 64 2 10 64 54 10 10000 1000 1000 1	0.022.080	34	14	1 100	54	193	445	26 295004	100005	40553090	40553930	101	0.000002000	4055120001	2.441	0.630	2 441	0.430	10051056	77003356	1034471	10090061	421004	204074	2.07	0.348
22121 8 9 1 4 9 9 22 4 4558 4646 72560 7272 560002 8000005 1000051 100556 0 1056 463 22 651 4000 7256 40000 70570 9770 7270 2512 5 9 1 8 29 1 8 29 1 8 29 1 8 10 10 10 10 10 10 10 10 10 10 10 10 10	0.0.0.3.3.3.3		14		116																					3,151
ALSSL 12 14 4 4 4 6 6 4 5 5 7 1 8 4 6 5 6 1 5 1 3 5 1 3 5 1 3 5 1 3 5 1 3 5 1 3 5 1 3 5 1 3 5 1 3 5 1 3 5 1 3 5 2 3 8 3 1 2000000000000000000000000000000000000	7773100	38	14	3 84	56		235	81471634	66364		15728232	85.0000002	0.000004258	382145681						30495378	4282842					0.212
27.23.2 30 5 1 31 295 300 594 952.2762 64700 6564557 69504556 37 0.00000001 217082711 1327 8.510 1327 0.500 218717 1004457 218025 223084 20044 170574 246 7.22.23 5 5 2 31 157 31 255 103.7214 6470 144956 144595 30000000 20000047 2007077 32768 6390 1502 5454 050 22718 103457 220204 14502 1																		24.054						234177	\$97.72	0.001
2x222 39 15 2 38 157 311 225 113.72475 44956 11445857 01445867 020000002 000000087 200295891 10.807 0.952 5454 0.83 22769 103477 2222514 1554359 114657 70256 2.27			10																							0.275
1110.0 40 15 3 28 28 111 1038 95.00107 33447 3465112 3465112 37.000001 0.00000017 2702785577 3.725 0.268 1242 0.015 119872 6327604 127124 89870 598285 532401 16.92			15	2 38																	2212834			76585		0.385
	841110.0	40	15	3 28	28				23647	34652821		27.0060001	0.000000837	270228597	3.725					6322604	227124	89(570	\$96295		16.92	0.058
						105										0.052	4.751	0.210		1429156	299553	195,294	100/52	7109	5.90	0.170
	100000									desider.								-								

Figure 4.45: Data obtained difficulty 2 by clustering

After of having all the data tabulated, I summarized the data grouped by number of games and number of schemas solved on each game in order to graphic the results [figure 4.46].

TF1	TF2	TF3	TF4	TF5	TF6	TF7	TF8	TF9	TF10	TF11	TF12	TF13	TF14	TF15	TF16	TF17	games	time	exp
50172680	50172762	137	0.000054	2706551982	3	1	2	2	4078977	25716237	4086488	3615692	557126	429490	20	0	2	63818	135
23755726	23755725	46	0.000002	1069005601	10	0	10	0	5296140	32589900	5297785	4550938	175446	-26730	1	1	1	101088	45
138853298	138853315	37	0.000001	2493484902	35	0	20	0	4064469	21087999	4075046	2849736	365888	34190	2	2	2	165849	35
30114533	30114532	85	0.000003	2529613633	0	3	0	3	2657533	17307805	2664785	2449585	638857	580721	21	0	1	29068	84
51291573	51291751	180	0.000049	4015385903	7	2	6	5	7540793	47291885	7549928	6643843	1224202	977044	83	1	3	123579	177
93508348	93508355	93	0.000002	4191287672	15	0	9	0	10162864	64040734	10172377	8996781	507027	187401	- 4	1	2	159813	91
56765345	56765480	148	0.000023	3685057311	11	1	7	2	8266202	51713096	8273531	7255401	758391	481449	28	1	3	138471	145
14745048	14745047	67	0.000005	973168747	12	0	12	0	7785177	49792461	7786150	7002675	170785	-41373	1	2	1	106079	66
73606220	73606799	263	0.000050	7709237832	89	1	64	6	15189759	93838881	15204424	13164721	2490353	1929045	188	8	5	280654	258
135012485	135012518	106	0.000002	9268013298	7	1	- 4	1	8811558	55567806	8823612	7808652	970521	695335	11	0	2	137593	104
33376460	33376459	128	0.000004	4238794165	0	6	0	6	3516491	23448125	3525423	3331809	1161459	1109145	43	0	1	26157	127
96121548	96121808	112	0.000012	5392816923	194	1	98	- 4	6505935	33358497	6524597	4545392	2122834	1575910	136	9	5	273462	107
245368784	245369297	190	0.000036	12644955191	56	2	27	7	6951042	38899290	6986294	5421212	3394422	2957900	191	2	5	218261	185
77114905	77115165	224	0.000035	8458574968	104	7	51	26	18194738	115911740	18207429	16325600	2108102	1592970	706	- 4	4	257566	220
110012905	110013024	117	0.000010	5928222580	36	1	13	2	6439646	37887074	6456726	5280237	1173868	850970	29	1	4	161449	113

Figure 4.46: Summary obtained difficulty 2 by clustering

Data Graphically shows in this case that the number or schemas solved in one game of 2 seconds is 2 [figure 4.47].

This is the behaviour of players playing a game of difficulty 2 [figure 4.48].

The chosen formula have 2 picks with 2 and 3 schemas solved, in the other hand 4 and 5 schemas solved present a incremental behaviour [figure 4.49] [figure 4.50].

The following graph shows the relationship between games and points obtained by the new point system, Formula 3 the chosen one [figure 4.51].

The following image represents the relationship between games vs time Average: 149527 Total games: 15 [figure 4.52].

The following is a pivot table that shows points vs total of points for each game. the ? value means that the user did a mistake but the time was count for the test [figure 4.53].

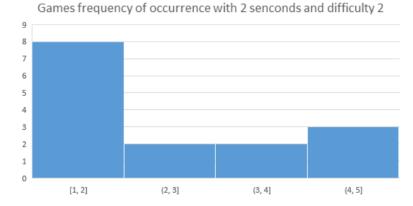


Figure 4.47: Games frequency of occurrence with 2 seconds and difficult 2

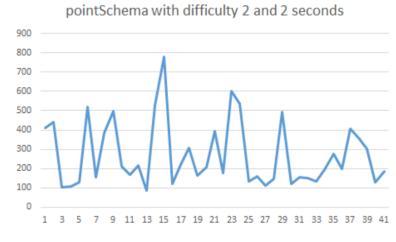


Figure 4.48: PointSchema with difficult 2 and 2 seconds

4 - Results

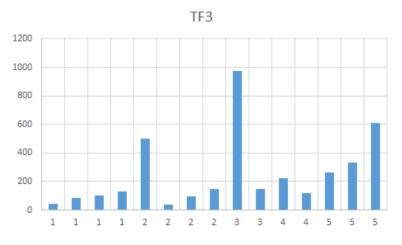


Figure 4.49: Formula 3 difficult 2

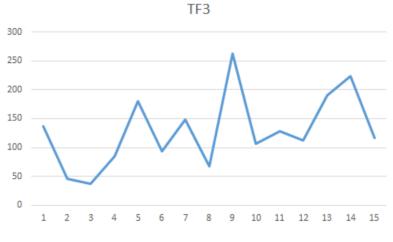


Figure 4.50: Formula 3 difficult 2 Line

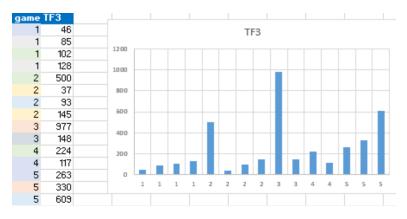


Figure 4.51: Games vs Formula 3 difficult 2

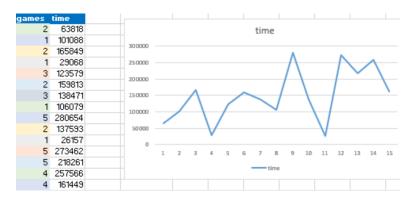


Figure 4.52: Games vs time difficult 2



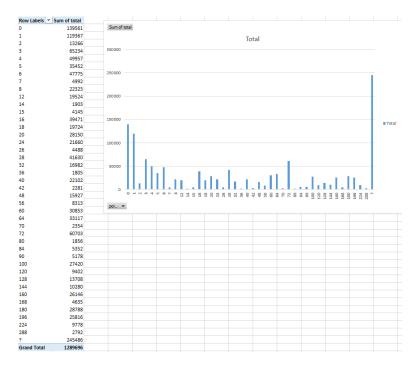


Figure 4.53: Sum of Total by points of difficult 2

4.3.3 Difficulty 3

The following table is the data obtained by playing on the difficulty 3 found by clustering [figure 4.54]. Each color represent the number of schemas done in 1 game. In this case the users played 22 games, but they had solve different number of schemas each time.

	10-68	game	exep	bonus p	ein/Sc w	eight	stanDer I	tine I		leenula Z 1	ormula 3			formula 6 fo		ormula 8 Te	rmula 3 I	censula 10	formula 11	formula 12	cenula 13	formula 14	formula 15	formula16	Tormula 17
9,8,5,5,4,2,0	1	1 1	17		T10	204	45.02	67667	43409362	43403361	13	0.0000004147		5	0.10	5	0.134	1504558	7793560	1500406	1053291	145563	22241	1.36	0.735
9,0,5,3,2,1,1	2	2 1	11	73	90		\$2.272	\$300	TH80044	1H000H3	12	0.0000010452		2	0.47	2	0.475	300533	1376821	305521	104337	70537	37901	3.33	0.300
3,3,7,6,4,3,1		3 1	- 4	111	203	1556	55.42	20405	W2226105	W2226104	5	0.0000000352	568904721	15	0.07	75	0.068	1042573	3236293	1053465	376542	135003	-47007	0.40	2.037
3384321		3 2	- 3	-40	143	393	68.853	65327	65465516	65465517	4	0.0000000754	392793067	-44	0.02	22	0.045	606305	1073591	633856	211705	107655	-24130	0.63	1,500
87,7,5,4,3,0	5	3 3	7	50	122	334	42,572	10517	17294888	17294833	8	0.0000005782	363192439	8	0.12	3	0.353	263244	1046358	275782	143285	199867	19833	7.42	0.135
8.6.4.4.3.2.0	6	4 1	6	-40	108	1036	48.198	66937	71410739	71419738	7	0.00000003900	428512393	75	0.09	11	0.090	324037	3405769	331289	420318	112433	-25381	0.63	1583
7.6.6.4.3.2.1	7	5 1	5	51	130		30.432	78394	10696772	10896771		0.0000005506		113	0.01	113	0.009	971367	3323187	972340	332390	83296	-73492	0.06	15.383
8.6.2.1.11.0	8	6 1	20	39	166	1278	101.73	104358	133158277	133158276	21	0.0000001577	2.6635+09	4	0.24	4	0.245	2859488	15382208	2968420	2096200	283144	74432	1,71	0.594
9555432	9	6 2	5	44	139	1278	S2.118	79263	101139595	101139598	6	0.0000000832	101E+09	25	0.04	12	0.080	384546	3362436	993478	414216	199620	10094	1.13	0.887
9854300 1	0	6 3	58	241	297	204	34.995	15358	10812091	10812200	57	0.0000054569	18165+09	1	0.86	0	2.566	975641	6135529	980569	875246	843676	812960	53.93	0.013
9864430	11	7 1	0		101	204	37.143	51274	64256897	64256896	1	0.0000000156	1	91274	0.00	91275	0.000	675133	675133	680061	4328	91274	-91274	0.00	51274.000
9887543 1	2	7 2	4	245	334	1481	52.314	60192	89144358	89144360	5	0.0000000673	713154817	20	0.05	10	0.098	688432	2133100	696859	261532	143158	22774	1.38	0.725
5654220 1	3	7 3	2	10	86	1276	101.76	16874	27658829	21658830	3	0.0000002303	129952945	20	0.05	7	0.150	163138	366666	172130	60759	70581	36633	3.76	0.317
7643100 1	4	8 1	3	10	120	135	32.831	106511	6222033	15222032	4	0.0000002628	45666088	262	0.00	262	0.004	1137855	3105053	1136628	329528	112452	-106570	0.03	37,221
5854000 1	5	8 2	6	8	113	204	101.73	55087	66341256	66341260	7	0.0000001195	003254577	45	0.02	23	0.044	1274533	4607665	1279461	580422	154267	-35907	0.62	1.607
5743320 1	6	8 3	26	124	210	1127	54.027	68702	TT432003	77432052	27	0.0000003745	6.045+03	7	0.14	2	0.434	2277272	12501104	2265231	1794721	603036	552892	3.12	0.110
7654331 1	7	6 A		15	105	135	55,101	37133	5161402	5161401	2	0.0000003587	20545242	1061	0.00	265	0.004	312057	534665	313040	41032	41032	-33234	0.11	3 520
2000740 1	i i	i 5		27	123	1401	00.227	12022	20610071	20612270	4	0.000000000000	303233445	×.	0.06	3	0.313	152052	4005555	162413	33626	101450	HEOL	11.17	0.030
6554210 1	3	2 1	46	201	270	129	29,253	158.04	10540973	10540372	47	0.0000044588	404082597	12	0.00	12	0.004	4040945	24979029	4043010	2602677	1202832	-30736	0.53	1682
36422212	0 1	0 1	7	40	127	1276	88,771	86322	10245132	10245131		0.0000000725	77171506.9	10	0.10	10	0.103	1266475	4072224	1253400	613777	142275	-23023	0.72	1.301
87.6.6.5.4.1 2	i i	0 2	ò		62	334	105.05	20191	10050336	1005032M	i.	0.0000001051	1	40382	0.00	20193	0.000	151090	151060	157538	13076	20191	-20101	0.00	20191.000
3755310 2	2		8	20	96	1227	36,753	75931	86333556	86333555	3	0.0000001042	6906683777	8	0.12	8	0.120	1169643	4814331	1177602	615466	139662	-12200	0.84	1.191
9755510 2	ā ·	5 2	. é	44	98	1227		9719	1050513	11050519	â	0.0000009049	175909043	2	0.47		0.936	151940	616352	159799	33729	137122	117684	13.11	0.076
9.8.6.6.4.2 2	4 1	2 1	1	31	71	\$17	102.87	3696	36464294	36464293	2	0.0000000548	36464293	41	0.02	41	0.024	327406	560902	333965	45492	45432	-32350	0.17	5.926
9.9.8.5.4.3.1 2		8 1	0	22	26		88.544	63200	62757601	62757600	1	0.000000059	1	63200	0.00	63201	0.000	467331	467981	474932	6951	63200	-63200	0.00	63200.000
9.6.6.5.4.3.1 2		i i	28	391	402	1228	78.9	1009	14047513	14047512	29	0.0000020644	393329553	0	3.25	0	3.245	390874	2240386	399806	317391	261312	239294	22.73	0.044
8.6.6.5.4.1 2		6 1		17	90	334	112	11119	FROMBOR	68311827		0.0000000293		78	0.01	78	0.013	614501	1053335	621039	79684	79684	-66594	0.09	11,172
7.7.7.5.4.2.1 2		ē 2	50	415	491	235	55.32	28583	FRIDE?	6811105		0.0000076347			0.20	2	0.405	1663777	10358677	1665422	1452803	133852	135886	5.63	0.176
56554312		8 1		114	190	1228	55.437	65255	83270494	83270493	10	0.0000001201			0.75	6	0.176	1070803	4534735	1079741	596330	145714	15136	123	0.811
5873200 3		7 1	80	128	170	937		10468	55075577	55075576	61	0.0000005415		2	0.58	2	0.554	6838770	43367250	6845329	6095082	435451	232515	3.88	0.258
5873200 3		7 7			171	937		11226	T3064163	73084136		0.0000005051	5 1957+05		0.21	2	0.420	3308136	DESTING	337635	2743307	537387	361301	5.83	0.170
38776533			22	730	776	1401	25.42	43423	64303406	64303N85	23	0.0000003576	14757+03	1	0.75	1	0.750	1277642	7000478	1200003	965836	271660	104014	5.26	0.130
6321000 3			25	22	122	445	119.77	23322	10401540	10401664	27	0.0000025313		- i	0.25		0.497	779592	4417024	702716	612000	105050	139216	6.97	0.143
26665313			23	540	632	1127		00016	94730322	94730321	30	0.0000003167		1	0.40	1	0.396	3032321	17522012	2010007	2424337	214241	147700	2.77	0.361
3387521 3				733	000		43,505	20643	329433390	32343443	56	0.0000017302			0.50	1	1153	2474251	2557141	2400760	2132405	673010	600633	85	0.062
3.8.7.6.4.42 3			100	2364	2438	305		30691	30285736	30295725	101	0.0000002344		1	1.05		1051	10062373	66276973	10063258	3376734	783330	596548	7.37	0.135
8843210 3	7 2			54	89		27.905	43238	45968297	45999239	4	0.00000000000		25	0.03	10	0.057	513404	1000668	519942	160812	89499	-3968	0.80	1254
9.8.7.7.7.4.3 3		1 1	41	828	928			10006		MEE27307	42	0.0000002954			0.61	2	0.613	4732293	29147764	4802655	4063336	524356	326344	4.30	0.233
3.6.4.3.3.2.1 3			21	262	353	1278	8169	70190	R9562473	89562502	32	0.0000003685			0.28	-	0.555	2697090	15752420	2706012	2193983	624203	483823	7.89	0.127
9.9.9.8.7,4.3 4	0 2		29	688	782	866	27.3	94397	60969470	62969431		0.0000004772			0.20	ć	0.205	3439694	19860762	3440346	2742389	223903	4105	143	0.697
7.7.5.4.3.2.1 4			42	414	494	235	34.717	59555	12585469	12585509		0.0000034981		2	0.09	2	0.205	2645501	10000102	2647146	2252310	132045	84935	2.59	0.387
5.85.4.11.1 4			41		339	230	57.61	53000	150390	150459		0.0000382497			5.69	2	12 621	2040001	453144	264796	82081	609081	6048330 604833	370.52	0.007
0,0,0,4,0,0	4 4	2 3		201	333	204	21.01	6.04	160300	100403	42	0.0000382437	141421323	0	5.00	0	12.621	01100	403 M4	00,00	02001	000001	604013	370.52	0.003

Figure 4.54: Data obtained difficulty 3 by clustering

After of having all the data tabulated, I summarized the data grouped by number of games and number of schemas solved on each game in order to graphic the results [figure 4.55].

TF1	TE2	TE:	TF4	TF5	TF6	TF7	TF8	TF9	TF10	TF11	TF12	TF13	TF14	TF15	TF16	TE17	games	time	exp
43409362	43409361	18	4.14657E-07	737958849		0.19	5.152	0.194	1504558	7793980	1509486	1053291	145563	22241	1	0.735	1	61661	17
11480844	11480843	12	1.04522E-06	126289153	2.106	0.47	2.106	0.475	300592.7	1376921	305521	184397	70597	37981	3	0.300	1	16308	11
224986589	224986600	17	6.89737E-07	1324890227	67.43	0.21	39.64	0.466	1998722	6156842	2023103	737531	398524	46826	9	3.811	3	175849	14
		11													3		3		14
71418739	71418738	- 7	9.80135E-08	428512393	11.09	0.09	11.09	0.09	924037.4	3405769	931289	420918	112493	-25381	1	1.583	1	68937	6
10896772	10896771	6	5.50622E-07	54483831	112.6	0.01	112.6	0.009	971366.7	3323187	972340	392980	83296	-73492	0	15.989	1	78394	5
245109963	245110074	84	5.6838E-06	5490982379	30.1	1.14	16.9	2.891	4819675	24880573	4842467	3385662	1E+06	897486	57	1.489	3	198977	81
175060084	175060086	9	3.13722E-07	843107763	91314	0.1	91292	0.249	1526823	3175119	1551050	327218	305012	-31868	5	91275.042	3	168440	6
185376755	185376813	44	2.11349E-06	7218600433	1391	0.24	555.2	0.805	5153779	21645433	5178979	2839330	1E+06	518786	21	48.547	5	323756	39
10540973	10540972	47	4.45881E-06	484882597	11.86	0.08	11.86	0.084	4048845	24979029	4049818	3489677	120932	-30736	1	1.682	1	75834	46
129103528	129103525	9	1.78619E-07	771715870	40392	0.1	20203	0.103	1395536	5024294	1411006	626853	169166	-44014	1	20192.381	2	106590	7
97384069	97384074	18	1.00918E-06	867476426	10.48	0.59	9.416	1.055	1321484	5432684	1337402	709195	276784	105484	14	1.268	2	85650	16
36464294	36464293	2	5.48482E-08	36464293	41.49	0.02	41.49	0.024	327405.5	560901.5	333965	45482.4	45482	-32350	0	5.926	1	38916	1
62757601	62757600	1	1.59343E-08	1	63200	0	63201	0	467981.3	467981.3	474932	6951	63200	-63200	0	63200.000	1	63200	0
14047513	14047512	29	2.06443E-06	393329553	0.308	3.25	0.308	3.245	390874.1	2240386	399806	317391	261312	239294	23	0.044	1	11009	28
75122885	75122932	53	7.66398E-06	749412328	83.16	0.22	80.69	0.418	2278278	11412012	2286461	1532494	273537	69293	6	11.348	2	102122	51
83270494	83270493	10	1.20091E-07	749434357	5.682	0.18	5.682	0.176	1070809	4594795	1079741	596330	145714	15196	1	0.811	1	65259	9
168159740	168159772	97	1.14786E-06	1.082E+10	6.561	0.76	4.183	0.974	10146905	63054965	1E+07	8838389	1E+06	673906	10	0.427	2	179466	95
74711126	74711149	50	3.04954E-06	1955692012	5.355	1	3.344	1.247	2057234	11427302	2070723	1578644	457518	324028	12	0.334	2	66745	48
127673712	127673764	86	2.04693E-06	6370945100	4.261	0.97	3.394	1.549	5507879	33087053	5521655	4616743	994261	748343	19	0.423	2	122959	84
138274033	138274033	105	1.20315E-06	9504493254	36.08	1.08	18.52	1.108	10575777	67676661	1.1E+07	9537546	872418	586560	8	1.390	2	142929	103
236190401	236190429	74	6.54897E-07	1.1565E+10	5.179	0.9	3.405	1.177	7489368	44900184	7508667	6263899	1E+06	810167	12	0.359	2	169196	72
76604281	76604399	115	4.2223E-05	3021850689	15.91	6.18	10.37	18.01	6162364	36485266	6173599	5077381	1E+06	730764	375	1.087	3	149586	112

Figure 4.55: Summary obtained difficulty 3 by clustering

Data Graphically shows in this case that the number or schemas solved in one game of 2 seconds is 2 [figure 4.56].

This is the behaviour of players playing a game of difficulty 3 [figure 4.57].

The chosen formula have a non exponential or sequential behaviour. [figure 4.58] [figure 4.59].

The following graph shows the relationship between games and points obtained by the new point system, Formula 3 the chosen one [figure 4.60].

The following image represents the relationship between games vs time Average: 2471783 Total games: 22 [figure 4.61].

The following is a pivot table that shows points vs total of points for each game. the ? value means that the user did a mistake but the time was count for the test [figure 4.62].

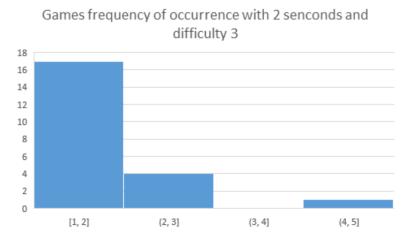


Figure 4.56: Games frequency of occurrence with 2 seconds and difficult 3

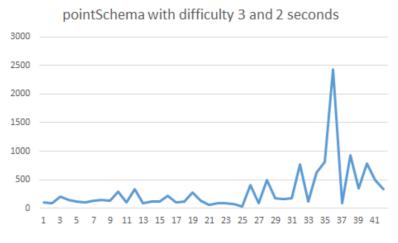


Figure 4.57: PointSchema with difficult 3 and 2 seconds

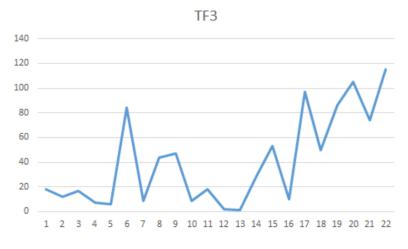


Figure 4.58: Formula 3 difficult 3 Line

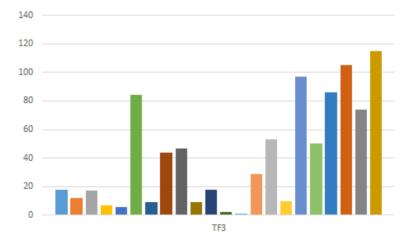


Figure 4.59: Formula 3 difficult 3

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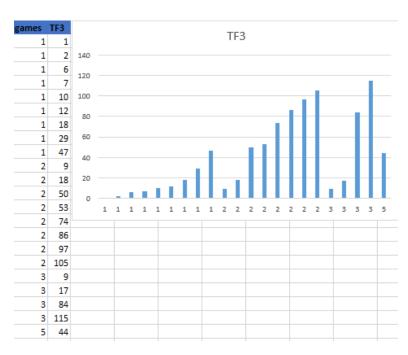


Figure 4.60: Games vs Formula 3 difficult 3

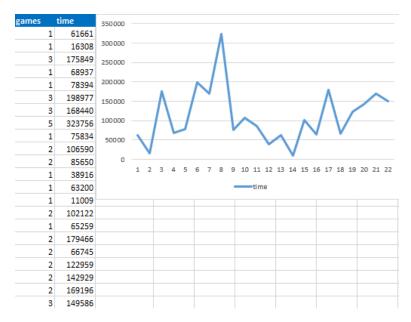


Figure 4.61: Games vs time difficult 3

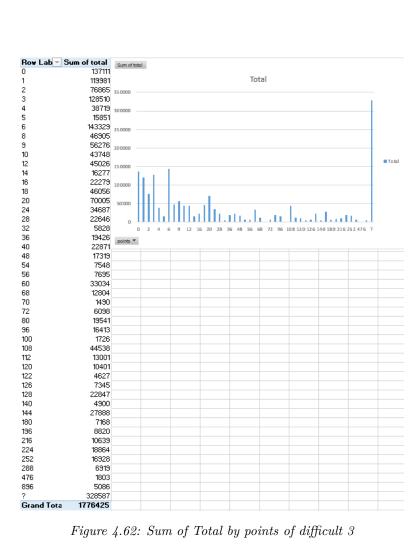


Figure 4.62: Sum of Total by points of difficult 3

4.3.4 Difficulty 4

The following table is the data obtained by playing on the difficulty 4 found by clustering [figure 4.63]. Each color represent the number of schemas done in 1 game. In this case the users played 19 games, but they had solve different number of schemas each time.

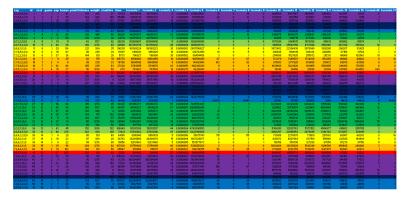


Figure 4.63: Data obtained difficulty 4 by clustering

After of having all the data tabulated, I summarized the data grouped by number of games and number of schemas solved on each game in order to graphic the results [figure 4.64].

																		games		
25675832	256758354	33	4.0971167	E-07	5632266885	52	0.199985	31	0.427065	4146747	17896725	4168755	2338287	789613	289291	7	3.221089	3	250161	25
7388908	73889094	11	1.4593986	E-06	314559676	115	0.055136	69	0.06595	1490666	5168054	1498590	621876	155123	-82119	1	6.509045	2	118621	11
9986982	99869821	4	4.0052140	80-3I	299609455	38	0.026205	38	0.026204	1111805	3036491	1118343	327341	126563	-87291	0	5.445134	1	106927	5
12682944	126829448	30	6.1660445	E-07	1964496470	27	0.158037	19	0.217184	3785586	19212990	3797640	2592427	340014	12136	2	2.044738	2	163939	28
20595538	205955428	56	5.5228099	E-07	10121221774	11	0.472569	9	0.819116	5735305	32533321	5752196	4492558	1037242	694768	11	1.235727	2	171237	54
10432496	104325046	84	5.4584885	iE-05	3094924936	17	0.653189	10	1.350199	4523991	25901481	4533147	3576261	477375	217733	23	0.97123	3	129821	81
4600820	46008327	74.00003	3.3026078	E-05	1455542434	242	5.828923	153	23.01151	4467530	21465308	4479297	2871938	887563	446621	646	15.53798	4	220471	70
4738665	47386656	41	1.0340474	E-06	2274557185	5	0.201489	5	0.201487	5885422	36484846	5888544	5103381	256459	43963	1	0.707322	1	106248	48
27891702	278917043	- 49	5.4690299	E-07	6681761623	43	0.356483	20	0.505576	6374543	32935055	6397265	4474930	797526	272166	6	1.535706		262680	46
12168107	121681132	58	1.9650205	IE-06	3719275933	39	0.510918	33	1.343747	5223328	28189678	5241745	3870404	749016	372902	26	4.275844	3	188057	55
2688052	26880524	63	3.2291445	E-06	1432725180	28878	2.265548	14441	2.265458	1827874	11031676	1836057	1544246	438855	359683	16	14439.06	2	39586	61
34241565	342416171	266	1.3583424	E-05	34419025264	99	1.685508	23	4.381462	20347811	125493797	20388502	17676682	4958625	4200209	128	0.975624	7	379208	259
17792247	177922513	93	1.1086067	E-06	10965081742	6	0.715112	- 4	1.011712	9233257	56685295	9247047	7929659	1092860	735120	11	0.461347	2	178870	89
5795506	57955077	2	1.5480715	80-3i	1203383191	127	0.346509	120	0.853327	1680246	6717642	1696689	880574	407287	181319	15	16.66337	3	112984	22
14670217	146702190	60	2.5956140	E-06	5712271376	52	0.481646	27	0.501786	6733409	39437987	6743314	5462070	559128	212374	4	2.075323	2	173377	58
308114	3081141	61	2.2070219	E-05	206431959	2	0.420129	2	0.42011	1649047	10559779	1650020	1486590	87852	43520	3	0.337448	1	22166	67
22407823	224078458	125	8.3254835	80-3I	10165651508	260	0.374928	82	1.32936	10745874	59443338	10773062	8214192	1753197	1045187	41	5.268389	6	354005	119
8583367	85833669		4.6601760	80-3	257500999	33	0.03049	33	0.030489	955678	2609860	962216	282257	111535	-72263	0	4.67985		91899	3

Figure 4.64: Summary obtained difficulty 4 by clustering

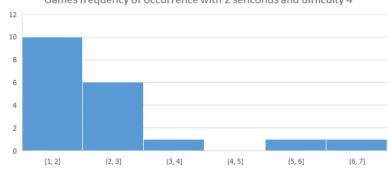
Data graphically shows in this case that the number or schemas solved in one game of 2 but in order to let players play we will take in count as maximum 3 in 2 seconds [figure 4.65].

This is the behaviour of players playing a game of difficulty 4 [figure 4.66].

The chosen formula have a non exponential or sequential behaviour but has a pick which means that the user was enthusiastic and it could solve some schemas with good score and good speed [figure 4.67] [figure 4.68].

The following graph shows the relationship between games and points obtained by the new point system, Formula 3 the chosen one [figure 4.69].

The following image represents the relationship between games vs time Average: 171705 Total games: 19 [figure 4.70].



Games frequency of occurrence with 2 senconds and difficulty 4

Figure 4.65: Games frequency of occurrence with 2 seconds and difficult 4

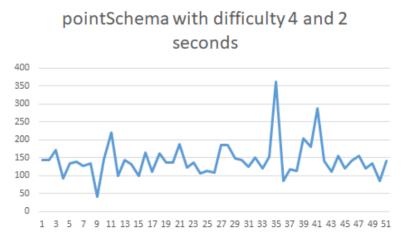


Figure 4.66: PointSchema with difficult 4 and 2 seconds

The following is a pivot table that shows points vs total of points for each game. the ? value means that the user did a mistake but the time was count for the test [figure 4.71].



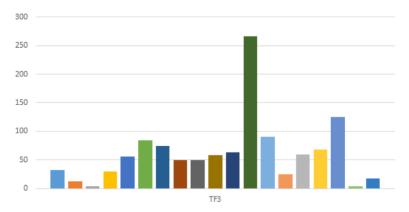


Figure 4.67: Formula 3 difficult 4

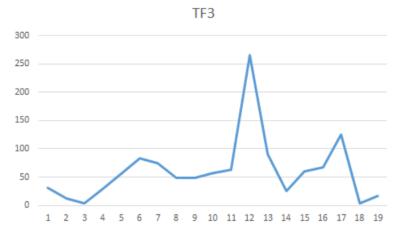


Figure 4.68: Formula 3 difficult 4 Line

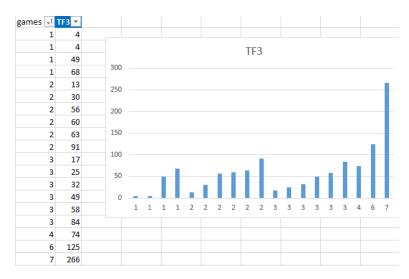


Figure 4.69: Games vs Formula 3 difficult 4

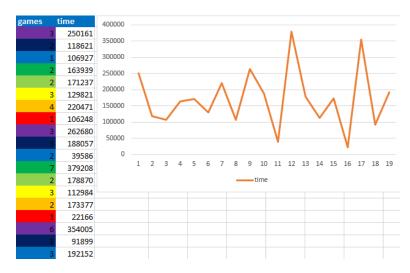


Figure 4.70: Games vs time difficult 4

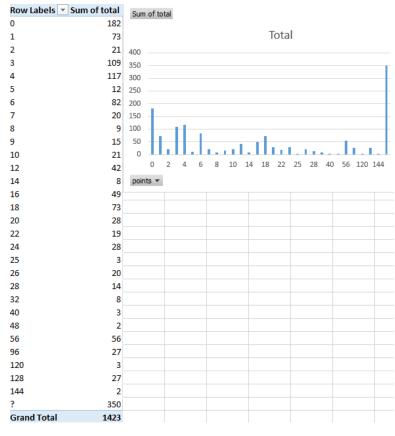


Figure 4.71: Sum of Total by points of difficult 4

4.3.5 Difficulty 5

The following table is the data obtained by playing on the difficulty 5 found by clustering [figure 4.72]. Each color represent the number of schemas done in 1 game. In this case the users played 25 games, but they had solve different number of schemas each time.

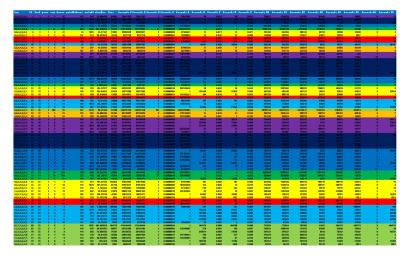


Figure 4.72: Data obtained difficulty 5 by clustering

After of having all the data tabulated, I summarized the data grouped by number of games and number of schemas solved on each game in order to graphic the results [figure 4.73].

TF1	TF2	TF3	TF4		TFS 1	TFG TF7	1	F8	TF9	TF10	TF11	TF12	TF13	TF14	TF15	TF16	TF17	games	ti	me	exp
79017336	79017335		2	0	79017335	90	0	90	0	710657	1218263	717195	91146	91146	-78056		0 :	3	1	84601	1
31462171	31462168		6	0	123536642	1219	0	633	0	836314	2584474	846163	308120	85330	-61526		0 59	4	2	73428	- 4
43126661	43126660		5	0	172506625	7	0	7		405140	1256324	413652	150406	69544	-1388		1	1	1	35466	- 4
159743963	159743962		15	0	2236415273	4	0	4		2090128	10292140	2101580	1378557	258074	62788		2	1	1	97643	14
40241038	40241037		6	0	92997476	38	0	26		408485	927857	419727	101411	72949	-13613		2	3	2	43281	- 4
43848228	43848227		5	0	94173092	805	0	592	0	1646756	3271808	1650011	275505	193555	-178685		0 6	9	2	186120	3
25084588	25084587		1	0	1	48147	0	48148		356282	356282	359929	3647	48147	-48147		0 4814	7	1	48147	0
38388672	38388671		7	0	124226239	106	0	66		755674	1948000	762282	207725	97422	-52982		1	7	2	75202	5
33788071	33788070		9	0	163271166	9	1	8	1	422714	1398356	440249	191401	111166	41874		4	1	2	34646	7
339463898	339463929		25	0	2242872460	135518	0	27184		3594269	9766739	3631796	1149033	662382	-27384		3 2703	5	6	344883	19
181786980	181786978		4	0	257911350	246	0	169	0	1472276	2523086	1486738	196563	196563	-153707		0 1	9	2	175135	2
3487102	3487101		9	0	27896745	23	0	23		386204	1590380	387177	201728	32930	-17244		0	3	1	25087	8
134126558	134126556		10	0	447997668	130233	0	65111	0	1845352	4698898	1860178	504042	236575	-133081		1 6505	9	3	184828	7
13681563	13681562		9	0	109452433	2	1	2	1	213023	874367	219974	117234	69445	41889		4	0		13778	8
84508849	84508845		6	0	178223587	64605	0	21667	0	1154266	2048458	1169274	180897	167300	-103556		1 2149	0	3	135428	3
146432149	146432148		101	0	14643204801	1	2	1	2	10107725	66572525	10118617	9422431	1184047	995831		2	0	1	94108	100
111722509	111722509		7	0	311301672	66	0	59	0	1135013	2686367	1148502	279036	173039	-63401		2	8	2	118220	5
166829583	166829590		12	0	402056035	420237	0	230884		2337761	3752945	2361365	314834	380630	-185240		4 23084	7	5	282935	7
202386576	202386587		17	0	1058346605	311	0	212	1	2398307	5771969	2429996	659792	480492	-12700		11 :	5	5	246596	12
291782195	291782196		16	0	1217174019	267532	0	133003	1	3312960	6169662	3354274	652920	627311	-133705		9 13276	3	7	380508	9
81815073	81815078		33	0	1523882439	43318	0	14446	0	2373803	11671235	2387537	1574441	334103	111961		5 1443	6	3	111071	30
260018482	260018473		12	0	765053123	95994	0	19120	0	2729898	5014284	2764380	499957	415128	-216114		2 1867	6	6	315621	6
87379987	87379985		4	0	142315216	380	0	343		1219229	2089271	1230016	164321	164321	-125693		0 4	6	2	145007	2
201890925	201890909		8	0	31880394	640107	0	209217	0	2436685	3066427	2466323	215250	345921	-280945		8 20857	9	6	313433	2
326571349	326571329		10	0	354000583	450178	0	198794	0	3035043	4143285	3072262	318072	428786	-337560		1 19848	2	7	383173	3

Figure 4.73: Summary obtained difficulty 5 by clustering

Data graphically shows in this case that the number or schemas solved in one game of 2 but in order to let players play we will take in count as maximum 6 in 2 seconds [figure 4.74].

This is the behaviour of players playing a game of difficulty 5 [figure 4.75].

The chosen formula have a pick which means that the user was enthusiastic and it could solve some schemas with good score and good speed [figure 4.76] [figure 4.77].

4 - Results

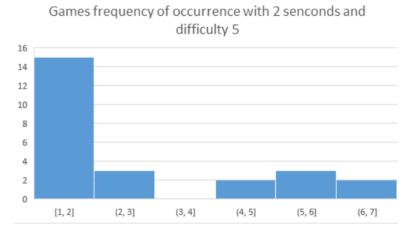


Figure 4.74: Games frequency of occurrence with 2 seconds and difficult 5

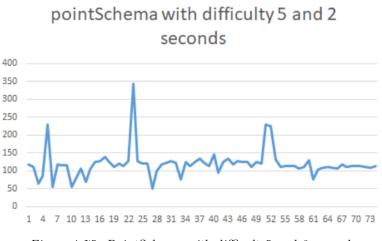


Figure 4.75: PointSchema with difficult 5 and 2 seconds

The following graph shows the relationship between games and points obtained by the new point system, Formula 3 the chosen one [figure 4.78].

The following image represents the relationship between games vs time Average: 157933 Total games: 25 [figure 4.79].

The following is a pivot table that shows points vs total of points for each game. the ? value means that the user did a mistake but the time was count for the test [figure 4.80].

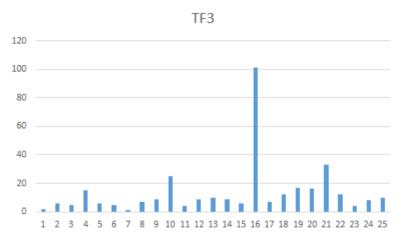


Figure 4.76: Formula 3 difficult 5

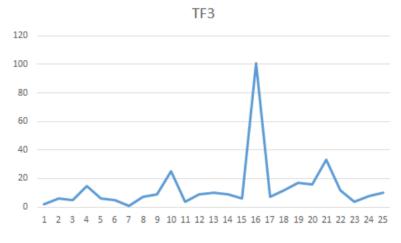


Figure 4.77: Formula 3 difficult 5 Line

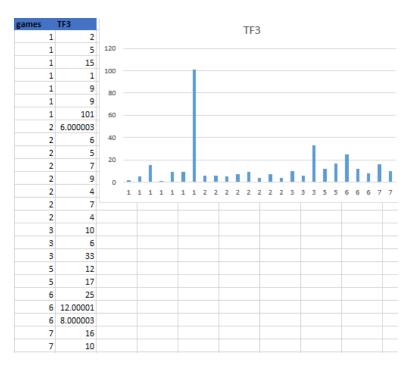


Figure 4.78: Games vs Formula 3 difficult 5

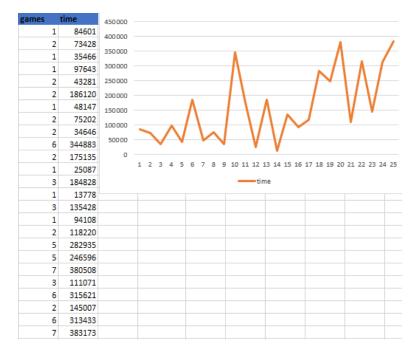


Figure 4.79: Games vs time difficult 5

Row Labels 🔻	Sum of total	Sum of total
0	336153	
1	120061	Total
2	91696	600000
3	457470	500000
4	116474	
5	18325	400000
6	106732	300000
7	4077	200000
8	56029	100000
9	54561	
10	20609	0
12	55473	0 2 4 6 8 10 14 16 20 30 40 96 ?
14	60265	points 💌
15	4120	
16	67522	
18	29168	
20	37653	
24	3382	
30	4131	
32	5574	
40	6158	
72	11604	
96	2506	
144	10057	
?	528826	
Grand Total	2208626	

Figure 4.80: Sum of Total by points of difficult 5

4.3.6 Difficulty 6

The following table is the data obtained by playing on the difficulty 6 found by clustering [figure 4.81]. Each color represent the number of schemas done in 1 game. In this case the users played 11 games, but they had solve different number of schemas each time.

																		785990	785990		4662				
																				2914788					
							49.5523		42971086				42971085		0.004			\$25350		828409	101398	101398	-95266		
	4				18 110		95,7595	69944					140307665	159	0.007	70		588770		595791	85993	83993	-55895		
.8,8,8,6,6,5	9	4		4	49 128		54.618	79010	97577355	97577554	5	0.00000005	590509401	16	0.053	16	0.065	900084	2797524	929729	524715	115620	-44400	0	
	10	4		5		0 00	49.2995	61805	37514428	37514451		0.00000019		41		20	0.049	705855	2620985	771144	517550	104550	19276		
		4	8	8	53 147	32	110.998	35606	11465138	11465141	. 4	0.00000052	103186189	110	0.009	87	0.027	370879	1011787	373133	118602	55914	-15258		
9.622.22		4	4	3	29 133		98.2757		80482047				365784481		0.060	- 4		209746	\$61366	220638	102860	150316	111136		
7,5,5,5,5,3	13	5	1		12 116		00.4316		52833825			0.00000004	52833824	202	0.005	202	0.005	867881	1488239	871458	106977	106977	-99809	٥	25
9,7,7,7,7,5	14	5	2		12 122		98,9118		64429770			0.00000005	1	187024	0.000	93514	0.000	092343	692545	097166	9545	95512	-93512	0	93512
A,3,3,3,3,3,2	15	5	5		16 123		33.1142		71495806			0.00000006	214487407	275	0.004	92	0.011	682671	1169037	688845	99590	99590	-62552	0	
AAAAA2	28	5	4	6	47 150		54.0269	45657	49091655	49091649		0.00000020	1178199001	25	0.039		0.155	555755	2159690	596655	293566	252681	145407	4	
	18																								
																							\$4217		
		6			62 266		5 47,4600					0.00000068		4	0.164						527191		944943	19	
4,2,1,1,1,1	22	7			15 118		94,5164		78955788			0.00000013	710601985	15	0.067	15	0.067	1655978	7257256	1091054	950706	151258	-54356	0	
87,7,7,7,8	23		2				80,9441		67216130			0.00000003		175042	0.000	87528	0.000	648234	648284	653610	10752	87521	-87521	0	87521
666643	24	2	3	2	15 120		53.4337		\$9273103			0.000000028	355638589	133	0.008	44	0.023	682794	1552326	688520	162115	106832	-38090	0	
9,9,4,5,5,2	25		1	3	45 147	- 75	105.847	101936	77369428	77169427	· •	0.00000005	232108273	-45	0.022	45	0.022	1059778	2894626	1065091	311143	117897	-85975	0	
7,7,5,5,3,2	26	4	2		59 145		41.5172		48715178			0.00000000	292291039	104	0.010	52	0.019	905495	2475159	910406	269289	110647	-63647	0	
.6,4,4,3,3,3	27	8	5	3	25 102				34175135			0.00000018	307576162	58	0.017	19	0.052	454007	1265945	499390	149494	92920	4028	1	
9,9,8,1,1,1	28	8	4 1		95 789		109.255	17729	5939319	5959615	202		2375686001	2	0.472	1	1.889	1905241		1997586	1785019	958468	921010	55	
99.6533	29	8	5		47 149		125.618	0	6	5	. 2	6.00000000	1	0	825.000	0	\$4,167	1625	1625	3900	11882	11382	11382	11382	
8,8,5,5,5,4	30		1	0	18 90		96,7593		62458542			0.00000002		61657	0.000	61658	0.000	456600	456600	463691	7091	61657	-61657	0	61657
									68701131									956295			210383		-93479		
															0.393					385419	136508				

Figure 4.81: Data obtained difficulty 6 by clustering

After of having all the data tabulated, I summarized the data grouped by number of games and number of schemas solved on each game in order to graphic the results [figure 4.82].

TF1	TF2	TF3	TF4		IFS	TF6	TF7	TF8	TF9	TE	10	TF11	TF12	TF13	TF14	TF15	TF16	TF17	games	time	exp
127996632	127996654		27	0	2860639602	106293		0 10628	Э	0	3696319	17168719	3705440	2259165	419233	27037		2 106282		2 196098	25
87654851	87654855		28	0	754147416	270		0 13	5	0	3160100	14134460	3179154	1884978	334622	-23496	13	2 11		179055	24
113124921	113124919		4	0	183278750	364		0 29	1	0	1414120	2423776	1424200	185392	185392	-151160		37		2 168276	2
177038968	177038978		19	0	1234424282	184		0 7	7	0	2248603	6992461	2274643	858227	424180	32162	4	3 6		4 196009	15
237851036	237851046		12	0	1445520233	187527		9381	\$	0	2831654	5509310	2854103	509580	532761	-110445		93545		4 321603	8
216500439	216500583		57	0	7026783821	184700		9236	5	1	5291633	21248309	5314824	2737607	1571988	862540	33	92274		354724	52
205445019	205445017		14	0	1066240575	175190		0 8758	2	0	3016706	9437816	3033184	1103572	345610	-179968		87525		3 262785	11
166199066	166199364		120	6	3207661476	209	32	6 11	5	56	4337144	19177976	4356373	2524328	1289305	786799	1143	7 11		5 251253	110
62458542	62458541		1	0	1	61657		6165	3	0	456600	456600	463691	7091	61657	-61657		61657		61657	0
130627391	130627423		39	0	4472237868	80		0 7	9	1	3585444	17785206	3597141	2385618	665682	336508		3 11		2 164587	37
75901397	75901404		23	0	1156159053	18		0 1	5	1	1873936	8534518	1889119	1137167	375610	169902	1	1 2		102854	21

Figure 4.82: Summary obtained difficulty 6 by clustering

Data graphically shows in this case that the number or schemas solved in one game is 3 in 2 seconds [figure 4.83].

This is the behaviour of players playing a game of difficulty 6 [figure 4.84].

The chosen formula have 2 pick which means that the user was enthusiastic and it could solve some schemas with good score and good speed [figure 4.85] [figure 4.86].

The following graph shows the relationship between games and points obtained by the new point system, Formula 3 the chosen one [figure 4.87].

The following image represents the relationship between games vs time Average: 20535 Total games: 11 [figure 4.88].

The following is a pivot table that shows points vs total of points for each game. the ? value means that the user did a mistake but the time was count for the test [figure 4.89].

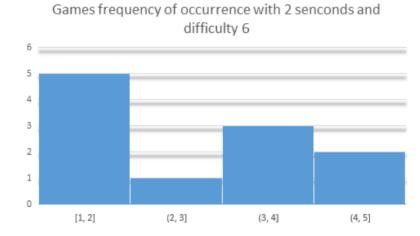


Figure 4.83: Games frequency of occurrence with 2 seconds and difficult 6

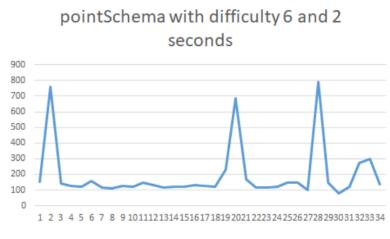


Figure 4.84: PointSchema with difficult 6 and 2 seconds



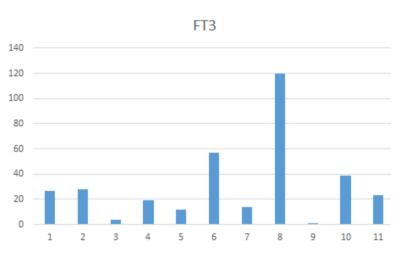


Figure 4.85: Formula 3 difficult 6

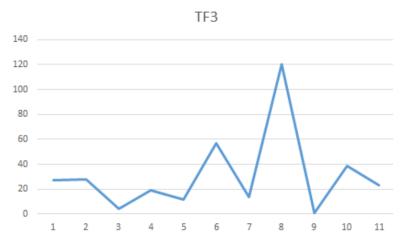


Figure 4.86: Formula 3 difficult 6 Line

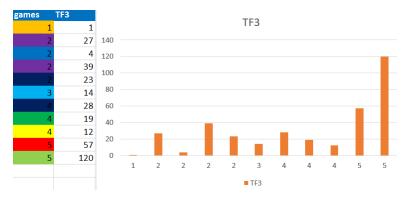


Figure 4.87: Games vs Formula 3 difficult 6

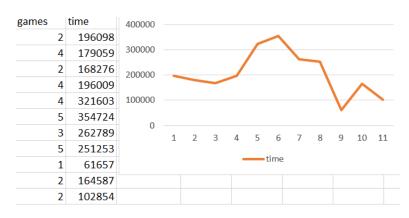


Figure 4.88: Games vs time difficult 6

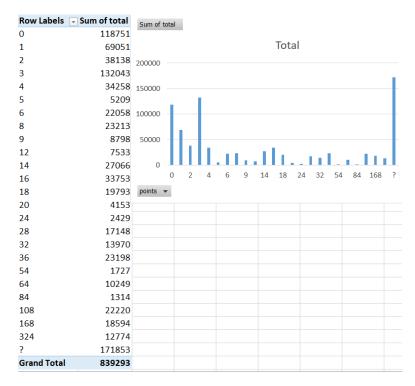


Figure 4.89: Sum of Total by points of difficult 6

4.3.7 Difficulty 7

The following table is the data obtained by playing on the difficulty 7 found by clustering [figure 4.90]. Each color represent the number of schemas done in 1 game. In this case the users played 36 games, but they had solve different number of schemas each time.

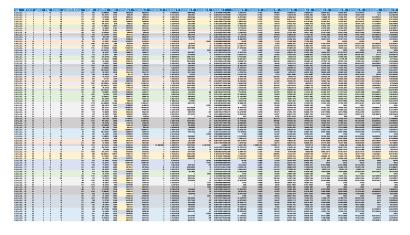


Figure 4.90: Data obtained difficulty 7 by clustering

After of having all the data tabulated, I summarized the data grouped by number of games and number of schemas solved on each game in order to graphic the results [figure 4.91].

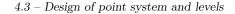
														1115		games			
77735949	77735953	22	1.18158E-06	1019776320	21	0.2338125	13	0.3021171	1810237	8445259	1819743	1118458.8	221783	31604.78112	3	1	2	95089	
20858255	20858254	20	9.58854E-07	396306466	17	0.0592313	17	0.0592306	2158800.6	11483659	2160585.6	1556068.4	115852	-47741.60793	0	2	1	81797	
121269512	121269533	39	2.16385E-06	2218276533	21	0.5361841	11	0.9951669	2739448.2	13557748	2757298.2	1835887	478429	226233.005	16	1	3	126098	
67403106	67403127	31	1.893598-06	980862058	20	0.3974115	19	0.7372113	1784612.7	7963167	1793824.7	1043749.3	335458	131674.2826	10	3	2	101892	
33481357	33481356	14	4.18143E-07	435257460	2	0.4223724	2	0.4223593	655552.09	3159430	662853.09	424710.05	127110	62908.05773	3	0	1	32101	
5009969	5009958	8	1.42603E-06	39269728	4	0.2426505	4	0.2426315	183454.18	717766	186571.18	92185.723	34352	8939.723393	2	1	1	12721	
40625655	40625654	11	2.70765E-07	406256441	11	0.0697981	11	0.0897968	1170209.3	5205869	1174437.3	676911.89	109615	-24907.10944	1	2	1	67261	
93828494	93828493	. 9	9.591972-08	750627881	10	0.0981634	10	0.0981623	1346769	5544129	1354280	707130.11	147592	-27297.88755	1	1	1	87445	
25598563	25598562	3	1.17194E-07	51197121	13	0.0768813	13	0.0768784	243276.59	552937	250220.59	58568.778	39708	-11902.22189	1	2	1	25805	
89124399	89124398	4	6.11286E-07	26704178	104371	0.178931	104369	0.3577156	\$31483.19	904779	844064.19	33062.778	141092	-79854.22189	5	104365	2	110473	
64505925	64505924	3	4.65074E-08	129011845	73	0.0136287	73	0.0136285	914161.82	2081690	918802.82	199243.78	106591	-87997.22189	0	10	1	97294	
121604730	121604729	5	4.11168E-08	486418901	23	0.0431237	23	0.0431233	1210719.7	3759640	1218734.7	432864.56	138295	-74115.44378	0	3	1	105205	
101896331	101896366	25	3.50789E-06	640237371	69601	0.6176278	69583	1.8243232	1250605.1	3089449	1267524.1	340838.56	476359	222132 5592	38	69564	3	127113	
116273524	116273539	67	1.17586E-06	4817356706	21	2.2948531	10	2.3446363	4505664.8	25415545	4521253.8	3505046.3	826952	551440.2886	17	1	2	137756	
110562944	110562945	32	6.16393E-07	2540109216	38	0.3604189	20	0.3892862	3246434.7	17356431	3257641.7	2366720.7	347143	105528.6717	3	2	2	120807	
75993086	75993085	7	9.21137E-08	455958475	11	0.0909014	11	0.0909001	949326.12	3496954	956837.12	432493.33	115933	-25712.66566	1	2	1	70823	
137343250	137343279	33	2.56812E-05	1899105946	62	0.9760396	44	3,5898929	2835419.9	11571192	2857483.9	1513968.3	538124	166980.2826	97	5	4	185572	
56791849	56791848	39	6.86719E-07	2158068781	3	0.3565644	3	0.3565599	3531862.4	21269578	3536972.4	2961676.8	272258	116663.7841	2	0	1	77797	
107180588	107180589	12	2.47355E-07	730792516	50	0.1021864	32	0.1291519	1603524.5	5530824	1615144.5	671626.89	208661	-47541.10944	1	3	2	128101	
262362095	262362104	24	3.48583E-07	3282462998	20	0.2704598	12	0.3378376	3049118.9	13887783	3068844.9	1831421.6	436367	100970.5592	3	1	2	167698	
71145228	71145227	20	2.81115E-07	1351758953	6	0.1743515	6	0.1743495	2324390.8	12362205	2330046.8	1678765.4	195655	19553.39207	1	1	1	88051	
25591557	25591556	12	4.68905E-07	281506996	4	0.2284225	4	0.228416	646276.81	2963207	651379.81	391339.28	91319	21109.27962	2	1	1	35105	
140096200	140098204	16	3.92368E-06	787017327	369	0.1681482	250	0.7155581	2359468.8	5971535	2386642.8	694576.28	416081	-56034.72038	23	30	5	236058	
439054159	439054170	24	2.38203E-06	3625405261	214882	0.1351997	86792	0.3758448	3856729.7	10423496	3908865.7	1281122.6	832891	92438.61395	10	86686	7	370226	
400732971	400732975	16	2,273425-05	2121648338	448	0.0834837	153	0.1974143	1006261.2	7505249	3041116.2	832043.28	508072	-99501.72038	4	11	5	303787	
231325293	231325301	15	1.76078E-06	770959962	143056	0.0742759	47754	0.2594491	2523294.9	5477977	2551896.9	575659.89	419129	-127347.1094	8	47582	5	273238	
49393107	49393119	18	8.8077E-07	657745114	251	0.0893055	245	0.1744366	1656719.6	6021168	1662543.6	736766.22	230596	-20583.7751	2	35	2	125590	
87285637	87285636	37	4.23896E-07	3142281601	2	0.6038445	2	0.6088361	3118284.8	18635725	3126789.8	2595011	378286	234605.005	4	0	1	71840	
107392510	107392512	10	6.08955E-07	375167621	94	0.1392159	71	0.3457837	1180432.5	2740901	1200697.5	302927.72	232330	-15128.27661	7	9	3	123729	
120530418	120630479	77	3.37595E-06	3594373703	22	0.4222344	12	0.7979279	5851206.8	32928679	5864534.8	4539708.8	709350	348127,7902	13	1	3	180611	
445758924	445759012	34	7.97953E-07	7995847820	287374	0.1455915	197363	0.6478701	4325492.8	13391025	4366470.8	1632362.3	1438182	681048.2826	20	197228	5	378567	
118606767	118606769	8	3.961875-07	366575561	66923	0.1733159	33499	0.4929554	1024270	1802362	1048084	182596.95	271445	31350.94528	10	33432	3	120047	
166480625	166430616	15	6.26462E-07	814229932		0.0853535	34194		2379611	8490557		1100738.3	249676	-115561.7204	1	34136	4	182619	
181452330	181452326	7	6.77368E-07	247480408		0.0418868	78581	0.1433864			1448424.8		240580	-114241.8328	4	76470	4	177411	
296188478	296188475	13	1.81884E-06	1037101147	92601	0.0540065	92205	0.1928738	2560364.2	4622720	2599431.2	471604.72	457793	-137243.2766	6	92067	6	297518	
328385552	328385550	16	7.06751-07	1299253162		0.0420856	0.4 70.4	0.1276763			4058860.1		605650	-262390.1094	-	84540	4	434020	

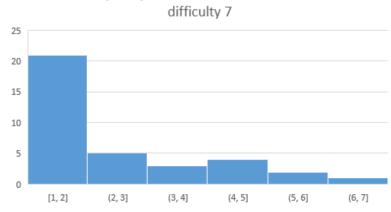
Figure 4.91: Summary obtained difficulty 7 by clustering

Data graphically shows in this case that the number or schemas solved in one game is 1 but to let players play we will take in count as maximum 2 in 2 seconds [figure 4.92].

This is the behaviour of players playing a game of difficulty 7 [figure 4.93].

The chosen formula have a non exponential or sequential behaviour but has 5 picks which means that the user was enthusiastic and it could solve some schemas with good





Games frequency of occurrence with 2 senconds and

Figure 4.92: Games frequency of occurrence with 2 seconds and difficult 7

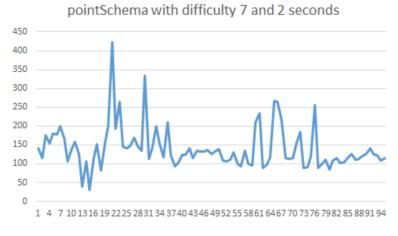


Figure 4.93: PointSchema with difficult 7 and 2 seconds

score and good speed [figure 4.94] [figure 4.95].

The following graph shows the relationship between games and points obtained by the new point system, Formula 3 the chosen one [figure 4.96].

The following image represents the relationship between games vs time Average: 148840 Total games: 36 [figure 4.97].

The following is a pivot table that shows points vs total of points for each game. the ? value means that the user did a mistake but the time was count for the test [figure 4.98].



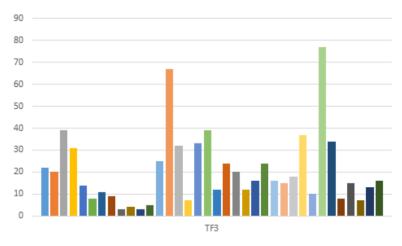


Figure 4.94: Formula 3 difficult 7

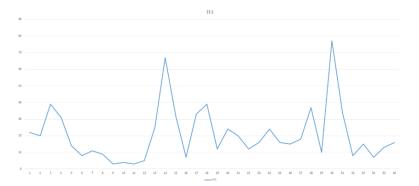


Figure 4.95: Formula 3 difficult 7 Line

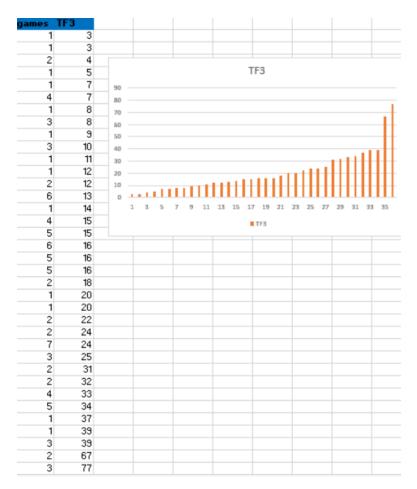


Figure 4.96: Games vs Formula 3 difficult 7

4 - Results

games	time	500000							
1	97294	450000							
1	25805	400000			٨				
2	110473	350000						1	
1	106205	300000					Λ	Λ	
1	70823						Λ	Λ	
4	177411	250000							
1	12721	200000			\mathbf{V}			\mathcal{N}	1
3	120047	150000	Λ.		\mathbf{V}				
1	87445	100000	\sqrt{N}	\sim	V	\sim		\mathcal{V}	
3	123729	50000			- Y				
1	67261	0							
1	35105		12345678	9 101112131	415161718192	021222324	12526272829	3031323334	3536
2	128101				time				
6	297518								
1	32101								
4	182619								
5	273238								
6	434020								
5	303787								
5	236058								
2	125590		Average:	148840					
1	88051		Total games:	36					
1	81797								
2	95089								
2	167698								
7	370226								
3	127113								
2	101892								
2	120807								
4	185572								
5	378567								
1	71840								
1	77797								
3	126098								
2	137756								
3	180611								
			-						

Figure 4.97: Games vs time difficult 7

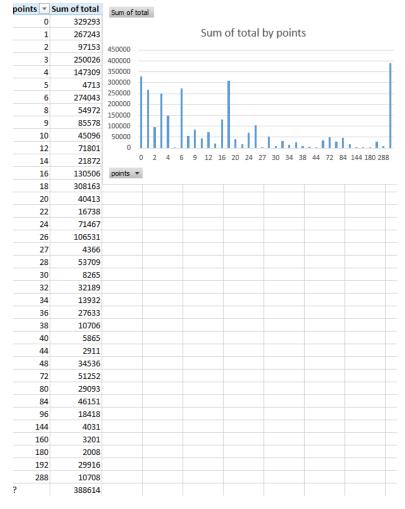


Figure 4.98: Sum of Total by points of difficult 7

The boundaries of each level were calculated by the study of each level behaviour in which the point of attention was time and number of schemas solved in one game. Error played an important role for this study. Many of the players have done mistakes and this represents less time to be consumed.

After having defined all the levels and the requirements, the next step was thinking about boosters and how them must be related to the levels. As we know, boosters can be given to users for free in a random period of the game, after had achieved some tasks or had pass some difficult levels, users seem them as a reward.

Reward in MAK07 are going to be shown as a medal, the following are examples of the image representation of them.

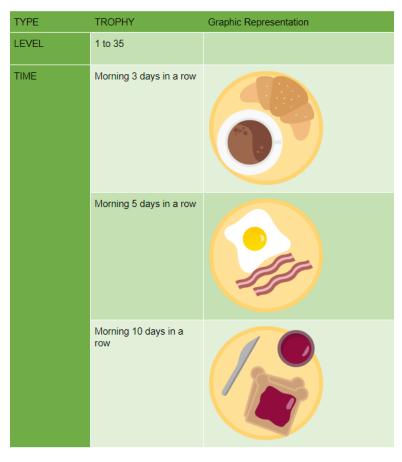


Figure 4.99: Table of trophies and graphical representation



Figure 4.100: Table of trophies and graphical representation cont. 2

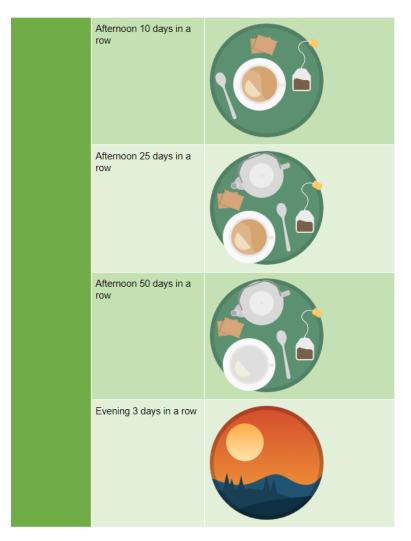


Figure 4.101: Table of trophies and graphical representation cont. 3

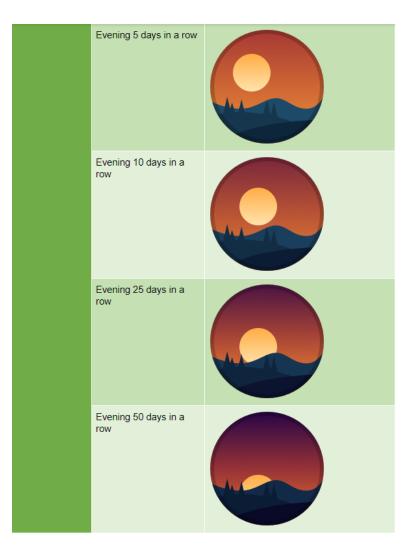


Figure 4.102: Table of trophies and graphical representation cont. 4

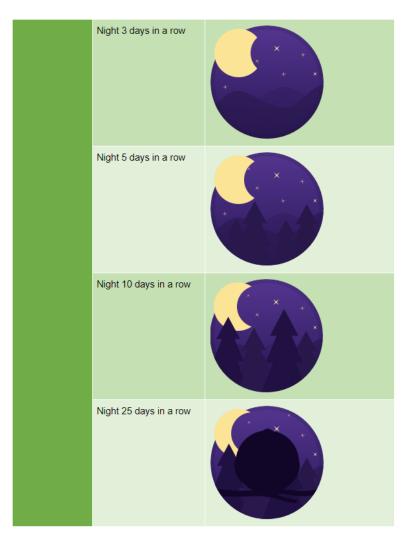


Figure 4.103: Table of trophies and graphical representation cont. 5

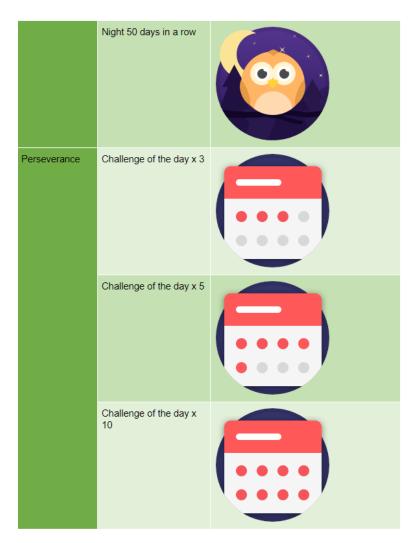


Figure 4.104: Table of trophies and graphical representation cont. 6

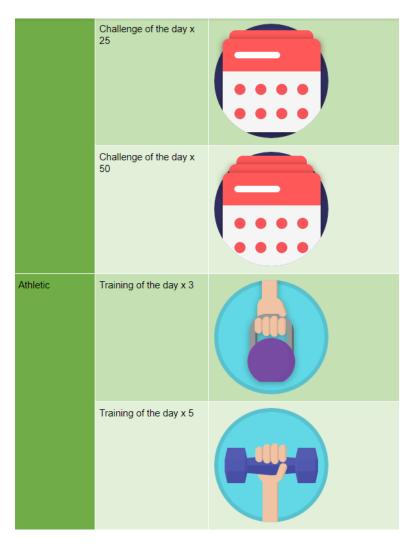


Figure 4.105: Table of trophies and graphical representation cont. 7

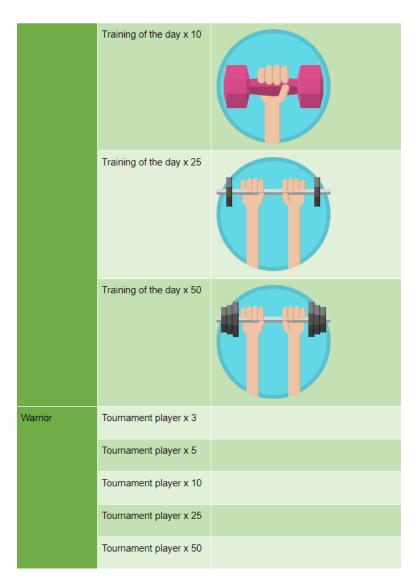


Figure 4.106: Table of trophies and graphical representation cont. 8

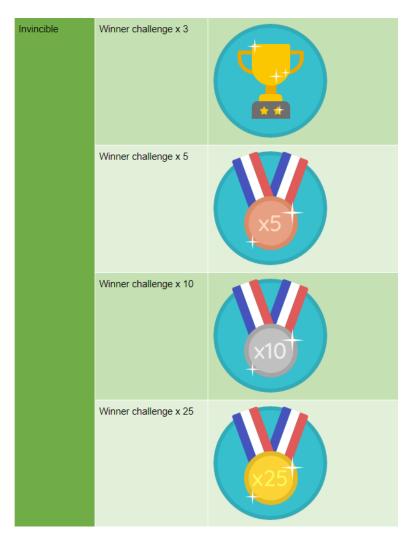


Figure 4.107: Table of trophies and graphical representation cont. 9

	Winner challenge x 50	
	Winner tournament x 3	
	Winner tournament x 5	
	Winner tournament x 10	
	Winner tournament x 25	
	Winner tournament x 50	
Challenges	Hard player x 100	
	Hard player x 500	
	Hard player x 1000	
	Hard player x 5000	
	Hard player x 1000 000	
	Hard player x 7 000 000	
Tournaments	Invincible x 100	

Figure 4.108: Table of trophies and graphical representation cont. 10



Figure 4.109: Table of trophies and graphical representation cont. 11

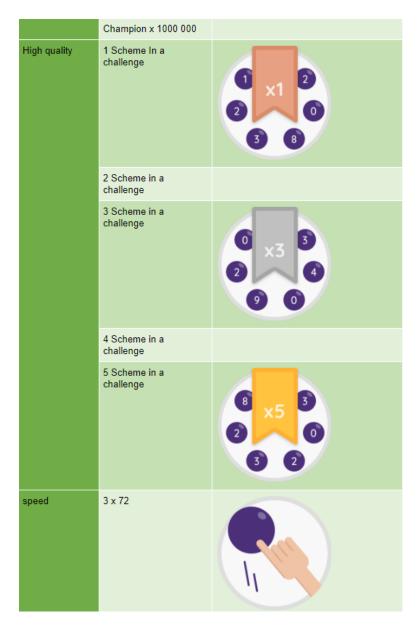


Figure 4.110: Table of trophies and graphical representation cont. 12

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Figure 4.111: Table of trophies and graphical representation cont. 13

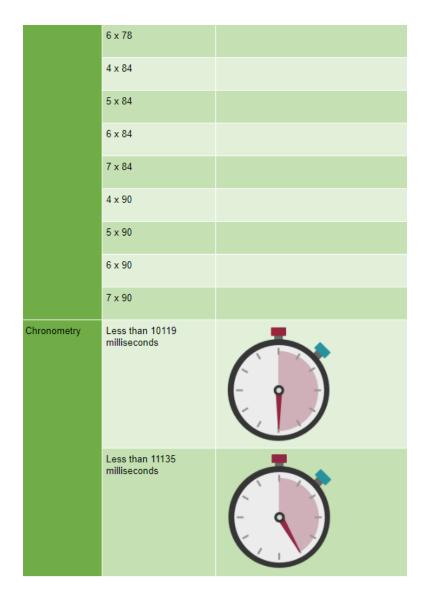


Figure 4.112: Table of trophies and graphical representation cont. 14



Figure 4.113: Table of trophies and graphical representation cont. 15

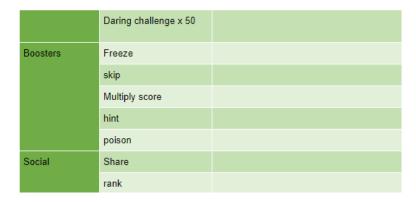


Figure 4.114: Table of trophies and graphical representation cont. 16

Chapter 5

Conclusion

3 main topics were covered with this thesis. the first one was the point system of MAK07 that was the door which opens the design of gamification components cross over the full system which was done with test and simulations of different formulas according to the normal behavior of users of MAK07. The second one was the classification of inputs that allows the design of levels of MAK07 and the definitions of requirements for each level. This classification was done thanks to applying a technique of clusterization of the input data finding groups of similar characteristics. The third one was the design and test simulation of a progressive game using an increasing combination of numbers in order to make the game difficulty more progressive.

The design of gamification on MAK07 from a high level point of view was enriched by documenting several use cases, list of requirements, user interfaces and definition of the components.

5.1 Future work

The gamification components designed in this thesis will be integrated in the main game and deploy on the store as soon as possible. As the theory of gamification says about feedback loop, the game will be constantly monitored in order to understand the new motivations and to manage feedbacks of users.

Levels can be increased over the time as well in solo game the stops on the path can be added in order to give more challenges to MAK07 users.

From the architectural point of view, the structure of MAK07 gives the possibility to scale in horizontal way thanks to the technologies of MongoDB and Docker.

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Glossary

- **Gamification** Use of game elements in a non-game context, use of game thinking and game mechanics to solve problems and engage audiences that are not exactly new, use of game elements in a non-game system to improve the user experience, is an informal term for the use of video game elements in a non-game system to improve the user experience and create hitch, integration of game dynamics in a site, service, community, content or campaign, in order that derives participation, is the interaction of game mechanics in a non-game environment to increase the engagement of audience with loyalty and fun . iii, 1–3, 5, 6
- MAK07 Math game composed by 7 balls, each ball has a number and have the target of arrive to 1 unique ball with value 0 using basic operations like addition, subtraction multiplication and division. iii, 2, 3