



# A Survey on Internet of Things Based Home Automation System

Pooja N.Pawar<sup>1</sup>, Shruti Ramachandran<sup>2</sup>, Nisha P.Singh<sup>3</sup>, Varsha V.Wagh<sup>4</sup>

B.E Student, Dept. Of CSE, GES's R.H.Sapat COE, Nashik, Maharashtra, India<sup>1,2,3,4</sup>

**ABSTRACT:** A low cost and user friendly smart home system, which uses an Android application to communicate with the cloud and provides switching functionalities, is presented. The System eliminates the use of Personal Computer (PC) and other Computer Peripherals which leads to overall reduction in the cost of the system. Unlike the similar system which uses either of the Bluetooth module network, the proposed system uses Internet of Things (IoT) for monitoring and controlling the Electrical/Electronic Appliances, remotely. Switches of Electrical/Electronic appliances are integrated to the system in order to demonstrate the effectiveness and feasibility of the system.

**KEYWORDS:** Internet of Things, Smart Home, Home Automation, Android Smartphone, Arduino

## I. INTRODUCTION

IoT is a trending concept in which the machines or things are made to interact with the environment by exchanging data and information sensed by the sensors. The devices gather information and data from the surrounding environment by using various latest technologies and then there is a data flow between devices. Typically, IoT offers advanced connectivity of devices, systems, and services which is beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices will usher in automation in nearly all fields, right from a Smart Grid, to the areas such as smart cities. IoT is a concept which is expected to rule the world within a few years.

### Major applications of IoT:

Tsunami Detection System using IoT: The System consists of sensors, satellites, active monitoring system etc. Not only sensors, but also satellites play an important role in IoT. The changes in position of Z-axis are measured by the sensor using GPS. The satellite collects data from the sensor nodes. The data gathered is then sent to the base station via Wireless networks. At the base station, the waves are analysed and are distinguished as normal and tsunami waves. <sup>[1]</sup>

Intelligent Traffic Monitoring System using IoT: The system uses RFID, wireless sensors like laser sensor, infrared sensor, ad-hoc networking. It enables the drivers to choose optimal paths to reach the destination. The moving vehicles can be monitored, controlled and administrated by the system. Traffic jam can be reduced to a great extent and traffic safety is guaranteed. <sup>[2]</sup>

Waste Management using IoT: An M2M sensor device called Sintelur is driven by the Carriots IoT platform. The filling level of waste (glass, paper, cardboard, cans, etc.) in the containers is determined by this sensor. Using GPRS, this data is transmitted to the management centre. To better manage the recycling process and improve recycling policies they have dashboards and tools. The pickup service becomes more efficient as it calculates the best routes for collecting the waste which results in reducing costs and CO<sub>2</sub> emissions. <sup>[3]</sup>

Vehicular Pollution Monitoring using IoT: The System consists of wireless sensor networks, gas sensors and RFID tagging system. It enables detection of level of air pollution on road. The vehicles which cause pollution over a certain limit are also monitored. RFID tagging systems along with the sensors are used to monitor and control the levels of air pollution anytime, anywhere. <sup>[4]</sup>

# International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Vol. 4, Issue 1, January 2016

Home Automation is a kind of extending building automation. Home automation mainly reduces the human efforts and enhances the facility of our home with improved convenience, ease and security. It adds smartness to the machine learning ideas. Home Automation is becoming popular as the concept of "Internet of things" has paired with it. With the help of internet of things, home automation control controls the home appliances such as control of lighting, air conditioning, heating, home theatre, electric doors and other electronic appliances.

Electrical devices of home are combined with each other in home automation system. These devices are connected through a home network to allow control by a Smartphone or tablet with internet access. Through the involvement of information technologies, the home appliances can operate smartly with the help of internet of things which results in convenience, ease, power efficiency, and safety. Also in industrialization, the automation system proves itself a highly intelligence.

In this paper we introduce Internet of Things based Home Automation System which provides a low cost, user friendly, smart home. It uses an Android application which provides Switching functionalities, where the Electrical/Electronic appliances can be monitored and controlled remotely. This System eliminates use of traditional personal computers (PC) and its peripheral devices, which provides easy mobility.

## II. EXISTING HOME AUTOMATION SYSTEM

The existing works were mainly focused on switching and controlling home appliances or connected devices rather than remotely monitoring of home environment.

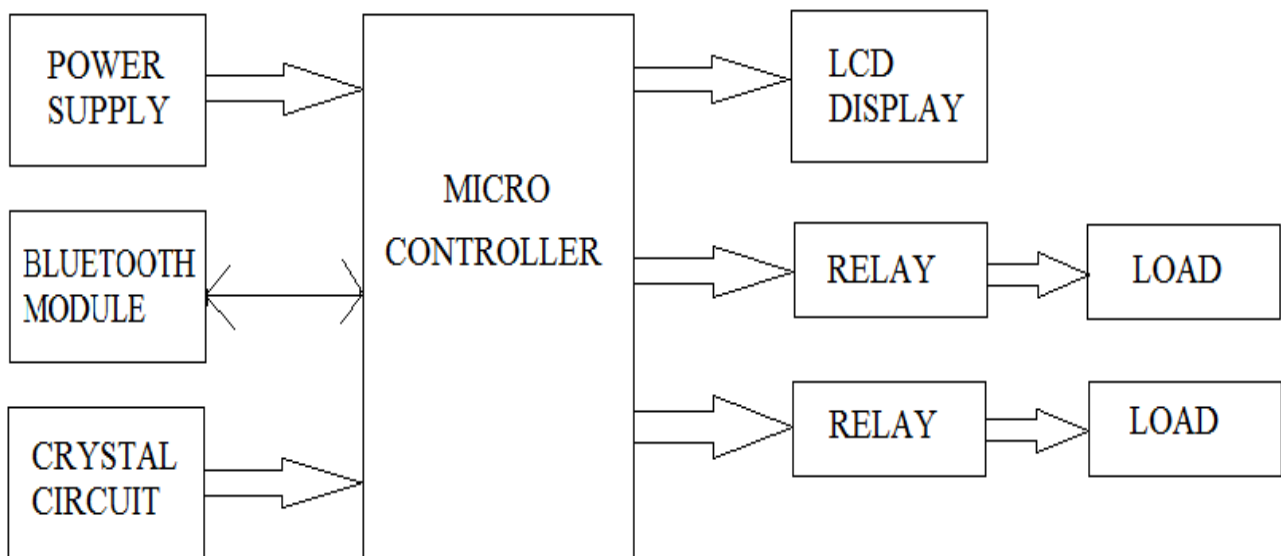


Fig: 1.1 Home Automation System using Bluetooth Module

Fig. 1.1 represents the existing system for home automation. In this system, Bluetooth module is interfaced to 8051 microcontroller. Wireless communication is used by the Android application to send messages to the Bluetooth. Program is written on 8051 microcontroller. In order to receive the commands, communication between the 8051 microcontroller and the Bluetooth module takes place serially. On the basis of command received from the Bluetooth, the microcontroller automatically switches the electrical loads.

This system consists of a microcontroller, Bluetooth module, 16 x 2 alphanumeric LCD, two 5V relays, a lamp and DC motor. For the above circuit, reset circuit and crystal circuit need to be connected additionally to the controller so that it works properly.

The statuses of electrical loads are indicated using circuit LCD. It is also used to display data received from Bluetooth. Here LCD is interfaced to the PORT1 of the microcontroller in 4 bit mode.

# International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Vol. 4, Issue 1, January 2016

Bluetooth module TX and RX pins are connected to the RXD and TXD pins of controller. GND pin is connected to ground and  $V_{cc}$  pin is connected to the 5V. Serial communication (UART protocol) is used by the controller to communicate with Bluetooth module. To communicate with Bluetooth, a baud rate of 9600 is used. The Bluetooth name and password can be changed by using Bluetooth AT commands.

### III. PROPOSED ALGORITHM

Remote Password Operated Home Appliances Control Project Algorithm:

- Initialize the LCD and UART protocol.
- Now read the data from Bluetooth module.
- Display the received data on LCD.
- Compare the received string with predefined strings and accordingly switch the
- Electrical loads.
- Display the status of electrical loads on LCD.

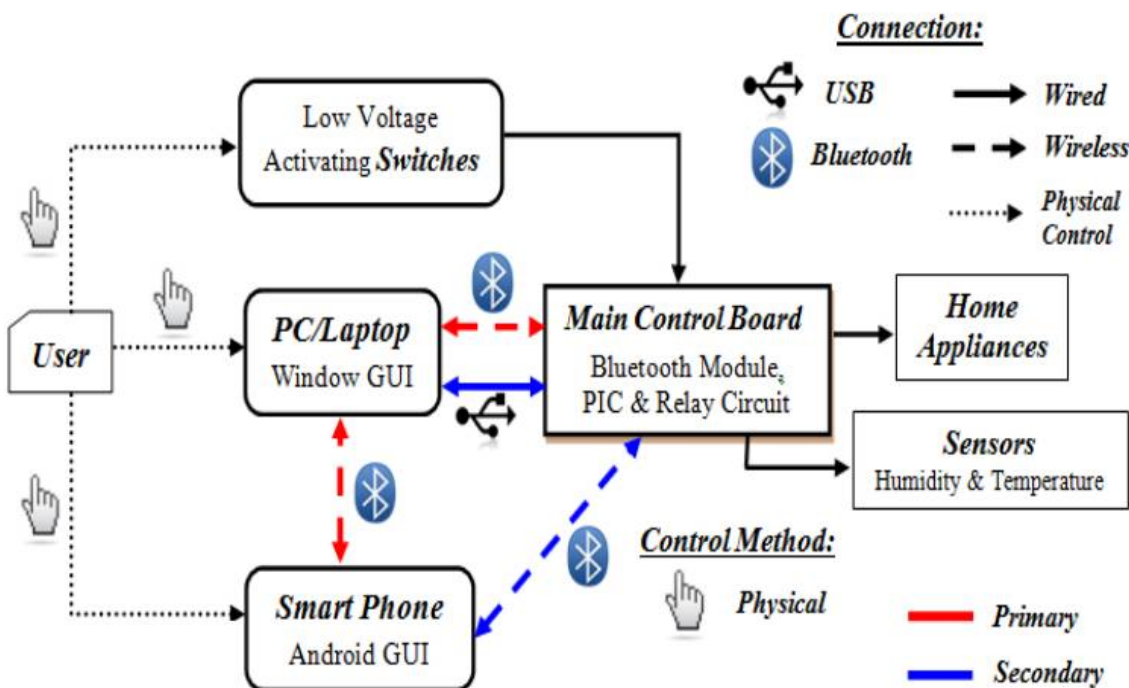


Fig: 1.2 Architecture for home automation system

The system is installed beside the conventional electrical switches on the wall. The risk of dangerous electric shocks can be avoided by using low voltage switches. The system uses two GUIs- one on the personal computer and the other on Smartphone. The status of the appliances i.e. weather it is on/off can be known by using this GUI. Any changes in the status of the appliances, immediate intimation is shown on the GUI.

The window GUI will act as a server to forward or transmit any data to/from the Smartphone and the main control board, after the Smartphone's Bluetooth is connected to the Bluetooth of the computer. In case, the Bluetooth connection between the PC or laptop and the control board fails, then connection can be re-established by using USB cable.



# International Journal of Innovative Research in Computer and Communication Engineering

*(A High Impact Factor, Monthly, Peer Reviewed Journal)*

Vol. 4, Issue 1, January 2016

However, due to limited range of operation (maximum up to 100 m) the system is unable to cope with mobility and can only be controlled within the vicinity. The proposed system eliminates this drawback, making the system more flexible. The user can monitor and control the devices from any remote location at any time using IOT.

## IV. LITERATURE SURVEY

Previous Research on existing Home Automation Systems: -

N. Sriskanthan and Tan Karand in their work have presented an application of Bluetooth Technology for Home Automation. The Bluetooth technology which emerged in late 1990's is used for implementing the wireless home automation system. Various appliances such as air conditioners, home theatres, cellular phones etc., are interconnected, thus creating a Personal Area Network in Home Environment. The communication between several client modules and the host server takes place through the Bluetooth module. A Home Automation Protocol has been developed to enhance communication between the host server and the client modules. The system also allows integration or removal of devices to the network which makes the system scalable. The wireless system aims at reducing the cost of Home Automation. But the system does not use the trending mobile technology. <sup>[5]</sup>

A. Z. Alkar and U. Buhur have developed an internet based wireless home automation system for multifunctional devices. A flexible, low cost, wireless solution to the home automation is introduced. The transformation of the initial simple functionality control mechanism of devices to more complex devices has been discussed. The home appliances are connected through a server to a central node. The system is secured from unauthorized users by using SSL algorithm. During tests, the wireless communication was found to be limited to <100 meters in a concrete building. <sup>[6]</sup>

Muhammad Izhar Ramli, Mohd Helmy Abd Wahab, Nabihah developed a prototype electrical device control system using Web. They have developed a web based controller, for controlling electrical devices. Whenever the condition of server is down they also set their server with auto restart. The system does not use mobile technology. Being a web based system; this application is less effective since the use of headphones and Smart phones is increasing rapidly. <sup>[7]</sup>

E. Yavuz, B. Hasan, I. Serkan and K. Duygu have designed and implemented a telephone and PIC remote controlled device for controlling the home electrical devices. In this Pin check algorithm has been introduced where it was with cable network and not wireless communication. The system ensures safety as it cannot be used by unauthorized users as the system uses Pin-check system. The architecture is very complex, but it gives an idea of remote handling of home automation system. <sup>[8]</sup>

Shahriyar, E. Hoque, M. M. Akbar, S. Sohan, I. Naim, and M. K. Khan presented a GSM based communication and control for home appliances. Different AT commands are sent to the Home Mobile for controlling different appliances. The drawback of this system is that a Graphical User Interface (GUI) is not provided to the user. Different AT commands have to be remembered by the users to control the connected devices. Also, the system supports Java enabled mobile phones. The system thus becomes less functional as now-a-days the use of Java enables phones are reducing and the use of Android phones are increasing tremendously. <sup>[9]</sup>

Jitendra Rajendra Rana and Sunil N.Pawar in their paper have implemented a zigbee based home automation system. Zigbee is a high-level communication protocol used to create personal area network. It supports any kind of micro-controller. The system eliminates the complication of wiring in case of wired automation. Considerable amount of power saving is also possible. Operating range is more than Bluetooth. But the system does not allow remote monitoring and controlling of appliances. <sup>[10]</sup>

R. Piyare and M. Tazil have presented the design and implementation of a low cost, flexible and wireless solution to the home automation. The system uses Bluetooth technology where the cell phone is used for interaction between the host server and the client modules. This system can be used by any appliances that require On-off switching applications without any internet connection. The drawback of this system was that the wireless communication system



# International Journal of Innovative Research in Computer and Communication Engineering

*(A High Impact Factor, Monthly, Peer Reviewed Journal)*

**Vol. 4, Issue 1, January 2016**

was found to be limited to a range less than 50m in a concreted building and maximum of 100m range in an open range. The system supports only the symbian OS cell phones. <sup>[11]</sup>

Amul Jadhav, S. Anand, Nilesh Dhangare, K.S. Wagh developed a system which uses one of the operating systems for implementation of the Home Automation System. An XML document is created and placed over the server, which can be used by any other mobile device without any platform issue. The layout of the screen is controlled by a common XML format. Downloading of XML file from the server and its parsing needs to be coded on every platform. As the design part is coded only once, a lot of coding effort is reduced. The same file is used by every other platform. The main objective of the paper was to develop a system without operating system platform limitations for Universal Mobile Applications. <sup>[12]</sup>

Deepali Javale, Shreerang Nandanwar, Mohd. Mohsin and M. Shingate have used Android ADK for implementing a home automation and security system. It presents a system in which the devices are connected to a Bluetooth sub-controller physically. It does not require internet connectivity. The Smart phone is used to access and control the devices using built-in Bluetooth connectivity. Communication is established between the android mobile device and the ADK, by connecting the appliances to the ADK. However, the system restricts mobility and can only be controlled within the specified boundary due to limited range of operation (maximum up to 100 m). Thus the system does not support remote monitoring and controlling of appliances. <sup>[13]</sup>

S. V. A. Syed Anwaarullah presents the design and implementation of a low cost, compact and secure Android smart phone based home automation system. A single chip microcontroller real time operating system is integrated to the system, to improve the responsiveness of the system and make it more dynamic. The system uses Bluetooth technology. The Bluetooth module that is used is based on the Bluetooth V2.0 protocol and has a range of 10m operating at frequency of 2.4GHz with a maximum data exchange rate of 2.1Mbps. Similar to most of the existing systems, this system also does not support remote monitoring and controlling of devices. <sup>[14]</sup>

## V. CONCLUSION

The proposed Home Automation System enhances mobility and supports monitoring and control of devices from any remote location. Being a simple and user friendly application it serves as an application of great help to the old aged or physically disabled people. Thus, the Internet of Things based Home Automation System is better than all traditional existing Home Automation Systems.

## VI. ACKNOWLEDGE

It gives us great pleasure in presenting the preliminary project report on “INTERNET OF THINGS BASED SMART HOME SYSTEM”. We would like to take this opportunity to thank my internal guide Prof.D.M.Deshpande for giving us all the help and guidance we needed. We are really grateful to him for his kind support. His valuable suggestions were very helpful.

We are also grateful to Prof.N.V.Alone, Head of Computer Engineering Department, Gokhale Education Society's R. H. Sapat College of Engineering, Management Studies & Research, for his indispensable support, suggestions.

In the end our special thanks to all teaching and non-teaching staff for providing various resources such as laboratory with all needed software platforms, continuous Internet connection, for Our Project.

## REFERENCES

- [1]Yuichi KAWAMOTO, Hiroki NISHIYAMA, Nei KATO, Naoko YOSHIMURA, and Shinichi YAMAMOTO, “Internet of Things (IoT): Present State and Future Prospects”.
- [2] Hasan Omar Al-Sakran, “Intelligent Traffic Information System Based on Integration of Internet of Things and Agent Technology”, (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 6, No. 2, 2015.
- [3] <http://postscapes.com/internet-of-things-award/project/sintelur-waste-management/>
- [4] Manna. S, Bhunia. S.S, Mukherjee.N, “Vehicular pollution monitoring using IoT”, Recent Advances and Innovations in Engineering (ICRAIE), 2014





ISSN(Online): 2320-9801  
ISSN (Print): 2320-9798

# International Journal of Innovative Research in Computer and Communication Engineering

*(A High Impact Factor, Monthly, Peer Reviewed Journal)*

Vol. 4, Issue 1, January 2016

- [5] N. Sriskanthan and Tan Karand, "Bluetooth Based Home Automation System". Journal of Microprocessors and Microsystems, Vol. 26, pp.281-289, 2002.
- [6] A. Z. Alkar and U. Buhur, "An internet based wireless home automation system for multifunctional devices", IEEE Transactions on Consumer Electronics, vol. 51, pp. 1169-1174, 2005.
- [7] Muhammad Izhar Ramli, Mohd Helmy Abd Wahab, Nabihah, "TOWARDS SMART HOME: CONTROL ELECTRICAL DEVICES ONLINE", Nornabihah Ahmad International Conference on Science and Technology: Application in Industry and Education (2006).
- [8] E. Yavuz, B. Hasan, I. Serkan and K. Duygu. "Safe and Secure PIC Based Remote Control Application for Intelligent Home". International Journal of Computer Science and Network Security, Vol. 7, No. 5, May 2007.
- [9] R. Shahriyar, E. Hoque, S. Sohan, I. Naim, M. M. Akbar, and M. K. Khan, "Remote controlling of home appliances using mobile telephony", International Journal of Smart Home, vol. 2, pp. 37-54, 2008.
- [10] Jitendra Rajendra Rana and Sunil N.Pawar, Zigbee Based Home Automation (April 10, 2010).
- [11] R. Piyare and M. Tazil, "Bluetooth based home automation system using cell phone", in Consumer Electronics (ISCE), 2011 IEEE 15th International Symposium on, 2011, pp. 192-195.
- [12] Amul Jadhav, S. Anand, Nilesh Dhangare, K.S. Wagh "Universal Mobile Application Development (UMAD) On Home Automation", Marathwada Mitra Mandals Institute of Technology, University of Pune, India Network and Complex Systems ISSN 2224-610X (Paper) ISSN 2225-0603 (Online) Vol 2, No.2, 2012
- [13] Deepali Javale, M. ohd. Mohsin, Shreerang Nandanwar, and M. Shingate, "Home Automation and Security System Using Android ADK", International Journal of Electronics Communication and Computer Technology, vol. 3, pp. 382-385, 2013.
- [14] S. V. A. Syed Anwaarullah, "RTOS based home automation System using android", international journal of advanced Trends in computer science and engineering, vol. 2, pp. 480-484, 2013.

## BIOGRAPHY

**Ms. Pooja Pawar** is pursuing Bachelor degree in Computer Engineering from R. H. Sapat College of Engineering, Management Studies & Research, Nashik. She looks forward to have successful career in Web Application Development.

**Ms. Shruti Ramachandran** is pursuing Bachelor degree in Computer Engineering from R. H. Sapat College of Engineering, Management Studies & Research, Nashik. She looks forward to have successful career in Android Development and Networking.

**Ms. Nisha Singh** is pursuing Bachelor degree in Computer Engineering from R. H. Sapat College of Engineering, Management Studies & Research, Nashik. She looks forward to have successful career in Software Development.

**Ms. Varsha Wagh** has completed Diploma in Computer Technology from K. K. Wagh Polytechnic, Nashik. She is pursuing Bachelor degree in Computer Engineering from R. H. Sapat College of Engineering, Management Studies & Research, Nashik. She looks forward to have successful career in Web Application Development and Network Security.