An iOS Application to Manage Home Automation

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Abstract

The technology covers more and more aspects of our daily lives. Home automation is the essence of this concept, since it represents a new way of managing the home, using the existing tools of Information and Communication Technology. With Home Automation, we intend automation and remote control of electronic equipment inside our homes: heating, household electrical appliances, lights, entertainment, video surveillance to mention some. To this end, in this paper we show an iOS application to manage the home automation system via iPhone or iPad, whatever is the position of the operator, by using a simple Internet connection.

I. INTRODUCTION

The term means the integration of home automation electronics, home appliances and systems of communication and control found in our homes. Home Automation means the integration of electronic devices, household appliances and communications systems and controls that are in our homes. The "automated home" is not only an environment in which the major domestic tasks are controlled through automated means. It's much more. An automated home must ensure several requirements including:

- *Safety of the individual*: intended as protection from possible malfunction of equipment potentially dangerous or harmful to people and housing. To manage "safety" are used, for example, fire systems, anti-flooding sensors, loads of power transmission managers, sensors that regulate the escape of gas;

- *Security environment*: that is the control of unwanted accesses, physical and telematics, from outside. The first control is delegated to the burglar alarm and access control systems. The cyber attacks are coming from the external network (e.g. Internet) connected to the home network. The protection from these types of attacks is through technologies such as MAC, Firewall, Proxy, as well as through access control using identification codes;

- Energy saving: in which all the techniques and systems to optimize energy consumption are covered. The design of a system that supplies the cheapest energy source is one of the first objectives, because it ensures significant savings [1];

- Comfort [2]: it gather all the tools to simplify and make easier living inside the house ensuring that the level of welfare perceived by the occupant is as high as possible. This category also includes the ease of use of home automation systems, closely linked to how you can manage the various functions of the system and to the user interface;

- Strength: namely the ability of the system to react to failures of individual modules in order to avoid mistakes that could compromise the functioning of the entire automated environment.

These features, appropriately integrated, lead to the emergence of a home automation system that greatly simplifies the life inside the house. Most functions are controlled by a system arising from the coexistence of electronic, computer and automation equipment managed through an instrumentation easily configured by any user. While the automation at factory level is a consolidated market, also thanks to higher financial resources, the home automation market is almost stationary because tight budgets do not allow

disseminating the Home and Building Automation systems to a large number of private users, despite the enormous benefits of having smart systems. The presence of so many communication standards for home automation systems, moreover, does not favour the market because of the incompatibility between devices from different companies. On the basis of careful market research, we identified the main characteristics that an automated home should have:

- Remote Control: it provides the ability to manage all the devices both inside and outside the home simply by using a portable device (an iPad or an iPhone, for example) whose controls are easy to understand;

- Motion Detection: The system must provide a mechanism for automatic lights switching in case of motion detection in passageways (corridors or stairs);

- Air conditioning [3]: management of air conditioning should be done both according to the user's preferences and on atmospheric measurements. The system, in fact, must be able to work on the heating system based on atmospheric and temperature parameters collected inside and outside the home;

- Lighting: the system must provide automatic adjustment of several independent zones (internal and external) together with the management of curtains and blinds to ensure significant energy savings;

- Timer: the equipment should allow the user to be able to determine the activation time bands for each device. You should to be able to regulate, for example, the start time of an appliance and its off or set the time slice of the irrigation of the garden;

- Alarms: the system must act as a result of detection of gas leaks, floods or fires, warning the user, and implementing key security measures.

This paper is so organized: Section II presents the system architecture while Section III will discuss, specifically, the characteristics of the iOS application.

Finally, Section IV summarises the paper by discussing possible future works.

II. SYSTEM MODEL

The goal of this paper is to present a network architecture to control all the devices in a home automated environment by using a remote controller (an iPhone or an iPad) [2]. The system allows wireless control of several devices that have the responsibility to increase security and reliability in the home. The architecture consists of sensors and actuators placed at various strategic points of the house. They are appropriately related to the equipment to be controlled - such as lights, curtains, air conditioning, alarms and entertainment systems - using IEEE 802.11b/g - Wi-Fi [4]. A wireless access point (AP) manages all network devices and allows you to monitor and control all apparatus through a computer - or any other device with an IEEE 802.11 b/g/n - Wi-Fi [4] interface - which interfaces the user with the system. The sensors are used to detect several parameters, while actuators react in case of commands coming from the user or PC. The Access Point is also connected to the Internet and, therefore, it is possible to control and/or configure the system also through devices like iPhone or iPad. The AP allows the user to manage the system even when he is not physically present in the house, making possible operations that would be impossible in its absence. The environment, however, is configured to ensure minimum power consumption [1]. Light, for example, switch on only in case of movements detected by sensors placed in the monitored area. The curtains regulate themselves according to the outside light conditions. The opening and/or closure are, in fact, determined by information gathered by twilight external sensors, which control the amount of light. It is expected, in addition, an instant messaging system, which by connecting to the Internet warns the homeowner, for example, when he forgot to switch on the alarm. The user is ultimately able to perform various remote operations on any device connected to the system; for example, he can start recording a TV program [5], raise the temperature of a particular room in your home [6] or download updates to your home entertainment system. In the next chapter, we will discuss the implementation of the iOS application for remote control. With it, we will show real examples of

what you can control and/or monitor in the home automation system just described through the application specifically designed.

III. THE iOS APPLICATION

The application has been implemented and organized using a View-Based Application that allows you to easily navigate between different Views of the application itself. Through the main panel you can manage different systems in each room of the house (Figure 1).

Figure 1: Control Panel

The remote control allows you to manage lighting, heating, entertainment, and the alarm system in different parts of your home from anywhere. By clicking on Lights (Figure 2) you can control several aspects of domestic lighting including: Ceiling, Wall, and Tables, which are managed through Horizontal Sliders.
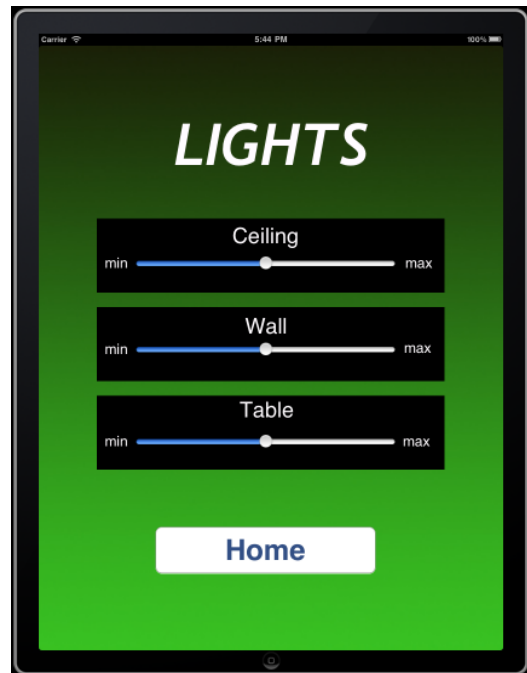

Figure 2: Light Management

The Climate section (Figure 3) allows you to control the air conditioning system, by switching on or off, by setting the temperature and an activation time slice.
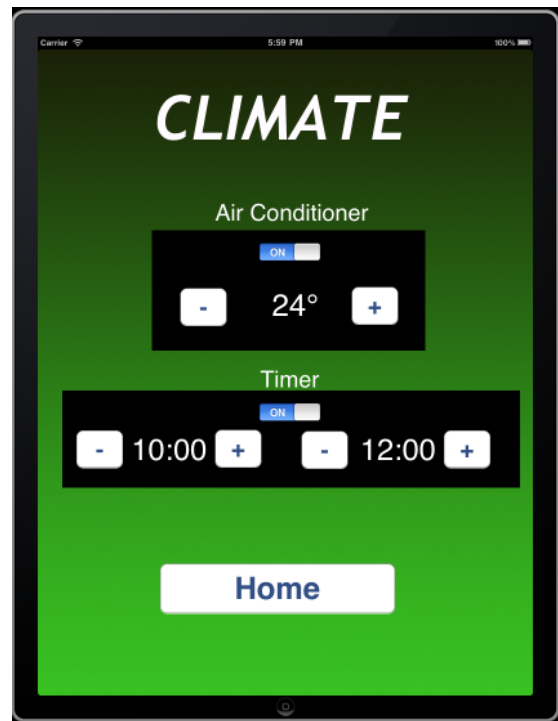

Figure 3: Climate Management

Entertainment function is instead designed to manage of radio Hi-Fi and TV (Figure 4). Our application allows you to change radio frequencies and the Hi-Fi

volume. Similarly, you can use the iOS device as a remote controller for TV.
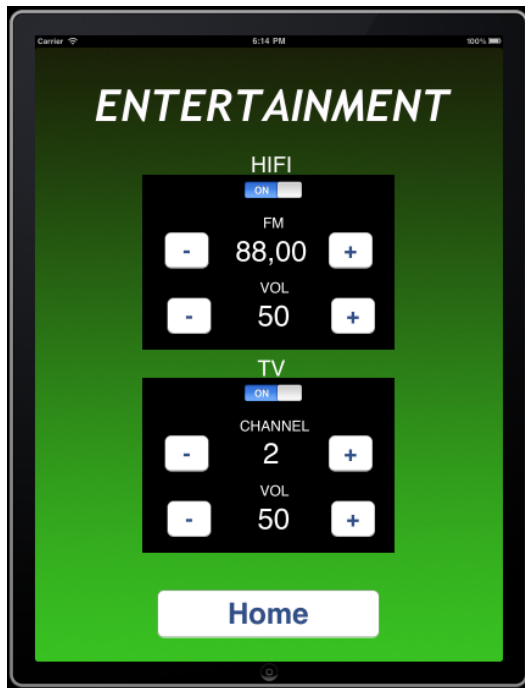

Figure 4: Entertainment Management

Finally, Alarm Section (Figure 5) allows you to set the anti-intrusion, anti-fire and anti-flooding alarms.
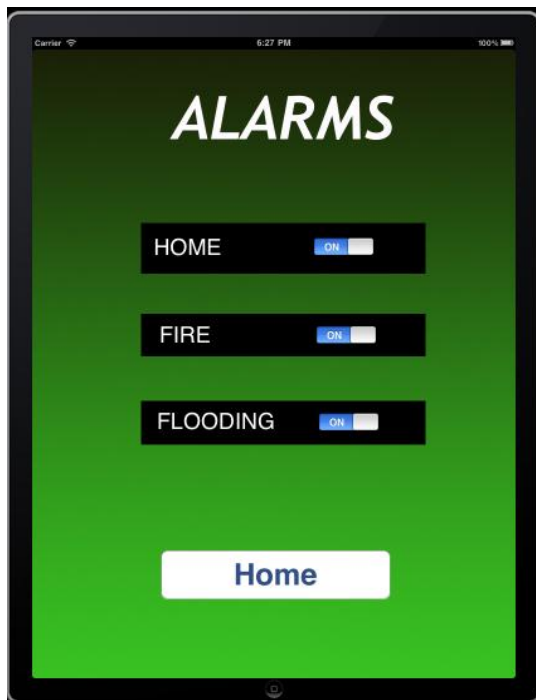

Figure 5: Alarms Management

IV. CONCLUSIONS AND FUTURE WORKS

In this paper we have shown an iOS application to manage devices in automated house through IEEE 802.11 Standard Protocol. For this reason, our application does not require proprietary solutions. At the moment, we are involved on the development of new features to improve the current application and the techniques of home management. The screenshots showed above are part of a prototype application and require a future work that improves the usability and attractiveness of the interface.

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