

MULTI PROFILE HOME AUTOMATION USING INTERNET OF THINGS

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Abstract—Home automation has great benefits for comfort and conveniences, energy and water management and even helps impoverished people save money on their basic needs. This paper proposes and provides a home control with monitoring system through internet for multiple users with the help of RFID tags. In this proposed system, the embedded gateway is used to transfer data between the user and the multiple home appliances through internet. In addition to that wireless technology is adopted, it establishes the connection between the home appliances and the gateway. In order to monitor and access functionalities actuators and sensors are used. The major application of proposed system is to monitor the performance of water purifier, knowing the status of the devices in order to reduce the power consumption and other appliances for replacement.

Keywords: Embedded gateway, Home Automation, Internet Of Things, Multi Profile, RFID Tags

1. INTRODUCTION

For many years Home Automation was a theoretical concept, but it has become practical in the early of 20th century because of the introduction of semiconductors and rapid improvement in information technology.

Home automation mainly focuses on comfort, security and to reduce man power. It includes centralized control of appliances, ventilation, lighting, heating and air conditioning, resource management systems such as energy and security systems. It also serves some additional functions like automatic plant watering and automatic home care for the elderly or disabled people and pet feeding etc. The advancement of technology in the field of smart phones has reduced the cost of electronic devices which lead to the significant increase in automation of devices. Recent technologies like Internet Of Things (IOT), Big data, etc. paves way for different automation techniques.

The main aim of home automation is to provide monitoring and control over day to day household functions to improve comfort, energy efficiency and security. Home automation is done by connecting all electrical devices in the home by a central control system, with the programmable microcontroller which provides various control functionalities of those devices according to user requirements.

With the help of IOT automated home can be converted into a smart home [1]. IOT connects everyday objects to the internet establishing communication with each other and complete tasks with the help of sensors and actuator without or with less user intervention. A smart home can be controlled easily through internet using a smartphone, tablets or computer. The recent version of internet protocol (IPv6) with its unlimited IP address in addition with big data and cloud computing concepts can be used for home automation.

IOT [2] is useful for domestic functions like water consumption security issues and also fire alarm. It also increases the comfort level by reducing cost. The proposed system can be widened to a 100 percentage smart home system with bi-directional communication [3] between sensors and actuators modules adhered with domestic appliances and client module through the internet for both automatic and manual home automation. The internet connectivity of household devices is an important feature of smart home. The existing system consists of an embedded gateway for home control and monitoring system that allows interaction between smart phones or laptops and things through internet.

There are a number of issues involved when designing a home automation system. It should provide a user-friendly interface on the host side, the devices should be easily setup, monitored [4] and controlled.

Furthermore the overall system should be good enough to realize the true power of wireless technology. Different wireless technologies that support remote data transfer, sensing and control such as RFID, Wi-Fi, Bluetooth and also cellular networks have been evolved to provide intelligence at various levels in automation.

The rest of this paper is organized as follows. section 2 discusses about the literature survey, section 3 gives an overview of the IOT, section 4 presents the architecture of IOT in detail, section 5 presents the proposed system, section 6 provides the results and discussion of the system, section 7 discusses conclusion of the paper.

2. LITERATURE SURVEY

Over the years automation techniques have been developed such as IR remote, RF remote, GSM, Bluetooth and WI-FI controlled. These techniques are meant only for single user and it is controlled using central controller.

YAN Wenbo, WANG Quanyu, *et al* [5] developed a system to help the people for managing the home appliance freely and build an autonomous environment in home. A wireless solution based on internet protocol is used to manage the smart home units easily. Based on this approach, design of smart home system with the implementation of related software and hardware is developed. People can use smart phones or any android devices or PC to control and monitor the home appliances both locally and remotely. The combination of remote server and home devices was a new scheme for remote controlling. The remote server can act as a service provider and it provides service for different homes and offices.

Kaylee Moser, Jesse Harder, *et al*. [6] designed IOT in energy efficient home automation and smart home technologies which explores the history and implementation of the IOT. The conclusion reviews modern technology and it determines the close implementation.

Ming Wang, Guiqing Zhang, *et al*. [7] proposed an IOT-based appliance control system for smart homes. In

this proposed system, solution to manage and control these increasing various appliances conveniently and efficiently so as to achieve more comfortable, security and healthy home based on IOT technology was developed. A series of control modules such as switch modules, radio frequency control modules have been developed in order to control directly all kinds of home appliances. The smart control system embraces the functions of appliance control, monitor, management, home security, energy statistics and analysis.

ChayanSarkar, [8] proposed and analyzed about a scalable distributed architecture for IOT. The challenges in the realization of IOT applications is ability among various IOT devices and deployments. In the existing system, the architecture comprises of smart control and spying has been identified by many ways, which will overcome most of the problems in the expansion process of IOT. It exactly addresses heterogeneity of IOT devices and enables seamless addition of devices across applications. In addition, layered architecture that provides various levels of abstraction to tackle the issues such as heterogeneity, security, scalability and interoperability.

Pavithra.D, RanjithBalakrishnan, [9] developed an efficient way of IOT used for monitoring and controlling the home appliances via world wide web. This result in communication with home automation network through an internet gateway by means of low power communication protocols like Wi-Fi, Zigbee etc. In this proposed system, the user will move directly with the system through a web-based interface over the global network, whereas home appliances like lights, fan and door lock are remotely controlled through website. An extra feature enhances the facet of protection from fireplace accidents is its capability of snooping the smoke in order to identify the event of any fireplace, associates an alerting message and an image is sent to Smartphone.

Luís M. L. Oliveira, Joao Reis, *et al*. [10] proposed IOT based solution for home power energy monitoring and actuating. In this proposed system, the main vision of IOT is to collect information from different devices and process the information from different sources to both control and interact with human users. Therefore, this demonstrates for power energy monitoring and

actuating system and it was developed for home environments. IPv4 to IPv6 transition mechanisms are used to provide connectivity to both IPv4 and IPv6 Internet devices.

Based on the above literature survey, the authors are motivated to propose the house control with monitoring system through internet for multiple user and the remaining section deals with the proposed system.

3. Internet Of Things

The concept of IOT is officially introduced by Kevin Ashton in the year 1999. Ashton had the right idea to make technology for IOT a feasible concept in the year 1999. When internet was first introduced, there was only Internet of computers. Each computer was connected to the internet and it allowed transferring data back and forth. When the number of people using the internet started to grow along with the popularity of social media sites, it became an era of the Internet of people. There are many websites and applications available to make people stay connected. Now that all the devices and almost every person are connected via the Web, the next logical step is to start connecting things.

This technology is able to provide smarter services to the environment. There are many things that can be done with the help of IOT and with numerous branches of possibilities. Many of these ideas are interrelated to each other. For instance, building automation has a connection with energy and water management. Both are different ideas with their own array of invention, yet it can be combined together to create homes and businesses with smart appliances and sensors made to monitor energy and water usage.

To connect the physical objects via internet, embedded sensors are attached to the appliances in order to collect data from them. These sensors can measure heat, light, movement and numerous other factors that can be used for monitoring and controlling the local environment. Each of these things is connected to the internet and the data collected from the objects are gathered, analyzed and studied on how these objects can be manipulated.

IOT is a recent technology which is relevant in many different environments such as patient monitoring system, security, traffic signal control or controlling various applications.

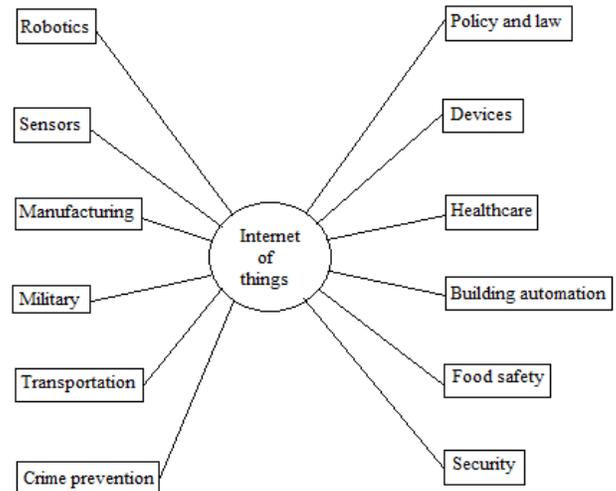


Fig.1 Branches of IOT

Fig.1 shows branches of IOT has been majorly implemented in several fields such as, health care, manufacturing also in military. It has importance in device automation providing high security which prevents form unnecessary criminal activities.

4. ARCHITECTURE OF IOT

The IOT based architecture provides greater flexibility of the information and communication. The IOT project aims to bring out the various opportunities of using IPv6 and other related standards to overcome the disadvantages using of the IOT. The IOT projects proves a dominant and thorough study of all sensible functionalities, mechanisms and various protocols that can be used for building IOT architectures. However interconnections may occur between all totally different IOT applications.

As in the networking field, where several solutions emerged to pave the way for a common model, the TCP/IP protocol suite, the evolution of a reference model for the IOT domain and the identification of reference architectures can lead to a faster and more focused development and a strategically improvement

of IOT related solutions. These solutions can provide a notable advantage to economies, as new business models can influence those technological solutions leading to economic development.

5. PROPOSED SYSTEM

The Proposed system provides solution for the automation of four number of users. More than four number of users can also be implemented with performance degradation. It consist a RFID identifier with embedded gateway for a remote home monitoring and control system through web application or web page. The goal is to achieve automation for multiple user without replacing any old appliances and enabling the user to change his automation through the web page created. The control unit will act as a mediator between the user and the end devices and at the same time the input from the embedded sensors will also have the ability to control the appliances from anywhere in the worldby connecting them to the internet. Any smart phone with an internet connection can access the home environment through the embedded gateway.

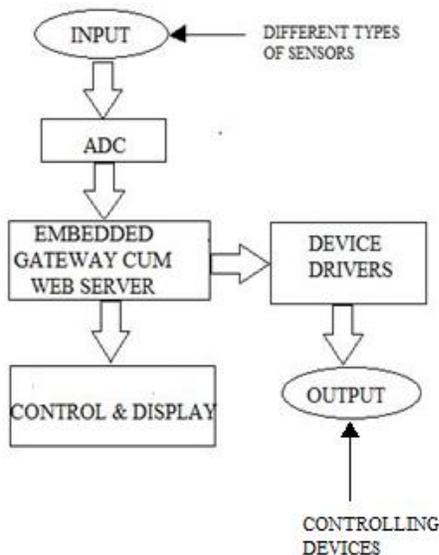


Fig.2 Block diagram of proposed system

Fig.2 describes about the proposed prototype and the data flow. It consists of three subsystems are as follows

1. Mobile or PC (Web page to control)
2. Embedded gateway and
3. Sensors and Actuators Module

The wireless embedded gateway is the heart of the system and it stores the input received from embedded sensors to the web page through internet and it sends the instruction or action to the actuators to control the end devices. The embedded sensors modules is connected to the end devices to be monitored and controlled. Each device is connected to the embedded gateway. The hardware parts required for the implementation of Embedded Gateway is Arduino YUN board.

Arduino Yun board acts like a minicomputer and it is used to connect devices. With the ease of Arduino it combines the power of Linux and it has an inbuilt Wi-Fi.

The RFID tags are mainly used to differentiate the users from one another. The home devices can also be controlled as per the client or user request. The client request may contain a command to change the actuators for control purpose. User module is a web page that interacts with the user and allows the user to access. It is a simple web page, which contain user interface for monitoring and controlling home devices.

6. RESULTS AND DISCUSSION

The Arduino Yun board act as a central controller and web server from which the web page is accessed in any android devices or personal computers, connecting the board and the device to the same network. The multi profile method helps to add more users in the automation environment which is an added advantage.



Fig.3 Webpage to select user’s Automation profile
The selection of user automation profile had implemented using webpage and selection process is shown in Fig.3 It displays the available number of users in the automation environment, which provides users their own preference and it provides user preference. It makes unique ID for each users.



Fig.4 User’s profile page to control devices

Fig.4 shows the profile page that allows users for interfacing with the devices connected and make their preferences. Each user can have their confined database about the automation. The web page also includes the status of the devices which helps in easy monitoring and controlling.

In order to accommodate two or more users, some precedence should be assigned for controlling the devices. Each user cannot be given equal importance to control the devices since there are people of different ages in the home, providing priority is crucial. The priority may be based on several factors such as age, time, etc. This will be helpful for better automation environment.

Table.1 Comparison with existing systems

Sl. No	Parameters	Existing systems	Proposed system
1	Access to multiple user	Not possible	Possible
2	Automation configuration capability	Not available	Available
3	Circuit complexity	High	Comparatively less
4	Cost of the system	High	Low
5	Wi-Fi	Externally connected	Inbuilt
6	Priority assignment	Not available	Available
7	Debugging capability	Low	High

Table.1 shows the comparison of proposed system with the existing system. From the table it identified that proposed system has enables more number of parameters compared to that of the existing system in terms of priority, multi user, comparatively less complexity with high debugging capacity. The major advantage of proposed system is multi profile with priority based system.

7. CONCLUSION

In this paper the home automation system is proposed and implemented. From the result it is concluded that the proposed system is more efficient than the existing

system. It is designed in such a way that it provides access for multiple user and user profiles with priority based system. The proposed system is comparatively less complex with high debugging capability. It provides notifications in the web page to the user, but in the future work voice alerts can also be adopted.

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