Automated And Integrated Smart Home Management System

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Abstract- *In the area of smart homes and smart grids, advanced technological systems that allow the automation of domestic tasks are developing rapidly. They enable communication between home appliances and users, and to enhance home appliances automation, monitoring and remote control capabilities. But their applications are mainly limited to individual households. In this study, Smart home management system is given in which a community or society broker role is used for integrating community services. It reduces the workload of community management staff, providing electronic information services, and deepening the community's integration with the surrounding environment. Here at flat or home terminal there is a fixed panel home controller system. The various sensors and devices for example security functions are connected to this home control system. The various building automation devices are connected to the society controller system. At watchman terminal there is a personal computer or server from which we can monitor the various activities in flats as well as in society. If there is an emergency in flat, for example fire detection then it can be detected easily.*

Keywords– Wireless communication; Smart home; Home automation; Building management; Society control.

I. INTRODUCTION

In the twentieth century, all homes will have the dedicated artificial intelligence, sensors, monitoring and controlling abilities required to control the all operating activities of home. This will helpful for more efficient interaction between user and home appliances, which result in improving human comfort, security as well as safety of human and energy savings. Industrialist and researchers are working for making efficient energy building and cheap automatic systems to monitor and control different systems of home like fans, lights etc.Smart homes are beginning to emerge and we continue to witness the rise of digital devices as well as Internet of Things around us. The main purpose of a smart home is to use technology to provide user with comfort and convenience, security, and efficiency in management of various home resources especially electricity and water. Smart home technologies are promoted to reduce energy usage in the residential sector. The objective of developing smart home system technology is to fulfill their promise of vastly improving the lifestyle of families through socially appropriate and timely assistance. Smart home technologies have developed rapidly in the domain of home networks and multimedia to various home automation systems. Particularly, these types of technologies are mostly used in home energy management, although their applications are mainly limited to individual households [1].

The smart home technologies have begun to integrate various smart devices, ranging from conventional sensors and remote controllers to smart home appliances and robot systems [3]. Consequently, many innovative applications have been developed. Recently, smart home technologies have been integrated with online-based services to provide value-added services, operations, and management.

The aim of this paper is to integrating community or society services, such as managing device operations, reducing manual labor required of community management personnel, providing electronic information services, supporting diversified services, and energy management as well as security services

II. LITERATURE REVIEW

In recent decades, automated and integrated smart home management system have drawn considerable attention, particularly because of it is an integrated online based smart home management system with community hierarchy.In particular, energy is an important resource requiredfor all the other smart home services and technologies. The electrical appliances, like fridge, washer/drier, entertainment systems, HVAC systems, sensors and communication devices results in the high-energy consumption in the home environment. Many smart homes have deployed renewable energy resources like solar and storage energy resources to help reducing the energy cost of smart homes as well as increasing sustainability by reducing carbon emissions.A literature review showed that studies on smart home systems have primarily emphasized following areas

Smart Devices

Kong et al., [1] paper is about HEMS-Related Studies, the Mainstream of Smart Home Studies: HEMS studies have shifted from examining home energy management involving simple home-appliance measurements to investigating energy-generation mechanisms [2]. Integrating cloud service platforms with environment-data acquisition has been gradually emphasized in HEMS studies [3].In particular, energy is an important resource for all other smart home services and technologies. The electrical appliances, like fridge, washer/drier, entertainment systems, HVAC systems, sensors and communication devices, result in high-energy consumption in the home environment Many smart homes have deployed renewable energy resources like solar and storage energy resources to help reducing the energy cost of smart homes as well as increasing sustainability by reducing carbon emissions (necessary for implementation of green homes. This is discussed in following papersLee et al. [4] focused on Solar Panels, a Popular Source for Generating Renewable Energy: Solar panels are frequently installed in public spaces, there by causing an overlap between HEMS spaces and community spaces [5]. Although various energy-related systems can exist in the community, such as electric vehicle (EV) charging systems and central management systems, these are related to monitoring public property, the space overlap arouses concern regarding integrating community operations and maintenance [6].

Byun et al., [7] paper consists of advancements in the core technologies of energy conservation and renewable-energy generation, studies on smart home shave focused on examining people and events in smart home systems, such as hierarchical relationships and standby behaviors of controlled home appliances, user activities and satisfaction, and living environments [8]. To accommodate increasing amounts of information generated, ultra large cloud service platforms were developed not only to provide access to environment information, but also to store historical data of user's energy consumption. Therefore, such cloud service platforms are closely connected with smart house systems [9].

Home security

Security is another important service that the smart home technology can offer to its users. In smart home security systems offers more benefits like fire, gasleak and smoke detection and home monitoring and surveillance. CCTV camera is provided for securing the smart home premises, by determining whether the person is a resident or an intruder. Kim et al., [10] discuss the smart home security application. Smart home systems typically integrate various sensors and surveillance cameras for identify and assess abnormal events related home safety

Healthcare

Elderly people and certain patients desire to remain independent at home. For ensuring their safety at home requires, it is important to monitoring and tele-caring, which could be implemented by use of smart home technologies. Panic situation, health monitoring and directed medication are a few examples of health-care and elderly-care services. Wang et al., [11] describes Home safety and Health care: In addition to energy management, home safety and health care have been explored in smart house studies. . In home health care, smart home systems not only employ body condition-specific sensors but also combine resources from remote cloud platforms with professional medical and healthcare services [12].

Previous studies have suggested that hierarchical architectures that are composed of community units, it can promote data and service sharing among several families. This study proposed a community broker role for integrating community services, and extending the community integration with the surrounding environment.

III. METHODOLOGY

A typical smart home system consists of home appliances, various sensors and actuators. Smart home system collect and present information through wired or wireless connection between the system and the home controlled system, which connect the single home or flats through community networking and integrates them into hierarchical architecture on an online service platform using smart phone.

The sensors for example physical sensor, extended sensors, converted sensors are used for security setting, energy report etc. all are connected to at control system. At control system controller is used. This subsystem is called Home Network.The second subsystem is society control system as shown in the Figure 1. The RFID reader, water level indicator, relays, LCD display all are connected to this society control system.

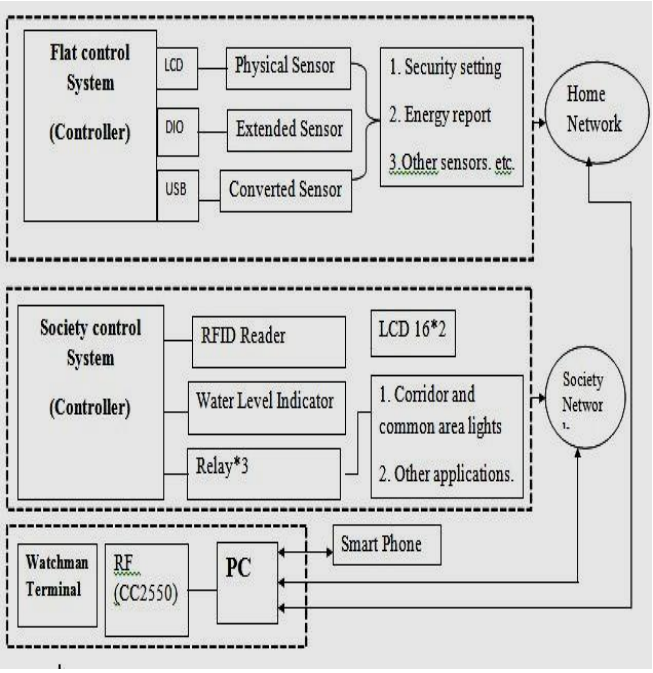

Fig. 1 shows the architecture of Flat and Society control system

This subsystem is called Society Network. The third subsystem is watchman terminal. At the watchman terminal the main server that is PC is given and all home network, society network and smart phone are connected to this PC. All flats as well as whole society monitoring and controlling can be done from watchman terminal.

Figure 2 illustrates the predefined interfaces and device setting at flat terminal. Here ARM7 microcontroller is used as a controller. All other peripherals are interfaced with main controller.

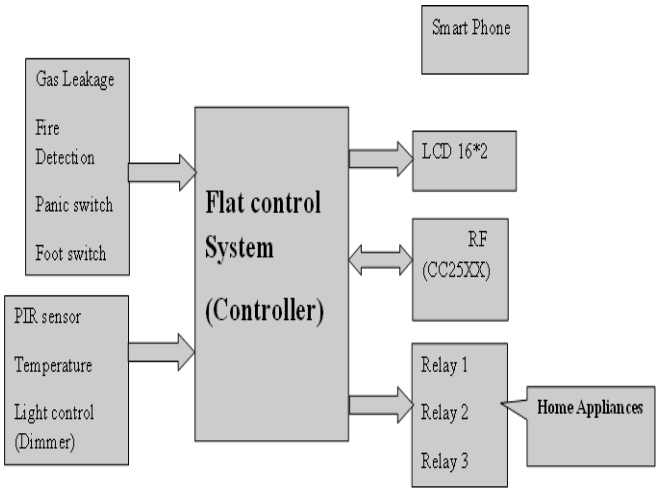

Fig.2: Predefined interfaces & device setting at flat terminal

Different types of sensors are used to monitoring activities in at or home. Gas sensor is used to detect gas leakage, fire sensor is used for fire detection, panic switch is used for any emergency occurred at home. Foot switch is used to detect any intruder at home. PIR sensor is used for person detector. LCD display is used to display message. RFCC2550 is used for communicating with PC or watchman terminal. Here relays are used as a home appliance. We can turn ON and OFF relays from watchman terminal as well as from android mobile phone.

IV. HARDWARE IMPLEMEENTATION

In the proposed flat and society control system consists of three technologies of smart home that are; integrated wireless technology, home energy management system, home automation and security.

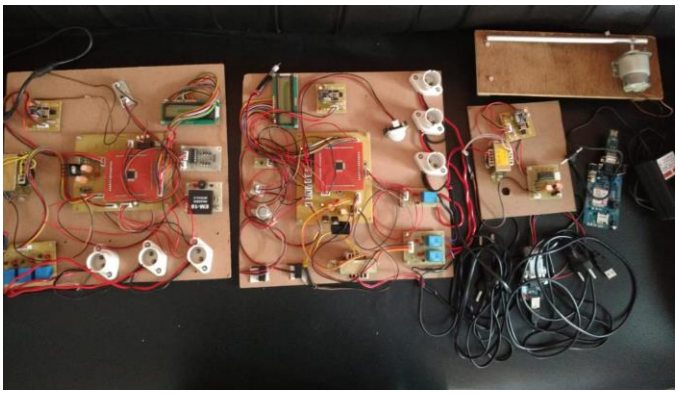

Fig. 3: Experimental setup of proposed system.

Figure 3 shows the experimental setup of the proposed system. In this system there are two main control systems. First is flat or home control system and another is society or community control system. The various sensors and home appliances are connected to the flat terminal for smart home management and different devices are connected to the society terminal for security and energy management from watchman terminal, so that we can monitor whole system.

V. RESULTS

The layout of the smart-home test bed is illustrated in the Figure 4; result shows the processing stage in which activities occurred in the flat terminal. In initial stage all LCD are ON and also the sensors of the flat terminal are ON for example if there is any person near flat section then PIR sensor is ON, if there is any gas leakage then gas sensor display value etc. In the same way output from the different sensors are displayed in LCD.

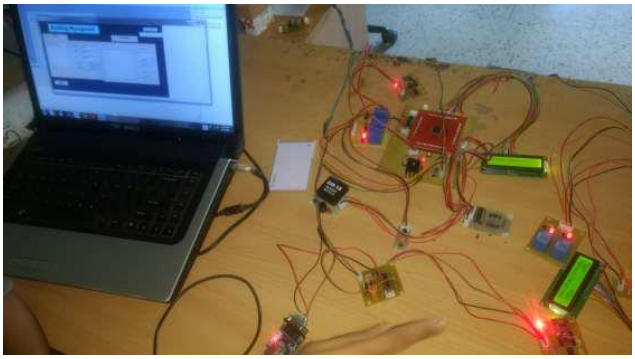

Fig. 4: Processing stage of proposed system

Figure 5 shows display of Building management system. In proposed system visual basics software is used for describing building management system in detail. There are two main subsections in building management system, first is flat section and second is society section. Respective sensor output is shown in Flat and society section in common portal as displayed in the Figure 5.

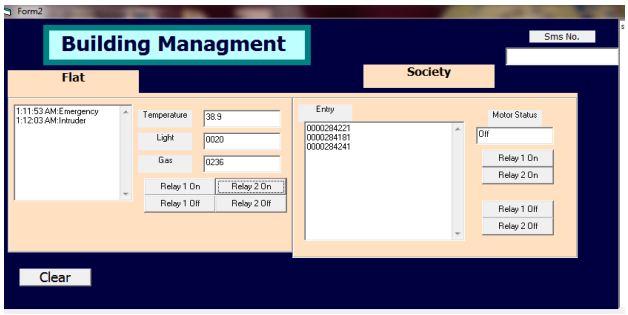

Fig. 5:Snapshot of Building management system

All appliances are connected to relay terminal for example fan, Ac, refrigerator, cooler, tube lights etc. and it is named as a relay 1 and relay 2 etc.These relays are switch ON and OFF as per user requirement from PC as well as mobile. Also user can monitor the real time situation at home. If any emergency occurred in flat then emergency switch is pressed in the system and message is displayed on mobile and PC, which is at watchman room.

The second subsection is society section; it will give idea about number of entries in the society which is displayed with its RFID number.

Fig. 6: Result of valid RFID card detection system

Figure 6 shows the result of valid RFID card. This RFID number is already saved in PC, if the person having RFID card then it is matched with saved number then and then society gate is open. In society section also have a relays, here we use relays to ON and OFF an appliances such as lights in corridor. It also displayed motor status.

VI. CONCLUSION AND FUTURE SCOPE

The existence and rise of smart homes has increased the need of applying intelligence in learning the activities of inhabitants and predicting their future demands in applications like resource management, energy efficient automation, security, and health monitoring. Instead of using separate home appliances, it is integrated as one system through use of network, so to provide user with added value. This work represents the general overview of smart home technology by considering all the basic component of the system. This study proposed a hierarchical and smart home-service architecture, which employed standard interface devices at the home end to separate the logic and user interfaces, and achieving multiple in-home displays. In this project two control system that flat control system and society control system. Moreover, this study applied a community broker role to integrate smart home services and extending the community's integration with the surrounding environment. By this way complete and integrated smart home system can be achieved.

This study is helpful for follow-up studies, employ data analysis applications and user perspectives in designing UX based interfaces. This proposed hierarchical architecture is expected to transform high-tech smart home systems into simple and easy-to-operate home automation solutions in the future.

VII. FUTURE SCOPE

When intending about future work in the field of Smart home applications run on smartphones, an important thought to consider is if the field is still in an early stage. Also

the main challenge for the industry is to educate the user about various functions by the system integration. And all system used in the smart home to be work as one unit and user friendly. In the future, we intend to implement these applications and also extend our model for multiple residents/ bigger societies in a smart home.

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