

# Smart Home: Security and Acuteness in Automation of IOT Sensors

M.Meenakshi, R.Naresh, S.Pradeep

**Abstract**— Smart home provides a well secured surroundings and a quality by utilizing the energy resources in an efficient manner. Looking at the worldwide energy crisis, home automation should be made common globally as aquintes sential element in overcoming loss of energy and using renewable resources. One of the basic problems in home automation is the amount of costit demands to get operated. Hence reducing the cost of automation is a factor to be concerned in the world. In this research study, an affordable home automation system based on Arduino microcontroller has been launched that operates with Modbus protocol. A Bluetooth module has been interfaced with Arduino, thus weeding out the deployment of desktops and laptops. The whole system has been tested and observed to run favourably and perform the desired functions like switching ON/OFF, speed regulation of fan, temperature control of AC and light acuteness management (Via Voltage Regulation). A computer-programmed app is designed in the proposedsetup which enables the operators to manage up to 20 devices incorporating various electrical appliances and sensors via Bluetooth technology. In the present world, a majority of home automation systems are designed for specific purposes while proposed system is built to fulfil typical objectives which can be operated in a home without much difficulty. The recommended apparatus exhibits more characteristics than the usual home automation systems as it incorporates an ultrasonic sensor and soil moisture sensor for water table detection and automatic plant irrigation system respectively. The recommended model of this automation system is applied and examined on gadgets and it produced desired results.

**Keywords:** Security, Sensor, Bluetooth, complexity.

## I. INTRODUCTION

Home automation system is a setup designed with the help of IT and control system to overcome the physical activity. The present technological evolutionenables to use electronic gadgets to control the home appliances distantly. An automated device possesses the skill to operate in a flexible and accurate way. The thought of home automation is a center of attraction for scholars and household accessories companies. Home automation system is also time and energy saving [2-3]. Initially property computerization systems were used in instruments used to reduce labour but now its main purpose is to facilitate elderly and differently-abled folks to perform their regular chores and manage the household devices comfortably. According to a well-known research [4], approx. 2 million automatic home devices were utilized in the United States of

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America (USA) during 2012 with an elevating scale of 46%. A cordless home computerization system makes the use of several technologies like ZigBee, Z-Wave, GSM, GPRS, Wi-Fi and Bluetooth. All of them have their respective merits and demerits. A Bluetooth based cordless home computerization system can be operated cheaply and is easy to implement in any home. According to a study, Bluetooth systems have proven to be swifter than wireless and GSM systems. Bluetooth can transfer data sequentially up to 3 mbps within a range of 10-100m corresponding to the kind of Bluetooth technology. The offered approach delivers the design and instalment of a cheap and easy-to-use home automation system using Bluetooth engineering. Its architecture makes the use of Arduino device, Bluetooth, sensors and android app. Bluetooth HC-06 is paired with Arduino and electrical devices which are combined with Arduino through relays. Android acts as a communication medium between smartphone and Bluetooth module. This whole set up is attached to Arduino board. The advised method can regulate the appliances and monitor the sensors from far-off places. A majority of home automation systems are modelled for old-aged and differently-abled people or for any other purpose. The recommended design also offers, home automation system for general purpose, allows easy implementation in an existing home. Ultrasonic sensor to detect that water level in soil moisture sensor to automate flooding.

## II. RELATED WORKS

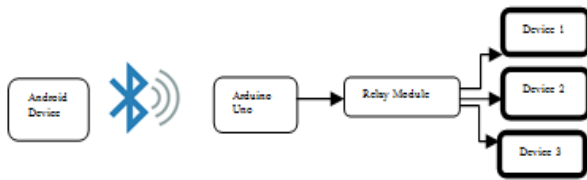
### A. Smart Home Automation System Using Bluetooth Technology

In this work [1], the designed system consisted of components like Arduino board, Bluetooth module, smartphone, ultrasonic sensor and moisture sensor. It allowed the customers to control up to 20 devices by connecting the user's smartphone to the Bluetooth module. This system assures the Bluetooth to be swifter than wireless and GSM systems with propagation of data speed of up to 3mbps in a range of 10-100m depending upon the type of module used. Various sensors like Water level of tank is measured by Ultrasonic sensor and water content of soil inside tank is measured by soil moisture sensor. This data was transferred to the smartphone where user can check for further changes. Coding for this system was performed in Arduino Integrated wireless network between smartphones and Arduino board. Password protection was used to allow access only to the authorized users. It was tested in a range

of 20 metres and proved to be 100% accurate. All the connected electronic devices were controlled and accurate data of water table and earth dampness were obtained on the electronic gadget. However, it had some problems like it cancontrol limited number of devices and that too in short range. Most of the houses have atleast 20 electronic devices to be controlled. So it was not suitable for large houses.

*B. A Bluetooth-based Sophisticated Home Automation System Using Smartphone*

In this work [2], the system was builtwith the inclusion components like Arduino board, Bluetooth module and smartphone. It could control electrical appliances like lights and DC servomotor. This system allows changing the light intensity and speed of DC motor with the help of android application installed in the user’s smartphone. It used Arduino board which had 14 digital input/output pins and HC-05 Bluetooth module which had 6 pins. This module could perform in Master and Slave modes. This entire set up works in the latter mode. The android device propagates signals through bluetooth to the Arduino which generate output signals. These generated signals manage different devices. PWM (Pulse Width Modulation) controls the speed and position of DC servo motor. This system has password protection feature so that only verified users are able to access the property. This system was a small and compact system which could be used to control only a few devices. The range to control the devices was limited to certain metres.

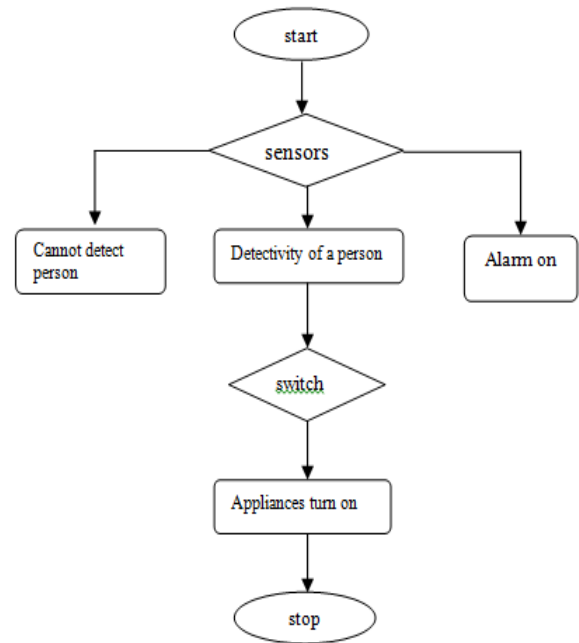


**Figure 1**System Architecture

*C. Task Scheduling for Energy Efficient Smart Home Automation by Low Cost Arduino*

In this work [3], the system was designed with the help of Arduino MEGA board, Bluetooth module, Android application, sensors, and actuators using ZigBee and wired X10 protocols. ZigBee was responsible for system reliability and X10 ensured decrease in total cost of the system by integrating various controllers. Ethernet shield ensure the internet connectivity of the Arduino. Arduino board consists of a computer program which spreads through the HTTP protocol with the computer program. Sensors were used for transmitting information like temperature, humidity, motion and actuators performed functions like switching and dimming. ZigBee and simple X10 protocol gave this system versatility and scalability. An android application was developed to connect user and set a communication with actuators and sensors. This android application is synchronized with the database in Arduino board which is located on SD card reinforced on that Ethernet shield. Arduino board uses scheduling algorithm to operate different devices according to the schedule given by the user. This algorithm is sent to android device for user’s approval. It is stored in database to check regularly and trigger events at specific time. This system was flexible, scalable and expanded to large houses. But use of wiring

could increase the cost of installation. So use wireless protocol to reduce the installation costs.



**Figure 2** Flow Chart

*D. Internet of Things(IOT) - Mobile-based Home Automation*

In this work [4], the set up comprises of Arduino microcontroller board, HC-05 bluetooth module and android phone. Android application was designed using android studio. This app has 5-6 icons parallel to various electrical appliances like lamp, AC, microwave oven, TV, fan and DC motor. The status of each appliance is notified by LEDs. Arduino Board is paired with smartphone through bluetooth using serial communication protocol. When data is sent from phone to Arduino board, it gets verified and the status of corresponding LEDs changes. This system could now be used from a distant location. So it was not suitable for large houses. It did not use sensors so it was limited to switching on and off an appliance. It could regulate the speed and intensity of the appliances connected with the Arduino board. It could operate only 6 appliances. Since every house has a very large number of appliances, it could be prove suitable only for a single room.

*E. Home Automation by Arduino and Modbus Protocol in Low Cost*

In this work [5], a low cost home automation can be created by using Arduino microcontroller and Modbus protocol. Arduino is a microcontroller which can receive inputs in the form of switches, e-mail or intensity of lights. It gives output in the form of turning on electrical devices, LEDs changing or sending/receiving an e-mail. Modbus is a sequential propagation method used to transmit data between electronic devices. This system includes sensor like temperature , motion , light and smoke as loads and lamps, a siren and an AC as outturns regulated by the Arduino board. DHT sensor collects information about the

temperature and humidity of the room, sends it to the Arduino board which compares it with the value set by the user and changes are done in the cooling of the AC. A light sensor gathers information about the light acuteness all over the place and its intensity is changed accordingly. “my SCADA”, open source software, controlled this setup through WWW. This system used C++ programming with the help of Modbus library for network connections. The

mobile device was able to connect to the router. The router was connected to the Arduino via Ethernet cable. It could switch lights on and off and adjust temperature automatically. It used a lot of wiring hence could not be used in pre-built places. It had few sensors and short-range connectivity, so it was not suitable for big houses. The future model of this system uses ZigBee protocol which can decrease the amount of wiring.

Table I

TITLE	PROTOCOL USED	USER INTERFACE	ADVANTAGE	DISADVANTAGE
Smart Home Automation using Bluetooth Technology[1]. Muhammed A Sadullah, Khali Ullah.	Bluetooth	Android Application	Low Cost. Worked with 100% accuracy in short range.	Not suitable for installation in large houses.
Bluetooth Based Sophisticated Home Automation System Using Smartphone[2] Sukhen Das, Sanjoy Ganguly, Souvik Ghosh, Rishiraj Sarkar, Debapama Sengupta.	Bluetooth	Android Application	Low cost, fast and reliable. Use of graphical results for comparative study.	No use of sensors, so could not change the intensity of lights.
Low Cost Home Automation using Arduino and Modbus Protocol [5] Vahid Hassanpour, SedigheRajabi, Zeinab Shayan, Zahra Hafezi, Mohammed Mehdi Arefi.	Bluetooth-Modbus	Android Application	Energy-efficient, convenient. Availability of sensors for self-controlling according to the condition.	Costly and could not be easily installed in pre-built places.
Mobile - based Home Automation using Internet of Things(IOT)[4] Kumar Mandula, RamuParupalli, CH.A.S. Murty, E.Magesh, Rutul Lunagariya.	Bluetooth	Android Application	Low cost. Password-protected to avoid unauthorized access.	Limited to 6 devices only. No sensors used to control light intensity.
Low cost Arduino/Arduino-based Energy-efficient Smart Home Automation System with Smart Task Scheduling [3] Kim Baraka, Marc Ghobril, Sami Malek, RouwaidaKanj, Ayman Kayssi	Bluetooth, Simple X10, ZigBee	Android Application	Use of database for comparative instruction. Could be installed in large houses.	High Cost
A Comparative Study And Implementation of Real-time Home Automation System [6] Amitya Ranjan Behera, Jyoti Devi, Deepta Sundar Mishra	Simple Object Access Protocol (SOAP), Bluetooth	Android Application	Low cost. Can be installed in large houses.	No sensors used. Deals with changing of status only.

Design and Implementation of a Low-Cost Arduino-based Smart Home System [7] SouveerGunpath, Anshu Prakash Murdan, Vishwamitra Oree	Raspberry Pi, Bluetooth	Android Application	Can be operated manually and automatically. Can be installed in large houses.	High Cost. No user authentication.
Enhanced Home Automation System using Internet of Things (IOT) [8], SLS Shri Harsha, S Chakrapani Reddy	Bluetooth	Android Application	Low cost. Adjustment of intensity/speed of devices with the help of sensors.	Cannot be installed in large houses. No user authentication.

III. CONCLUSION

The comparison of home automation systems is presented based on the detailed analysis. A microcontroller, a user interface, a communication interface and their performance factors are compared. Home Automation which is Low Cost that produce high performance allow to create a number of Do-It-Yourself(DIY), e.g., Raspberry Pi, Arduino etc. This review explained different home automation system, e.g., Web-based, E-Mail based, Bluetooth & Mobile-based, SMS& ZigBee-based and DTMF-based, cloud-based and internet-based. In future, home computerization will be smarter and faster. It would reach large-scale surroundings like schools, hospitals, colleges etc.

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