International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)
Web Site: www.ijettcs.org Email: editor@ijettcs.org
Volume 5, Issue 4, July - August 2016 **ISSN 2278-6856**

Smart Office Automation System

Renuka Bhuyar[1], Saniya Ansari[2]

[1]Student, Dept. Electronics and Telecommunication Dr. D. Y. Patil School of Engineering Pune, India

[2] Prof., Dept. Electronics and Telecommunication Dr. D. Y. Patil School of Engineering Pune, India

Abstract

Design & implementation of smart automation system for office environment is being done in this system. Various controlling subsystems are designed based on lighting, ventilating, luminance, security. Various sensors are used to extract the real time information i.e. temperature, light intensity, smoke, motion sensor are used. This data collected through these various sensors is then send to ARM 11 Controller. Further it is send to PC where data is saved. Through Network switch this data is send to other PC's. The data collected is stored as database and can be accessed anytime. The data is send to the android or any internet enabled device. This system also provides need based emergency services like Ambulance call, fire alarm. Biometric fingerprint is used for security purpose. Manual mode and automatic mode are two alternative modes designed to promote the usability of smart office system. Control of electric lighting fixtures of different office spaces is done.

Keywords: — automation system; smart office system; alternative modes.

1. INTRODUCTION

Nowadays most of the People spend lot of time in offices. Office environment directly affects the working efficiency of employees. So comfort is needed in office. Two decades ago, technology at its best meant a fax machine and an electronic typewriter; today it's an iPad connected to an enterprise cloud solution. A smart office - a place that makes life easy for employees and customers, empowers and it increases their ability to stay connected through by making use of various advanced technology and different tools and solutions to improve the efficiency of users. As the physical boundaries are being bridged, a complex and competitive world focuses on innovation and creativity is being developed. The world is fastly experiencing the emergence of intelligent growth zones so smart office- has fast become the need of the hour. A smart office is one that ensures the optimal and effective utilization of physical infrastructure and IT resources. In other words, offices in today's generation of information technology are automated. There is need for technological advancement environment which is very transparent. Thus the office automation allows the systems to become more transparent, it enables information sharing more openly, which creates an opportunity for making an informed decision which has an great impact across the functioning of the business. The effective advanced automation, use of various communication tools in the system shows the positive impact on the business and growth of company or any organization over a period of time. Advantage of smart office is the elimination of internal reporting processes, i.e. in/out timings of the employees by an open office arrangement. It also increases the productivity through enhanced communication among team members which affects in the output.

A smart office is to be designed with one thing in mind to release full potential of workforce. It's not rocket science just innovative thinking and new technology that best fits people's needs. Office automation among other things facilitates easy documentation and real time communication. Office automation refers to the integration of office functions usually related to managing information The modern history of office automation began with the typewriter and the copy machine, which mechanized previously manual tasks. Today's office automation is increasingly understood as a term that refers not just to the mechanization of tasks but to the conversion of information to electronic form as well. The effective communication tools or use of automation in the output of an organisation that showcases the positive impact on the bottom line over a period of time.

Smart building is like a smart home, which is an intelligent space that optimizes efficiency, safety, comfort and by collecting and analyzing sensor data .The building sector consumes lot of energy. It is one of the main cause of the global energy consumption. Modern buildings contain sophisticated control systems ,complex mechanical devices and various features to improve the safety, productivity of occupants and safety. A smart building can be considered a super system of interconnected building subsystems. The smart building will requires connectivity between all the systems, equipments in a building. It helps building managers to visualize information and make fast and precise decisions. Through a building automation or building management system (BAS), the control of a building's different

subsystems is automatically centralized i.e. lighting ,heating, ventilation and air conditioning, and other systems are achieved. Improved efficient operation of building systems, occupant comfort, and decrease in energy consumption and operating costs, and improve life cycle of utilities are the objectives of building automation system. BAS core functionality keeps building climate within a specified range, based on an occupancy schedule, provides light to rooms, monitors performance and device failures in all systems, and provides malfunction alarms to building maintenance staff. A BAS should reduce building energy and maintenance costs compared to a non-controlled building.Existing building architectures consumes large amount of energy. Significant amount of energy can be saved by managing the electric consumption in commercial buildings. Because of these issues, the concept of Smart office emerges.

This concept of smart office can be applied to whole building, i.e. smart office building which reduces the energy consumption. In this paper, a comprehensive smart office system concentrated lighting, ventilating illuminating, is designed in order to save energy and to promote the satisfactions of the employees. Smart Office Energy Solutions achieves energy savings with a multifaceted approach that capitalizes on human behaviour.

2. RELATED WORK

Researchers have put focus on different controlling strategies and have controlled different parameters of smart office. Various parameters, processing's and results of various papers are discussed in this section.
Donatella Sciuto et al has proposed a system to automate the design process of such smart spaces. There is a growing interest for efficient management of the energy consumption of the buildings, both in academia and industry. Unfortunately, nowadays, with ad-hoc solutions these systems are still designed manually. As a consequence, a huge effort has to be spent for each new smart building. Within this context, aim of this system is to propose a methodology [1].Giovanni Bettinazzi et al has proposed a general method and algorithms to integrate residential smart buildings with smart grids. Such integration system has the ability to deal with the smart building to forecast its energy consumption; the proposed method is able to learn to use of such information to forecast the energy consumption and the building occupants habits. For selecting the most appropriate appliance usage scheduling it presents a method given a energy reduction request coming from the smart grid [2].

Tseng-Yi Chen et al , The system proposes a solution for porting uIP library to the wireless sensor network devices and presents the IPv6 ready sensor device and integration of a speaker module. Based on the integrated system to help people escaping from disaster environment, it also propose a safe building application. The system contributions are building an IPv6 ready wireless sensor network environment and develop a safe building system to make the concept of IoT in IPv6 network environment come true [3].Shin, M et al has proposed a system which presents the transient simulation studies of smart building power networks and modeling using PSCAD. A typical BPN is modelled based on the real load characteristics of a office building, UPS with multiple static transfer switches is included to protect the system while uninterruptedly feeding critical loads. The simulation results show that the given BPN can remain stable during the outage. The effects of the distribution automation on the grid is outlined [4].

Radloff, A. et al has proposed a system which shows two use cases demonstrating typical applications of approach in multi-display environments: (1) to modify the arrangement and layout of views and (2) to interact with the displayed information within a view [5].Jung, M. et al ,Building automation devices are considered for an integration in the IoT, where they are used for example to realize a sustainable and smart building operation. Ubiquitous access to the objects is facilitated by the concept of building automation systems (BAS) that already provide a virtual representation, mainly sensors, control devices and actuators of physical objects,. This system investigates the readiness and compatibility of existing BAS technologies with IPv6 [6].

Hennecke, M.H et al, Presents a system which implicitly interacts with multiple users in a smart conference room. In this system the lighting conditions are automatically controlled and the attention of the audience is directed to the active speakers based on audio source localization.[7].Bujdei, C.et al has proposed a system which presents the study on what represents and how it is possible to ensure the indoor office comfort, which are the most important types of comfort (thermal, visual, acoustic, air quality, etc.) and how each of them could be analyzed (characterized) [8].

Shiquin Shen et al, This system proposes a novel mobility simulation framework based on behaviour patterns for office environments. Simulation time controller is the base part, on which we model the structure of offices and define behaviour patterns [9].Nati, M et al, This system presents the outcomes of a study that examines human interactions and mobility patterns in indoor spaces such as office environments. An initial analysis of these traces provides deeper insights into the encounter characteristics between static infrastructure devices and human-held devices. The presented findings also confirm that opportunities between mobile devices derived from observations of infrastructure

devices can introduce significant errors into the modelling of such encounters [10].

Moreno, M.V. et al, This system proposes to model the energy consumption associated with services provided in buildings to help select the best strategies to save energy. To verify the feasibility of the proposed approach using measurements of relevant parameters affecting, it carry out some analysis in a reference building of which we have contextual data [11].Hui-Huang Hsu et al, This system aims to solve this predicament and contributes a higher quality to the smart meeting room. Hence, Microsoft Kinect and Bluetooth techniques to build an smart conference system with personalized Bluetooth supported equipment to identify each participant's identity, and use these IDs to search the central database in order to retrieve his/her contact information. In this smart meeting room, participants don't need to bring additional equipment but only to use his/her Bluetooth supported cell phone. This simplified smart conference room can provide great benefits for the users, this is the main purpose of this paper [12].

Tangjian Deng et al, A smart meeting room usually refers to a working environment, which can provide meeting attendees with a highly effective information acquisition and exchange space, with an aim to improve the working and decision-making efficiency. System abstracts devices spontaneous interoperations into three categories and present design and implementation of a context-aware spontaneous interoperation of information devices in building a smart meeting room [13].

3. SYSTEM ARCHITECTURE

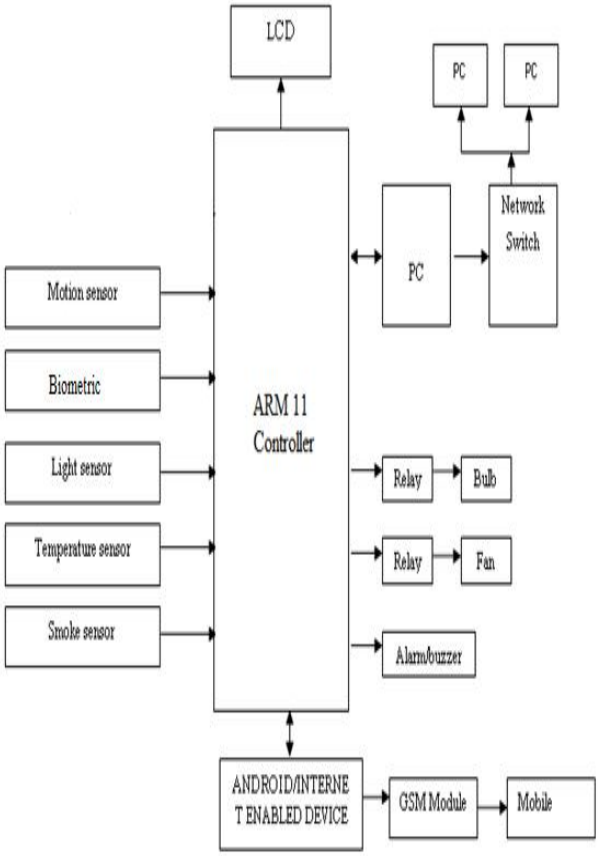

Fig.1. Block diagram of smart office system

The smart office is designed for users comfort and leisure. It works on automatic and manual mode. In automatic mode the working of system will depend On/off conditions of various sub-systems i.e. lightning and ventilating. The block diagram of smart office system is showed in Figure.1.It consists of various sensors attached to the controller.

PIR Motion sensor will detect the presence of any person and also counts the number of people entered in office. The system will get activate only in presence of person. If light intensity increases or decreases below or above some value, the bulb will glow. The system will then automatically adjust the light intensity according to the atmosphere. LM 35 is the temperature sensor used to sense the surrounding temperature. If the temperature increases/decreases the fan will be ON. MQ-7 smoke sensor is used to detect the presence of smoke/fire. Alarm/buzzer will get activate in presence of smoke/fire. If there is presence of smoke/fire message will be send to the Fire extinguisher and to the service rooms so that

immediate service can be provided .Fingerprint Identification Module is used for security purpose. The finger prints of all employees in the office can be taken and enrolled in it. This will only allow the office employees to enter the area. If other person tries to enter, it will show No match and that person will not be allowed to enter in the office. Thus a fully secured system is designed. All the sensed data is send to the ARM 11 Controller. The data is displayed on LCD display.

This data sensed through different sensors is then send to computer and is stored in Office's database. This data is then send to other computers in service room from where the data is being monitored. The data can be controlled and monitor from service rooms. Other computers are connected to the main computer via Network switch. The smart office data can be remotely monitored through Android or any internet enabled device .Call will be given to the office admin if there are any changes in the parameters of office. If there is any accidental emergency, the system calls the ambulance and call is given to the service room .

4.FLOWCHART OF SYSTEM

The flowchart of system is shown in Fig.2.Firstly microcontroller, LCD ADC, UART & IO Initialization will be done. Second step it will check for sensor's input.(Temperature, LDR, smoke, PIR sensor).Take the sensor's data. After that it will check for the threshold value. If it crosses the threshold value, the controlling devices will be ON. The threshold value for the sensor is decided by the environmental factors. Otherwise the controlling devices will be OFF. The controlling devices which are used are bulb, fan, Alarm buzzer. This data is then displayed on GUI(Graphical user interface).The sensor's data is viewed on webpage as shown in Fig.4.This webpage can also be viewed on mobile screen. This information can be accessed through android or any internet enabled phone. To get this information on mobile phone (to view the webpage),we have to put the IP address of local host on mobile.

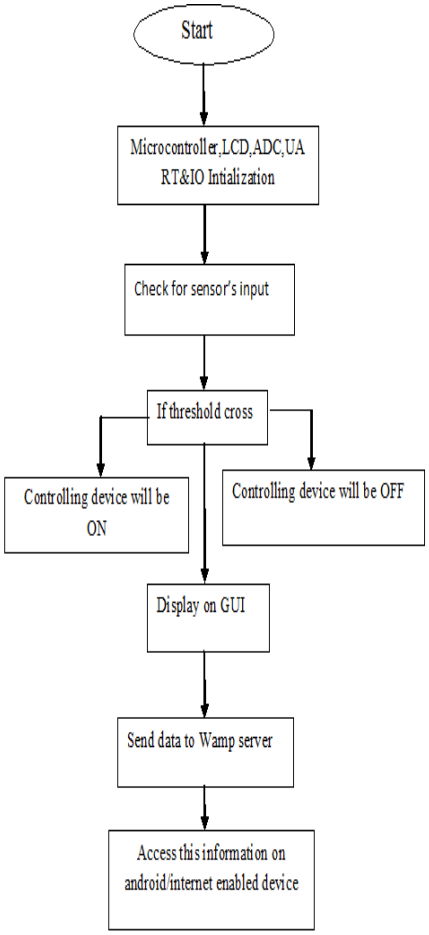

Fig.2. Flowchart of system

5.RESULT

Fig.3. Experimental Setup Of Implemented System

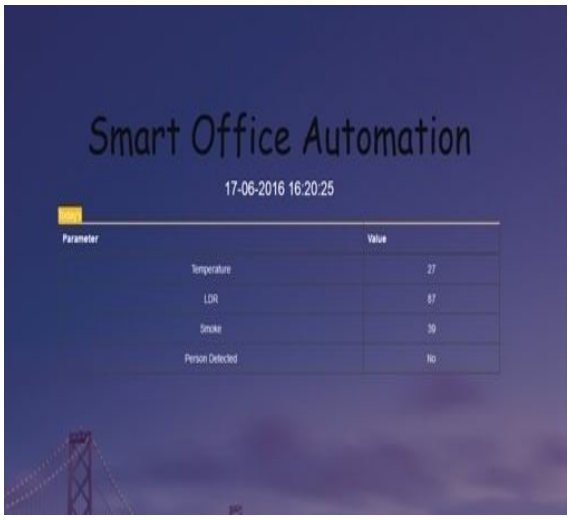

Fig.4.Showing sensor's data(output) on webpage

The Fig.3. shows the complete structure of hardware of proposed system. Which have used ARM lpc1769μc, Buzzer, relays, transformer, LCD display , Fans , LED bulbs and sensors (Temperature, , Smoke, , PIR and LDR sensors).And for seeing the results of this system we need one PC and personal mobile. By combined all these elements made a new application for Smart automation for office Environment successfully.Fig.4. shows the sensors data on Webpage .It can be attached to other PC's in the service room. This data can be viewed as it is on mobile screen also. For this we have to enter the url of webpage on server.

6.CONCLUSION

In this system, close attentions are given to user's comfort and satisfaction. The illuminating, lighting, heating, ventilating, smoke detection, security, systems are being designed. The smart office system in the system is based on an independent smart office and then expanded to the whole smart building. In this smart office system, two working modes automatic mode and manual mode are use. The manual mode is viewed as a supplement of the automatic mode.

ACKNOWLEDGEMENT

This study is useful for the smart automation systems for office environment and in understanding the different subsystems for office use by using ARM controller and it is used to reduce the power consumption.

References

[1]. Luigi Martirano, Matteo Manganelli, Luigi Parise and Danilo A. Sbordone "Design of a fuzzy-based control system for energy saving and users comfort" Dept. of Astronautics, Electrical and Energetics Engineering Sapienza University of Rome, Italy IEEE ,2014

[2]. Donatella Sciuto ; Politec. di Milano, Milan, Italy ; Alessandro Antonio Nacci "On how to design smart energy-efficient buildings" Embedded and Ubiquitous Computing (EUC), 2014 12th IEEE International Conference .

[3]. Tseng-Yi Chen Hsin-Wen Wei ; Nien-i Hsu ; Wei-Kuan Shih "A IoT Application of Safe Building in IPv6 Network Environment" Computer Software and Applications Conference (COMPSAC), 2013 IEEE 37th Annual

[4]. Francis Therrien and Juri Jatskevich "Modeling and transient simulation studies of smart buildings power networks with UPS and distribution automation" Department of Electrical and Computer Engineering,The University of British Columbia Vancouver, BC, Canada IEEE,2013

[5]. Axel Radloff, Anke Lehmann, Oliver Staadt, and Heidrun Schumann "Smart Interaction Management: An Interaction Approach for Smart Meeting Rooms" Intelligent Environments (IE), 2012 8th International Conference IEEE,2012

[6]. Jung, M.;,Reinisch, C. ; Kastner, W. "Integrating Building Automation Systems and IPv6 in the Internet of Things" Innovative Mobile and Internet Services in Ubiquitous Computing (IMIS), 2012 Sixth International Conference .

[7]. Marius H., Hennecke Christian, Kleine-Cosack Gernot "Illumisense: Context sensitive illumination" . Hands-free Speech Communication and Microphone Arrays (HSCMA), 2011 Joint Workshop IEEE,2011

[8]. Catalin Bujdei and Sorin Aurel ,Moraru Brasov, Romania "Ensuring Comfort in Office Buildings: Designing a KNX Monitoring and Control System" Intelligent Environments (IE), 2011 7th International Conference IEEE,2011

[9]. Shiquin Shen , Nanjing , Ningning Cheng .Guihai Chen "A Behavior Pattern Based Mobility Simulation Framework for Office Environments" Wireless Communications and Networking Conference, 2009. WCNC 2009. IEEE

[10]. Gluhak, A. ; Martelli, F. ; Verdone, R. "Measuring and Understanding Opportunistic Co-presence Patterns in Smart Office Spaces" Green Computing and Communications (GreenCom), 2013 IEEE and Internet of Things (iThings/CPSCom), IEEE International Conference on and IEEE Cyber, Physical and Social Computing

[11]. Moreno, M.V. ; Comput. Sci. Fac., Univ. of Murcia, Murcia, Spain ; Skarmeta, A.F. ; Dufour, L. ; Genoud, D. "Exploiting IoT-based sensed data in smart buildings to model its energy consumption" Communications (ICC), 2015 IEEE International Conference

[12]. Hui-Huang Hsu ; Yi Chiou ; Yu-Ren Chen ; Shih, T.K. "Using Kinect to Develop a Smart Meeting Room"Network-Based Information Systems (NBiS), 2013 16th International Conference .

[13]. Tangjian Deng , Feng, L. ; Yue Suo ; Yu Chen "Spontaneous Interoperation of Information Appliances in a Smart Meeting Room" Intelligent Systems and Applications (ISA), 2010 2nd International Workshop