Integrated Services With Smart Home Control Systems Applications

Ahmed Nabih Zaki Rashed[1*], Ayman A.Kotb[2], Osama M. I. Elshazly[3], Ahmed B. Ali[4],
Ibrahim A. S. M. Khattab[5], Mohamed A. Elsayed[6], Mohey Z.Ramadan[7], and Angham Z.Kandel[8]
[1]Electronics and Electrical Communications Engineering Department
Faculty of Electronic Engineering, Menouf 32951, Menoufia University, EGYPT
[2,3,4,5,6,7,8]Giza Institute of Engineering, Electronics and Communications Engineering Department
[*]E-mail: ahmed_733@yahoo.com

Abstract— *Smart Home technology started for more than a decade to introduce the concept of networking devices and equipment in the house. Smart home is a house that uses information technology to monitor the environment, control the electric appliance and communicates with the outer world. Smart home is a complex technology, at the same time it is developing. A smart home automation system has been developed to automatically achieve some activities performed frequently in daily life to obtain more comfortable and easier life environment. According to the Smart Homes Association the best definition of smart home technology is: the integration of technology and services through home networking for a better quality of living. Many tools that are used in computer systems can also be integrated in smart home systems. This paper has deeply investigated the integrated services with smart home systems applications.*

Index Terms— Energy management, Internet access, Fire alarm, security, Solar cells, and Motion detection.

I. INTRODUCTION

Due to the rapid advances in wireless communication and information technologies it is now possible to embed various levels of smartness in the home [1, 2]. These smart homes are ones that can interact intelligently with their inhibitors to provide comfort and safe living. This interaction may range from simple control of ambient temperature to context-aware and mobile agent based services. An example of that is delivery of particular information content based on the smart home inhibitor location inside the home and the activities that he or she is engaged with. Wireless networks and sensors are seen to play an increasingly important role as key enablers in emerging pervasive computing technologies that are required for the realization of smart homes [3]. The wide spread of wireless networks in our daily life is enabled by the communication standards such as WiFi, Bluetooth, Zigbee, RFID, and cellular technologies. A combination of these standards is envisaged to be used to construct the smart home. Effectively all wireless technologies that can support some form of remote data transfer, sensing and control are candidates for inclusion in the smart home [4].

Home automation, intelligent house, smart home, home environment automation and control, systems integration, home network, home area network, management of home from anywhere, or domotics all refer to one thing which is a system uses different technologies to equip home parts for more intelligent monitoring and remote control and enabling them for influential harmonic interaction among them such that the everyday house works and activities are automated without user intervention or with the remote control of the user in an easier, more convenient, more efficient, safer, and less expensive way [5]. Without mobile, smart home services will lack the reach and coverage required for the mass-market, and an omnipresent interface for remote monitoring and control [6].

The existing niche home-automation market is being transformed by the mass-market availability of connected smart devices that enable a wide variety of new smart home services. Both the utilities and communications sectors are playing a significant role in this transformation [7]. On the one hand, utilities companies are widely deploying smart meter and smart grid technology, driven by public policy commitments in Europe and North America. This development is taking place in parallel with a growing consumer awareness of the need to consume energy responsibly and the potential to use new technologies to control household expenditure. In some countries, the growing adoption of home electricity generation capabilities and home charging points for electric vehicles is leading to the use of a wider range of smart utility devices in the home. At the same time, a sharp decline in the cost of broadband connectivity and embedded chipsets, and the emergence of low-power technologies for home area networking, are providing an expanding technological platform for the proliferation of smart home devices [8-10]. Mobile connectivity will be a crucial piece of the smart home puzzle. Without mobile, smart home services will lack the reach and coverage required for the mass-market, and an omnipresent interface for remote monitoring and control [11, 12]. This study outlines a vision for the mobile-enabled smart home of the future. It is intended to foster a common understanding of the smart home market opportunities and the associated challenges for companies and regulatory bodies from both the mobile and the utilities industries [13]. They explore the capabilities of mobile technologies and the mobile ecosystem that will be crucial for enabling companies from utilities, home security, mobile health and entertainment industries to design and deliver viable and valued smart home services [14].

II. BASIC ARCHITECTURE OF SMART HOME SYSTEM

A top level architecture of a smart home is illustrated in Fig. 1. It includes a server/gateway/router that can be used as the central point of connectivity for devices within the home as well as allowing connectivity to the outside world. The setup also includes smart sensors as well as appliances that have either wired or wireless connectivity. Communicating with the smart home from the outside can be done using one or a combination of the following external networks such as phone lines, xDSL lines, cable TV, GSM and power line networks [6].

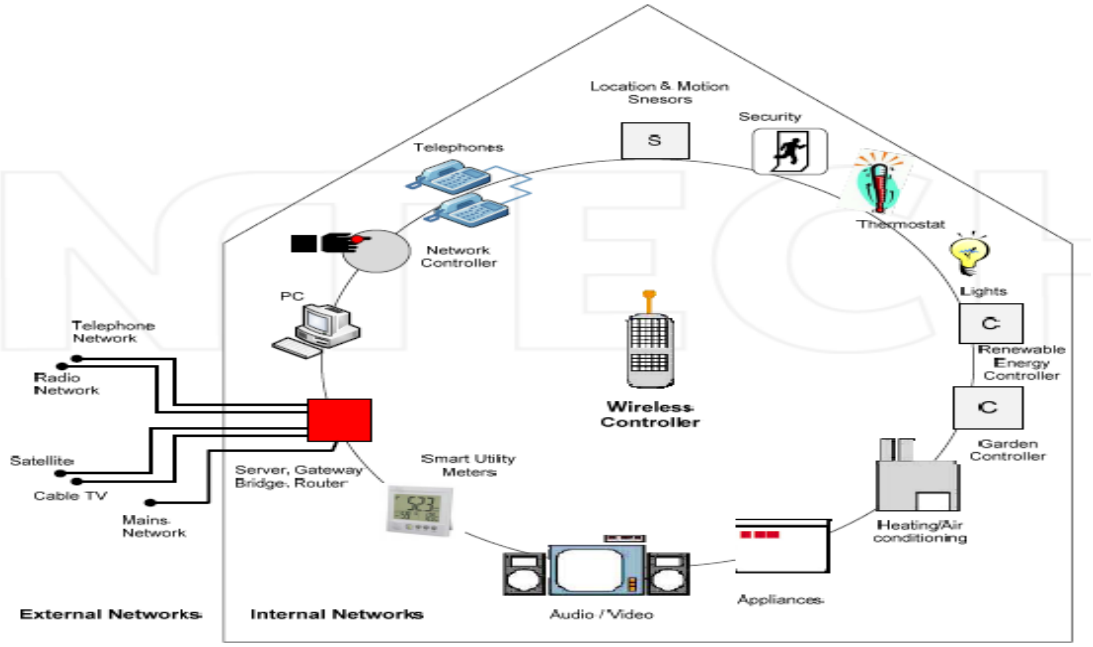

Fig. 1. Basic smart home network system architecture [7].

The wireless technology standards are everywhere. Bluetooth, Zigbee, RFID, WiFi, and cellular technologies are the most well known standards. A combination of these standards is envisaged to be used to construct the smart home. Effectively all wireless technologies that can support some form of remote data transfer, sensing and control are candidates for inclusion in the smart home portfolio. This section discusses some of these key wireless technologies. Bluetooth is a universal radio interface that enables various electronic devices, including mobile phones, sensors… etc, to communicate wirelessly through a short range radio connection [8, 9]. The introduction of this technology eliminated the requirement for wired connections, eased the connectivity process between devices, and enabled the formation of personal networks. The pervasiveness of Bluetooth enabled electronic devices is enabling ubiquitous connectivity and hence allowing the development of many applications [10].

III. Experimental Circuits Set Up and Analysis

The smart home is Based on the concept of home automation using a Android technology to control and monitor the physical parameters of environment. Example- Temperature, light intensity etc, The sensors are interfaced to the microcontroller whose analog data is process in the microcontroller and given out in their respective units. Example- Celsius,..etc. There are 4 to 5 user defined relay to control the applications and 2 to 3 sensor control relay to perform the automated task. Bluetooth is a new technology, which has at its center the goal of eliminating wired connections between computers. Instead of connecting with wires, every appliance has small transmitters/receivers. Here we have used a HC-05 Bluetooth module for communication. The recent well-known and a powerful technology in writing code for embedded system called as Arduino is used for project which is based on c/c++ languages.

- Microcontroller Atmega328P with Arduino bootloder.
- Bluetooth Module HC-05 SPP Supported.
- GAS Sensor MQ05 detects LPG and other gases.
- Temperature Sensor LM35 measure Temperature in degree Celsius.
- PIR sensor module for motion detection.
- LDR for light intensity.
- LCD to display reading of sensor.
- Relay for application switching.

The practical Electronic circuits

- Automatic room light Control with bi directional visitor counter circuit
- REMOTE CONTROL FOR home appliances
- solar cell SOLAR LIGHTING SYSTEM
- FIRE ALARM USING THERMISTOR
- power supply

III. 1. MAIN BOARD AND RELAY

Microcontroller Atmega328P with Arduino bootloder.
Bluetooth Module HC-05 SPP Supported.
GAS Sensor MQ05 detects LPG and other gases.
Temperature Sensor LM35 measure Temperature in degree Celsius.
PIR sensor module for motion detection.
LDR for light intensity.
LCD to display reading of sensor.
Relay for application switching.
Arduino Solar Tracker with Servo Motor.

III. 2. AUTOMATIC ROOM LIGHT CONTROL WITH BI DIRECTIONAL VISITOR COUNTER CIRCUIT

The objective of this project is to make a controller based model to count number of persons visiting particular room and accordingly light up the room. Here we can use sensor and can know present number of persons. In today's world, there is a continuous need for automatic appliances. With the increase in standard of living, there is a sense of urgency for developing circuits that would ease the complexity of life. Also if at all one wants to know the number of people present in room so as not to have congestion, this circuit proves to be

III. 3. REMOTE CONTROL FOR HOME APPLIANCES

Connect this circuit to any of your home appliances (lamp, fan, radio, etc) to make the appliance turn on/off from a TV, VCD or DVD remote control. The circuit can be activated from up to 10 meters. The 38kHz infrared (IR) rays generated by the remote control are received by IR receiver module TSOP1738 of the circuit

III. 4. SOLAR LIGHTING SYSTEM

The world cannot continue to rel for long on fossil fuels for its energy requirements. Fossil fuel reserves are limited. In addition, when burnt, these add to global warming air pollution and acid rain. So solar photovoltaic systems are ideal for providing independent electrical power and lighting in isolated rural areas that are far away from the power grid. These systems are nonpolluting,don't deplete the natural resources and are cheap in the long run.The aim of this circuit is to demonstrate how we can utilise solar light to electrify the remote areas, i.e., how we can store the solar energy and then use it for small-scale lighting applications. Solar cells generate direct current, so make sure that DPDT switch S1 is towards the solar panel side. The DC voltage from the solar panel is used to charge the battery and control the relay

III. 5. FIRE ALARM USING THERMISTOR

In this fire alarm circuit, a thermistor works as the heat sensor. When temperature increases, its resistance decreases,and vice versa. At normal temperature, the resistance of the thermistor (TH1) is approximately 10 kilo-ohms, which reduces to a few ohms as the temperature increases beyond 100°C. The circuit uses readily available components and can be easily constructed on any general purpose pcb

III. 6. POWER SUPPLY

In most of our electronic products or projects we need a power supply for converting mains AC voltage to a regulated DC voltage. For making a power supply designing of each and every component is essential. Here I'm going to discuss the designing of regulated 5V Power Supply. Let's start with very basic things the choosing of components

Component List :

1. Step down transformer
2. Voltage regulator
3. Capacitors
4. Diodes

Let's get into detail of rating of the devices :

Voltage regulator :

As we require a 5V we need LM7805 Voltage Regulator IC.

7805 IC Rating :

- Input voltage range 7V- 35V
- Current rating $I_{c=}$ 1A
- Output voltage range $V_{Max=5.2V}$, $V_{Min=4.8V}$

IV. CONCLUSION

We have deeply investigated the smart home and other home automation technologies require widespread changes to the way buildings are made, changes that call for cooperation among the manufacturers of construction components, utility suppliers, and regulatory agencies that oversee the building industry. With the rapid changes in electronic and materials technology, it may well be that new standard building technologies will become obsolete by the time it can gain a footing.

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Authors Biographies

Dr. Ahmed Nabih Zaki Rashed was born in Menouf city, Menoufia State, Egypt country in 23 July, 1976. Received the B.Sc., M.Sc., and Ph.D. scientific degrees in the Electronics and Electrical Communications Engineering Department from Faculty of Electronic Engineering, Menoufia University in 1999, 2005, and 2010 respectively. Currently, his job carrier is a scientific lecturer in Electronics and Electrical Communications Engineering Department, Faculty of Electronic Engineering, Menoufia university, Menouf. Postal Menouf city code: 32951, EGYPT. His scientific master science thesis has focused on polymer fibers in optical access communication systems. Moreover his scientific Ph. D. thesis has focused on recent applications in linear or nonlinear passive or active in optical networks. His interesting research mainly focuses on transmission capacity, a data rate product and long transmission distances of passive and active optical communication networks, wireless communication, radio over fiber communication systems, and optical network security and management. He has published many high scientific research papers in high quality and technical international journals in the field of advanced communication systems, optoelectronic devices, and passive optical access communication networks. His areas of interest and experience in optical communication systems, advanced optical communication networks, wireless optical access networks, analog communication systems, optical filters and Sensors, digital communication systems, optoelectronics devices, and advanced material science, network management systems, multimedia data base, network security, encryption and optical access computing systems. As well as he is editorial board member in high academic scientific International research Journals. Moreover he is a reviewer member and editorial board member in high impact scientific research international journals in the field of electronics, electrical communication systems, optoelectronics, information technology and advanced optical communication systems and networks. His personal electronic mail ID (E-mail:ahmed_733@yahoo.com). His published paper under the title "**High reliability optical interconnections for short range applications in high speed optical communication systems**" has achieved most popular download articles in Optics and Laser Technology Journal, Elsevier Publisher in year 2013. Dr. Rashed is the

supervisor of the project of Smart Home Applications in department of communications engineering and electronics, Giza Higher Institute of Engineering and Technology.

Eng. Ayman A. Kotb was born in Giza state, Egypt country in 25 November, 1975 .He is student's project with smart home applications. Studying final year at department of communications engineering and electronics, Giza Higher Institute of Engineering and Technology, his job carrier is a Head of Technical Support and Maintenance Department, Reem Research & Electronics Manufacturing S.A.E.

Eng. Osama M. I. Elshazly was born in Atfih city, Giza state, Egypt country in 7 January, 1984. He is student's project with smart home applications . Studying final year at department of communications engineering and electronics , Giza Higher Institute of Engineering and Technology ,his job carrier is PLC control unit , Iron and Steel Company Egyptian.

Eng. Ahmed B. Ali was born in sohag state, Egypt country in 12 July, 1980. He is student's project with smart home applications. Studying final year at department of communications engineering and electronics, Giza Higher Institute of Engineering and Technology, his job carrier is Director of management and technical.

Eng. Ibrahim A. S. M. Khattab was born in Giza state , Egypt country in 13 August, 1982. He is student's project with smart home applications. Studying final year at department of communications engineering and electronics, Giza Higher Institute of Engineering and Technology. His job carrier is Director of the company's khattab Contracting.

Eng. Mohamed A. Elsayed was born in Kafr El Dawdar city, Al Buhayrah state, Egypt country in 7 September, 1991. He is student's project with smart home applications. Studying final year at department of communications engineering and electronics , Giza Higher Institute of Engineering and Technology. He has gained trainig courses in software engineering applications.

Eng. Mohey Z. Ramadan was born in el saaf city, Giza state, Egypt country in 27 April, 1991. He is student's project with smart home applications. Studying final year at department of communications engineering and electronics , Giza Higher Institute of Engineering and Technology.

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Eng. Angham Z. Kandel was born in ElBahariya oases state, Egypt country in 1 August, 1993. He is student's project with smart home applications. Studying final year at department of communications engineering and electronics, Giza Higher Institute of Engineering and Technology.