Comparison of Various Technologies for Home Automation System

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***Abstract*—Internet of thing is growing network of everyday object, from industrial machine to consumer goods that can share the information and complete task while you are busy with other activities Because of the advanced development in computer technology, the microprocessors are not only on the desktop but also exist everywhere Home automation allows us to control household appliances like light, door, fan, AC etc. It also provides home security and emergency system to be activated. Home automation not only refers to reduce human efforts but also energy efficiency and time saving . It is obvious that microprocessors are embedded in electronic appliances in our home today. In the past, the appliances are working on stand-alone and cannot cooperate with one another. But in the recent years, these appliances can be monitored and controlled by embedded microprocessors and be displayed on terminals. This paper focuses on comparision of various technologies used for home automation system and to find out the most efficient technology present.**

***Keywords*—Home Automation and Security; Arduino; Embedded Systems; Wireless LAN; MicroControllers**

I. INTRODUCTION

A home automation system is a means that allow users to control electric appliances of varying kind. Many existing, well established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through Internet from anywhere around the world. Home automation or Smart Homes can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficiency to its occupants. Remote Environment represents authorized users who can access the system on their Smart phone applications using the Internet via Wi-Fi Owing to the rapid growth of personal computers and the Internet, high advanced telecommunication technologies, the importance of the home network has increasingly emphasized in various domains . Home automation for the elderly and disabled can provide increased quality of life for persons who might otherwise require caregivers or institutional care. The most available home automation systems use different wireless communication standard to exchange data and signaling between their components, like Bluetooth, Zigbee, Wi-Fi, and finally the Global System for Mobile Communication (GSM).

Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

1) Reduced installation costs
2) Easy deployment, installation, and coverage
3) System scalability and easy extension
4) Aesthetical benefits
5) Integration of mobile devices

For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.

II. LITERATURE SURVEY

1. Bluetooth based home automation system using cell phones:

The smart home concept in the system increases the standard of living .In Bluetooth based home automation system the home appliances are connected to the Arduino BT board at input output ports using relay. The program of Arduino BT board is based on high level interactive C language of microcontrollers; the connection is made via Bluetooth. The password protection is provided so only authorized user is allowed to access the appliances. The Bluetooth connection is established between Arduino BT board and phone for wireless communication. The main control system use wireless Bluetooth technology to give remote access from PC/laptop or smart phone.

2. Zigbee based home automation system using cell phones:

ZigBee is a low-power digital radio having applications like home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection. To monitor and control the home appliances the system is designed and implemented using Zigbee. The device performance is record and store by network coordinators. The message for security purpose first process by the virtual home algorithm and when it is declared safe it is re-encrypted and forward to the real network device of the home. Over Zigbee network, Zigbee controller sent messages to the end. The safety and security of all messages that are received by the virtual home algorithm. To reduce the expense of the system and the intrusiveness of

respective installation of the system Zigbee communication is helpful. The microcontroller analysis all signal and convert them into command to understand by GSM module.

3. Wi-Fi based home automation system using cell phones:

Wi-Fi based home automation system mainly consist three modules, the server, the hardware interface module, and the software package. Wi-Fi technology is used by server, and hardware Interface module to communicate with each other. The same technology uses to login to the server web based application. The server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser. Software of the latest home automation system is split to server application software, and Microcontroller (Arduino) firmware. The Arduino software, built using C language, using IDE comes with the microcontroller itself. Arduino software is culpable for gathering events from connected sensors, then applies action to actuators and pre-programmed in the server. Server application software is culpable of maintaining the whole home automation system, setup, and configuration.

4. Home automation using Android ADK:

The devices of home are associate to the ADK and the Connection is established between the Android device and ADK. The devices of house are link to the input/output ports of the board and their current situation will have passed to the ADK. The microcontroller board is based on the ATmega2560. It has a USB host connection to associate with Android based phones. The two important features of Android Open Accessory Protocol are as follows: It has audio output that is from the Android device to the component and it also support for the component serves as one or more Human Interface Devices to the Android device.

5. GSM Based Home Automation System:

This system presents a completely unique, stand alone, cheap and versatile GSM based home automation system. This device is connected to a ZigBee Transceiver and it communicates with every and each node gift within our home . The GSM Controller facilitate for the information follow between user and microcontroller. The GSM Controller uses portable technology to speak. From the portable, command will be send via SMS to the Controller that successively interprets the command so activates the specified switch to regulate the electrical item. As long as there is GSM portable signal coverage, it's attainable to regulate all electrical things from anyplace within the world. The system is straightforward to work, and is secure in this solely pre-determined mobile numbers will operate the GSM Controller. The installation of the GSM Controller is comparatively straight forward and may be tailored for any existing home system .Management of lights and geyser area unit done via the electrical distribution board

6. SMS Based Home Automation System:

This system presents style and model implementation of a basic home automation system based on SMS technology. The automation system consists of 2 main components; the GSM electronic equipment, which is that the communication interface between the house automation system and therefore the user. GSM electronic equipment uses SMS technology to exchange information, and signalling between users and residential automation system. The second module is the microcontroller, that is that the core of the house automation system, and acts because the bridge between the GSM network (the user) and sensors and actuators of home automation system. Sensors and actuators are directly connected to hardware small controller through appropriate interface. System supports a good vary of home automation devices; power management components, security, transmission applications, and telecommunication devices.

Table I. The Comparison of different Home Automation System

Sr No.	System	Communication Interface	Controller	User Interface	Applications	Benefits
1	Wi-Fi based using Arduino Microcontroller	Wireless LAN and Wi-Fi shield	arduino	**Web based application**	Temperature and humidity, Motion detection, Fire detection, Door at us, Light level Video monitoring, controlling appliances	Low Cost, Secure, Ubiquitously accessible, auto configurable, Remotely Controlled
2	Cloud Based Using Zig Bee Microcontroller	Zig Bee Wireless Network	Smart Socket	PC or Android Phone	management, monitoring the power consumption, temperature and humidity	Convenience, safety and power saving
3.	Smart Task Scheduling Based using arduino and android	Wireless Zigbee	Arduino	Android Application	Energy Management and task scheduling with power and cost	Energy-efficient and highly scalable

4.	Wireless Sensors based with mobile technology	cloud-based data server	PCB circuits	Mobile Applications	monitor the home conditions and power consumption of appliance	Low power consumption and system cost efficiency
5	Android based using Arduino	Micro Web server	Arduino Ethernet Shield	Android app	switches, temperature, humidity, sensor, intrusion detection	Feasibility and Effectiveness
6	GSM based using PIC microcontroller	SMS	PIC16F887 microcontroller	Mobile phone	Control appliances	High availability, coverage and security
7.	GSM Based Using arduino	SMS	Arduino	Smartphone app	Control appliances	Simplicity
8.	Bluetooth Based using arduino	Bluetooth	Arduino	Python supported mobile	controlling	Secured and low cost

III. FUTURE SCOPE

Using this system, the system can be expanded to include various other options for home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is dangerous and also for environmental monitoring. Limitation to control only several devices can be removed by extending automation of all other home appliances. It will be flexible to support various wired as well as wireless technologies like Bluetooth, Zigbee, WI-Fi, World Wide Web.By doing this system will increase system mobility, configurable, and scalability.

IV. CONCLUSIONS

This paper proposes a low cost, secure, ubiquitously Accessible, auto-configurable, remotely controlled solution. The approach discussed in the paper is novel and has achieved the target to control home appliances remotely using the WiFi technology to connects system parts As mobile technologies become more reliable, wireless technologies will be more emphasized in a real home networking market. Especially, the ZigBee, one of the important wireless technologies, has become attractable in both of commercial and research areas, because of open standard, low-cost, and low-power characteristics.

Deployment of SMS technology in home automation increase system security and is cost-effective as compared to the previously existing systems. Hence author concludes that the required goals and objectives of home automation system have been achieved. The discussion consists of Android phone with home automation application, Arduino Mega ADK. User can interact with the android phone and send control signal to the Arduino ADK which in turn will control other embedded devices/sensors So the overall implementation cost is very cheap and it is affordable by a common person.

In the future, the home automation system will become smarter because of the ability of collecting information from the Internet.The process of developing a powerful home automation system will encounter a lot of problems. We will continuously research how to construct a more powerful HA both in the hardware and software aspects

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