Appendix A

User manual

A.1 The system

The prototype you are going to test has the aim to provide a new method of authentication, where the user must not make any cognitive effort.
It is based on the concept of *implicit memory*, which represent the ability of the human brain to learn information without focusing on the actual memorization of them.
In fact, you do not have to create any password nor make any kind of decision. The password is uniquely associated with the user by the system and it must not be memorized. The password is composed by a set of images, not directly stored into a database.
The user is request solely to detect an arrow in the image, recognise its direction and then click the respective button, located under the image.

A.2 Test execution

The user is first redirected to the homepage, where is required to sign in.
In order to start the registration, the user must click on the "SIGN IN" button in the menu on the left.
The user is now redirected to the registration page, where is asked to insert the email to be registered. This email can be invented or a real one.
Then the user is asked to click the "START" button in order to begin the registration process.
After the registration process is completed, which include the training session, the user is redirected first to a quick questionnaire and then to the personal page.
In the personal page the user can change the username, book a trip on a bus and delete it, logout or delete the account. It is preferable in this first phase not to delete the account, because it would mean registering again.
The user who logouts is redirected to the homepage and is requested to perform the login. Analogously to the registration, after the login the user is redirected first to a quick questionnaire and then to the personal page, where the above mentioned secondary operations are permitted.
After the login phase, and performing some or all the secondary operations, the user can decide to either logout or delete the account.

No limit has been imposed on the number of times a user can repeat tasks during the test session.

After each task the participant is redirected to a brief questionnaire, regarding the emotional state, attitude and effort experienced during the completion of the activity. At the end of the test, the user is asked to complete a final questionnaire (by clicking the "FINAL QUESTIONNAIRE" button in the Homepage), in which general questions about the entire experience are proposed.

Below a more detailed specification of each page is presented.

A.3 Homepage

The homepage is the principal page, where the user is redirected at the beginning of the test and anytime an error occurs.

On the left, the menu is shown, with the buttons that respectively allow login or registration. On the upper right corner there is a help button, represented only by a "?" character (Fig. A.1). This button permits the user to open a different window with the user manual, in order to consult

Figure A.1: Help button

it. The help button is present in each principal page (e.g. sign in and login pages).

A.4 Registration

Registration is the first action required to the user and it is fundamental for the completion of the other tasks.
The first action required to the user is to insert the email. It can be a real or a fictitious one, the system will not verify the real existence of the inserted email.

Consequently the user is redirect to another page, where is informed that the registration process is about to start.

After clicking the "START!" button, the user will be redirected to the real registration page. In this page will appear an image and below 4 buttons, which indicate the four possible directions of the arrow associated with the displayed image.
The user is asked to detect the arrow casually located in the image, recognize its direction and click the respective button (Fig. A.2).

The registration phase is composed by the random repetition of the set of images, which will represent the password associated with the user.
It is important to notice that the user must not memorize any information, neither the images nor the directions nor the sequence of images (images are indeed presented in a casual order).

In this phase, in case of error there will be no consequence.

A.5 Training

After the first stage of registration, the user must be trained with the personal associated images. The objective of the training phase is to allow the user to acquire the sufficient visual-motor skills

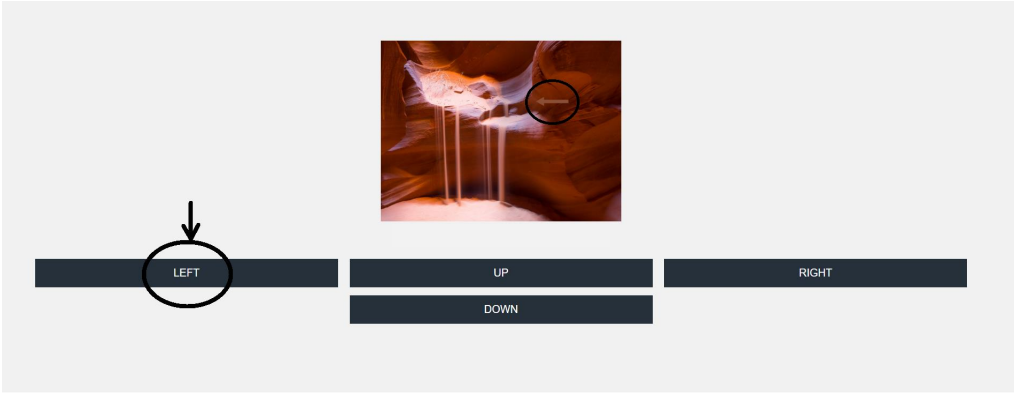

Figure A.2: Typical page format

to pass the subsequent login phase, where it is essential to rapidly recognise the location of the target in the image (i.e. visual skill) and click the correspondent button (i.e. motor skill).
In order to achieve these abilities, the images associated with the user are randomly displayed for several times. In addition, to improve the skills, a time limit is imposed , within which the user must complete the actions.

The page that is presented is graphically identical to the registration page and the operations to be performed remain the same: the user must detect the arrow and click on the corresponding button.

In this phase, in case of error there will be no consequence.

After the completion of the training phase, the user is redirected to the personal page.

A.6 Login

The login process represents the verification of the acquisition of the secret, which allows the user to access their personal page and execute secondary operations.

In contrast to the registration phase, the login phase consists of a single round, in which the set of images of the registration phase are presented to the user in addition to supplementary random images, never seen by the user.

A time limit is inserted, within which the user must identify the arrow and click the correct button. Each incorrect entry or no entry are considered errors and used as secret knowledge discriminators.
The user in order to correctly authenticate must make a maximum of 3 errors, otherwise the login fails.

At the end of the login process the user is redirected to the personal page.

A.7 Personal page and secondary operations

In order to obtain a more realistic and comprehensive analysis, additional tasks are requested to the participants. They refer to subordinate operations, such as the username change, which can

exclusively be performed after successfully authenticating (i.e. sign in or login).
In the personal page the user finds a series of buttons, each of which represents a secondary action to be performed and finally the button to log out. It is important to be noticed that, after the registration, it is preferable for the user to log out instead of deleting the account. The reason is simple: once the account has been deleted, the user must register again, executing all the steps.

At the bottom of the personal page, the current route of the minibus is represented, with the various routes booked by other users. Since there are 4 seats available on the minibus, before booking a trip it is advisable to check in advance if the number of passengers exceeds the maximum for the route the user wants to book.

A.7.1 Book your trip on the minibus

This operation permits the user to book a maximum of 4 seats on this imaginary bus, accurately called Minibus. The user can select from a drop down menu the route to be covered.
After clicking on the "Book your trip" button", the user is redirected to the booking page, where the number of passengers must be insert and the points of departure and arrival selected. To complete the reservation click on the "Conclude" button.

If the booking is successfully completed, in the personal page, the departure and arrival points are coloured in green. The reservation will not be completed in the case of insertion of invalid itineraries or excess of the maximum number of people.
In order to book a different trip, the user must delete the previous one.

A.7.2 Delete your trip

This button permits the user to eliminate the trip previously booked, without entering any information. By clicking the button the trip is automatically deleted.
After deleting the reservation, the user is able to make a new one.

A.7.3 Change username

This action permits to modify the username from the email to a preferred name. It is important to notice that to authenticate the email is mandatory: you cannot login with your new username. In fact, after the logout the username will not be stored and it will not appear in the personal page unless the user changes it.

A.7.4 Delete account

The user who wants to delete the registration to the system can click on the correspondent button and agree to eliminate the account.
After this operation, in order to re-utilise the authentication system the user must register again.

A.8 Logout

The logout represents the ultimate operation, when the user finishes to perform the desired operations.
Once logged out, the user can login.

A.9 Installation manual

In order to proceed with the test, the technical environment must first been prepared. The folders needed are provided in a .zip file, named "*TSAuth_Test*". It is suggested to export the "*TSAuth_general*" folder on the Desktop, in order to facilitate future operations.

A.9.1 Web server

The mechanism to be tested needs to have web server support installed on the computer utilized for the test.
If the user already has one, the "*TSAuth_general*" folder can be directly inserted where required by the application utilized.

If the user did not have to download XAMPP, proceed to the database configuration section. Otherwise the most updated version of XAMPP can be downloaded at the following link:
https://www.apachefriends.org/it/index.html
In this case, once the installation is complete, the steps to be followed in order to prepare the web server to correctly work are specified below:

- Open the control panel (double click to open the program);
- Click on the "*Start*" both at the Apache line and at the MySQL line;
- The "*TSAuth_general*" folder must be placed inside the folder "*htdocs*":
  - Go to the XAMPP Control Panel;
  - Click on the "*Explorer*" button on the right side of the panel;
  - A folder will be opened;
  - Search for the "*htdocs*" folder and enter it (double click);
  - Copy the "*TSAuth_general*" folder in this folder.

Proceed to the configuration of the database.

A.9.2 Database

In case the user didn't have to download XAMPP:

- Search within "*TSAuth_general*" the file named "*conf.php*";
- Change the values that allow the access the own database;
- Create a new database named "*tsauth*";
- Import the "*tsauth.sql*": the file contains the initial configuration of the database for the testing. DO NOT MODIFY this file.

In case the user had to download XAMPP:

- From the XAMPP Control Panel, at the MySQL line, click the "*ADMIN*" button;
- The user is redirected to the phpMyAdmin site (also reachable at http://localhost/phpmyadmin/index.php);
- Different databases are displayed on the left, click on "*New*;
- Name it "*tsauth*" (all lowercase!) and then click the button "*create* on the right (Fig. A.3);
- The user is redirected to the database newly created, which has to be initialised:
  - At the top of the page, click on the section "*Import*" (Fig. A.5);
  - Click on "*Scegli file*";
  - Search for the "*TSAuth_general*" folder in the system (e.g. in th folder exported at the beginning from the .zip file);
  - Open the "*tsauth.sql*";

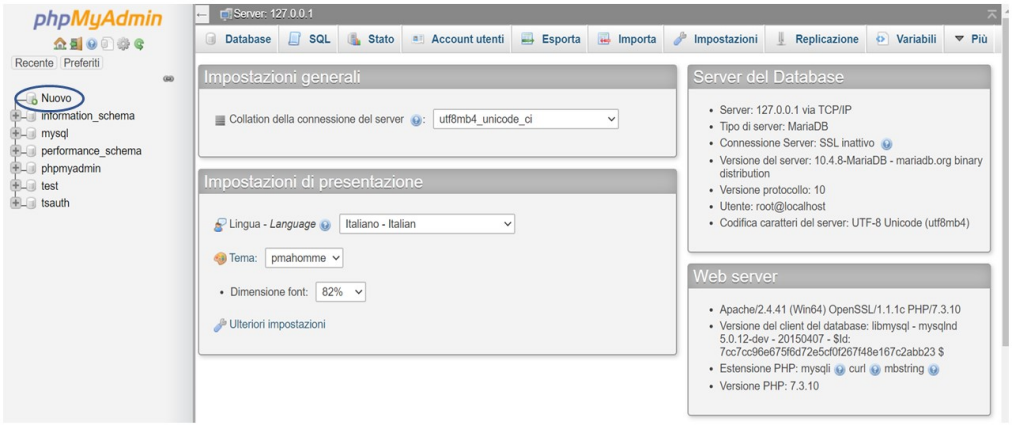

Figure A.3: Creation of the new database

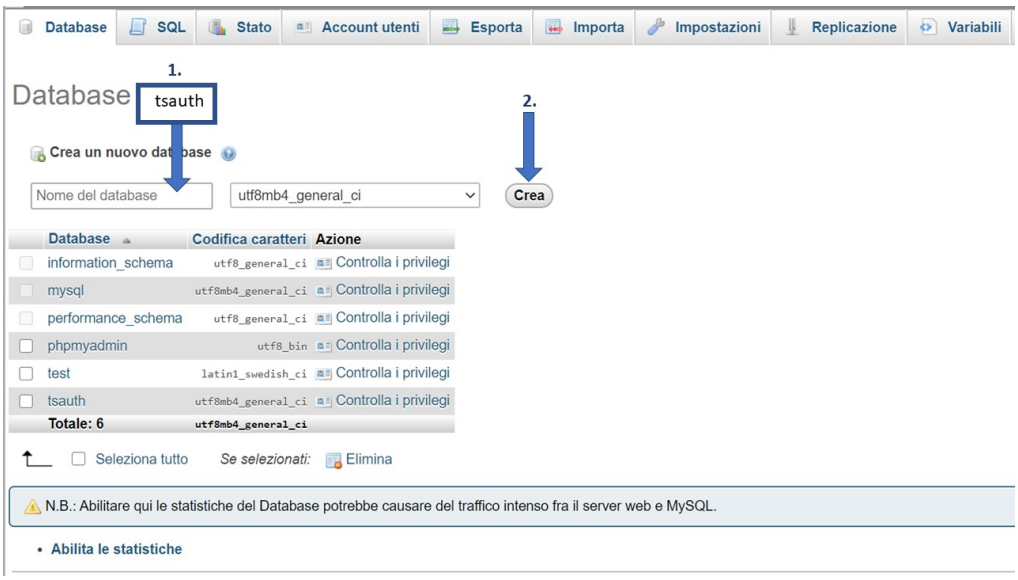

Figure A.4: Creation of the new database: set the name

– Scroll down and click the button "*Esegui*" (Fig. A.6);

In order to improve the security of the database, it is preferable to insert a password:

- Return to the main page, by clicking on "phpMyAdmin" in the upper left corner (or at the url `http://localhost/phpmyadmin/index.php`);
- Click on "Account utenti" in the top bar (Fig. A.7);
- Click on "Modifica privilegi" (Fig. A.8);
- Click on the button at the top "*Cambia password*" (Fig. A.9 (1.));
- Insert a password of your choice in the specific area (Fig. A.9 (2.));
- Click on the button "*Esegui*" at the bottom right;

Now, in order to be able to successively access your database, the phpMyAdmin configuration file must be updated:

Figure A.5: Creation of the new database: set the name

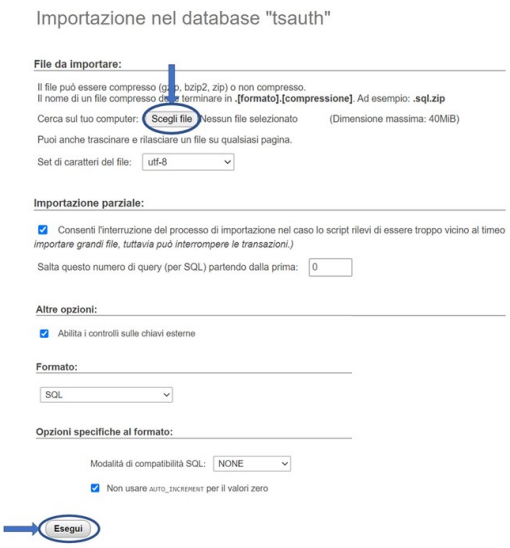

Figure A.6: Creation of the new database: import of the .sql file

- Go to the XAMPP folder (click on the "*Explorer*" button on the right side of the control panel);
- Open the "*phpmyadmin*" folder;
- Open the "*config.inc.php*" file;
- Write your password between the quotes, i.e. '' (Fig. A.10);
- Modify to *false* the last line (Fig. A.10);

Finally, in order to permit the connection to the database, the configuration file of the test must be modified:

- Search within "*TSAuth_general*" the file named "*conf.php*";
- Change the values that allow the access the own database, i.e. the password created for the database;

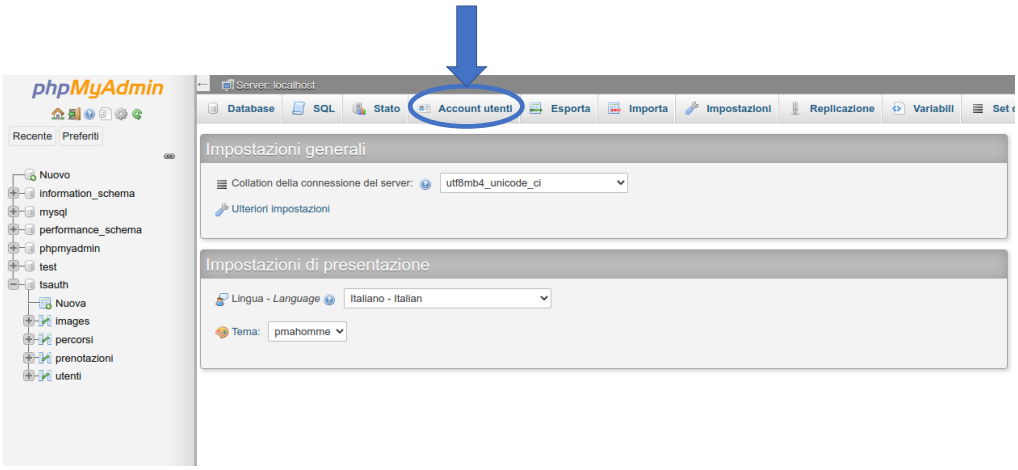

Figure A.7: Set a password: Overview of user accounts

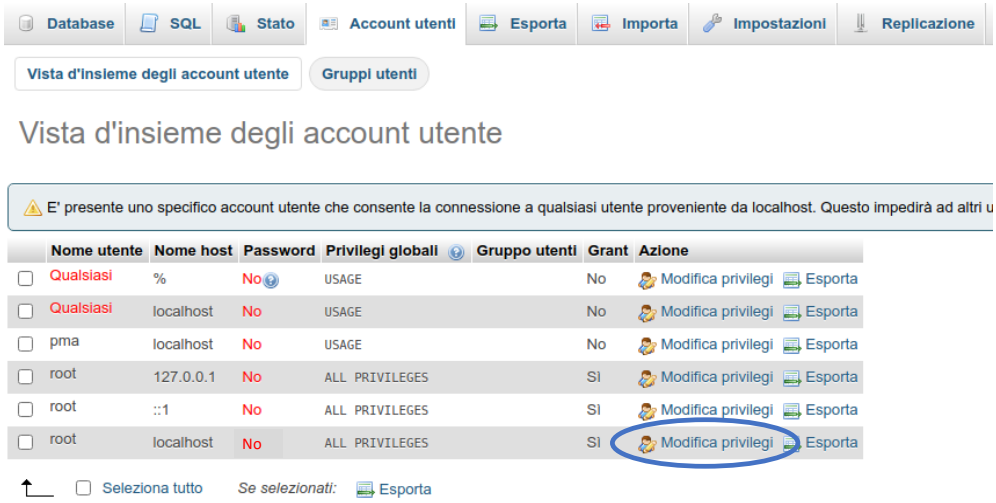

Figure A.8: Set a password: Edit privileges

- Save the file;

Now that the database has been created, the user can proceed with the test event at: https://localhost/TSAuth_general/index.php

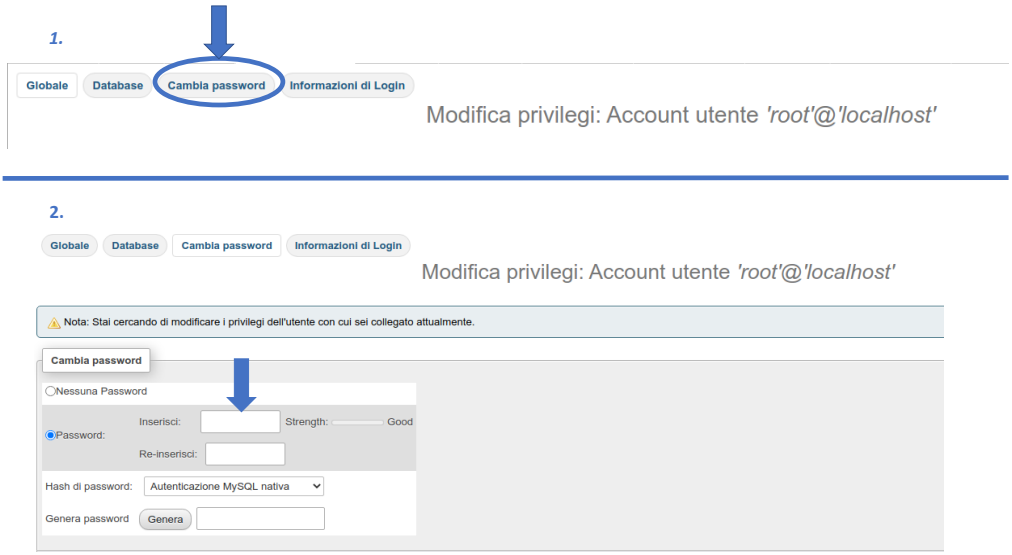

Figure A.9: Set a password: Insert new password

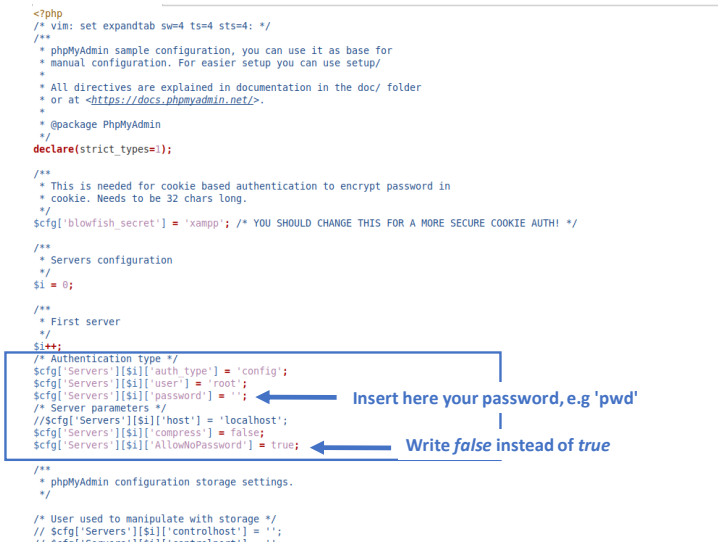

Figure A.10: Set a password: Modify the configuration file