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Department of Computer Technology A Survey on Control and Monitoring of Home Appliances using Internet of Things (IOT).

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Abstract: *The main goal of this paper is to describe the systems which automatically control the devices through mobile through Internet. The various implemented systems are used to control appliances in the house like fan, light, and water tank or tap by just turn ON or OFF the switch from mobile phone.*

Internet-of-Things (IoT) is elaborate by the internet services. IOT Applications and Uses of new technologies in IoT environment are increasing rapidly. It has been already developed in Industrial Wireless Sensor Network (WSN). A smart home is also one of the applications of IoT. Rapid growth in technologies and improvements in architecture comes out many problems that how to manage and control the whole system, Security at the server, security in smart homes, etc. This paper presents the architecture of Home Automation using IoT.

Digital homes are those where home appliances/devices could monitor and control remotely. When these household devices in digital homes connect with the internet using proper network architecture and standard protocols, the whole system can be called as Digital Home in IoT environment or IoT based Digital Homes. Digital Homes ease out the home automation task. This paper presents not only the problems and challenges come in

IoT and Digital homes system using IoT but also some solutions that would help to overcome on some problems and challenges.

Keywords *: Internet of things (IOT), Node-MCU, Relay circuit , Sensors, Web services, Arduino*

I. Introduction

In the recent years various technologies are developed which helps people to get self control systems. These systems first sense the data from the sensor and by processing on that provide output for controlling. And this control action is taken by the mobile application as it provides a much faster alternative than mobile web browsing. It has made human life more easier and comfortable. Now we are going to familiar with these technologies.

Internet has changed human's life by providing anytime, anywhere connectivity with anyone. As many advancement in technology has been come the sensors, processors, transmitters, receivers, etc. are now available very cheap rate. Hence these all things can be used in our day to day life [4]. If anyone wants to expand the services of internet then Internet of Things can be said as the expansion of internet services [1]. Today's internet is now expanding towards Internet of Things (IOT).

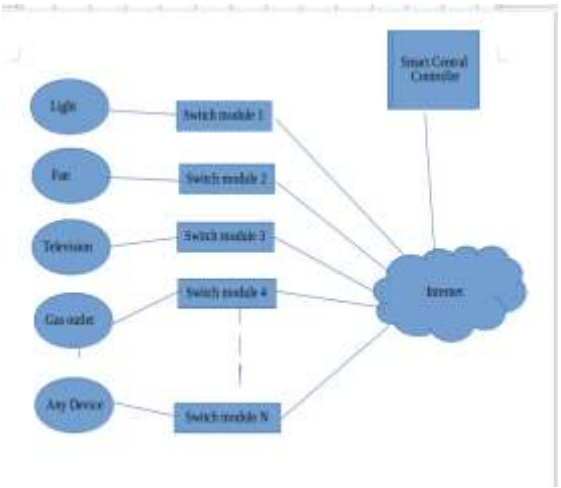

Fig. 1.1: Basic idea for Smart Home System using IoT

1.1Internet-of-Things: The internet where the existing network of internet to the computer systems will connect to the real world objects or things. Things may include any objects, home appliances, devices, vehicles, etc. And when these things connect to the internet in specific infrastructure via standard protocols then the whole system is said to be Internet of Things (IoT) [1-4].

1.2Things: Things may be real or virtual, moving or steady but things will be active participants in the whole system. Things will communicate with each other, called as things-to-things communication. Things will also able to communicate or interact with human then it is called as things-to-human communication [4]. However the internet of things is not just deep vision for future. It is already here and is having an impact on more than just technological development. These things and communicating objects which used to communicate with the internet can configure themselves independently and can operate without human intervention [3].

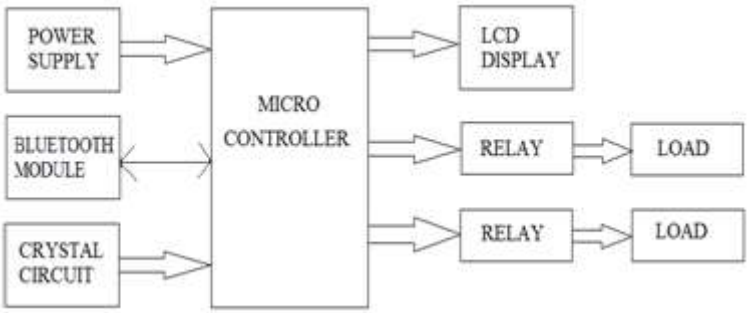

Figure 1.1 shows the architecture of IoT [5].

II. 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.

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.

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.

III. 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. 1.2 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.

3.1 Implemented System Based On The Various Wireless System

The existing system of home automation using internet. In this, wireless personal area network (WPAN) specified as internet is interfaced with 8051 microcontroller. The devices which have to control are automatically connected to the internet server controller which is then accessed & controlled by the smart phone using built-in Internet connectivity. Communication between the Internet module and the 8051 takes place serially. Program is written in 8051 micro controller. On the basis of command received from the Internet, the micro controller automatically switches the electrical loads from ON to OFF or OFF to ON.

In the system where GSM and Zigbee technology used the device is connected to a ZigBee Transmitter and receiver. And it communicates with each and every node present inside home. From the mobile phone, command is send via SMS to the Controller, which in turn translate the command and then turn ON and OFF the required 'electric switch' to control the electrical item.[2] The liability of this system is that, at the remote places there should be a full coverage of GSM mobile signal. And zigbee system has less signal rate than Internet or Wi-Fi.

Home automation using Wi-Fi used for exchanging information between two or more devices without any physical

connectivity that is wire or cable. Wi-Fi module is used to obtain commands from internet and then connected to the controller for performing controlling action. The user can send the commands through allocated IP and then send to Wi-Fi module. This Wi-Fi module is interfaced with output load.

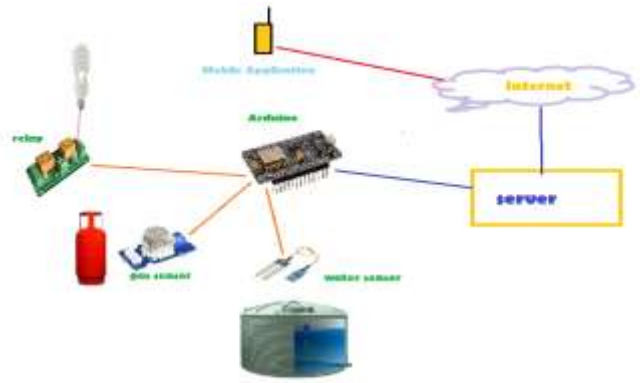

Fig.2 Block diagram of Home Automation Using Node-MCU

1. Arduino UNO:

Arduino UNO is an open wellspring prototyping podium based on Atmega328 micro controller. It has 14 digitalinput/output pins,6 analog inputs. The existing system with Arduino has drawback of it doesn't have inbuilt Wi-Fi, SD card slot and flash memory of 32kb only. It requires operating voltage 7 to 12 V. So this board is only affordable but not practically useful.

2. Sensors:

Sensors is the devices that are frequently used to detect and respond to electrical signals. A**Sensor** converts the physical parameter into a signal that can be measured electrically.

3. Relay circuit :

Ais an. Many relays use anelectromagnetmechanically operate a switch, but other operating principles are also used, such as-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.

As we studied the various systems of Smart Home using different wireless system and development board. But all have a definite limitations, like short range, large voltage requirement, small signal rate, high cost etc. To overcome this we use the Raspberry pi module which bound these drawbacks.

Node-MCU module has inbuilt Wi-Fi and Micro SD card slot. We can control the home appliances like fan, light, and water pump.The controlling action takes place through relay which is interface with Node-MCU GPIO pins.

IV. Conclusion

In this paper, we have provided a various security and control system and discussed various methods to implement this project. By using a high-fidelity devices we can implement a better system. As these systems are wireless system, so easy to carry out everyday by working people.

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.

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