POLITECNICO DI TORINO

Honors thesis

COURSE OF COSTRUCTION AND CITY

Abstract

Public lighting and adaptive control systems: applicability and energy assessments in a case study.

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The following thesis stems from the intention to analyze and study new management and control solutions for public lighting systems in smart cities, in order to examine the applicability and assess the potential energy savings compared to traditional solutions.

Today, the term smart city means a community of the future able to meet the needs of citizens through the use of technologies and services, from different fields, characterized by interoperability and coordination. To this end, it is necessary to have an infrastructure that connects people and objects, able to collect data and information to improve the quality of life of citizens.

In this context, the concept of smart street was taken into account, i.e. intelligent streets characterized by a vast network of street lamps spread throughout the territory. These are fundamental public services capable of connecting objects and people. In addition, they have a dual function. In fact, given their presence on the territory as electrified points, they can accommodate sensors and cameras that detect information from the smart city, while maintaining their main function of public lighting, even if, have been increased and improved their main activities of switching on, off and dimming.

In fact, with a view to pursuing the objectives of the smart city, adaptive management and control systems have been developed that allow to optimize the use of light at night and also, through the use of LED sources, to achieve significant energy and cost savings. In recent years, many lighting companies have been involved in the development of new intelligent systems capable of interacting with the services of the smart city.

In order to study and analyse the functioning and applicability of these systems, the city of Savigliano was identified as a case study. In 2018, a project was launched by the company Ardea Energia and the lighting company Schréder, aimed at detecting traffic flows and applying an adaptive system.

Pursuing the objective of the thesis of analysis and use of an adaptive system TAI (Traffic Adaptive Installation), the UNI 11248:2016 standard was applied to three different types of road owned by the municipality, which allowed the development of a risk analysis and identify the feasibility of the intervention only in correspondence of the road outside the city SP20.

Since night-time detection of vehicles was not available, energy consumption was assumed to be obtained from three different scenarios represented by a full power, pre-programmed and adaptive lighting system. For the latter, it was not possible to identify a specific energy consumption but it was determined a range obtained by detecting the passages of high and low intensity vehicles. Subsequently, two different samples of traffic profiles were identified, which allowed the development of a regulation profile and the evaluation of the relative consumption, in order to determine whether in these cases the adaptive system is economically advantageous compared to a pre-programmed system.

The objective of the thesis, as far as the case study is concerned, was to verify the applicability of the adaptive control of lighting systems in a real context, highlighting potentialities, application limits and verifying not only the economic convenience of an adaptive system, but also its predisposition in pursuing the objectives of the smart city and its suitability in providing, during all night hours, lighting capable of meeting the safety requirements and improving the visual quality of users.

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