Fully Automated Home System Using Sensors

Shishir Chandra Nigam[1], Swapnil Soni[2], Abhishek Kumar Anand[3], C. Lekha[4]

[1,2,3]Student, Dept. of Computer Science and Engineering, SRM Inst. of Science and Technology, Chennai, India
[4]Asst. Prof., Dept. of Computer Science and Engineering, SRM Inst. of Science and Technology, Chennai, India

Abstract—**In the present scenario, the home automation appliances are controlled by the system, which works based on the commands received, and hence the manual work is still required and the system has not been able to become fully automatic. However, with more and more advancements in the technology it is no more impossible to achieve it. This paper illustrates a methodology to provide low cost Home Automation System using automated sensors. The proposed project is a complete push towards zero human efforts, and intelligently save power by automatic control. Unlike most of available home automation system in the market at present. Thus making this proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems at present.**

Index Terms—**Internet of Things, Home Automation, Sensors based working, cost efficiency, Microcontroller, Proximity Sensor, Temperature Sensor**

I. INTRODUCTION

The Internet of Things (IoT) can be described as using everyday objects like Home Appliances like AC, Tube lights, Fans etc. in association with other everyday devices like smartphones, Internet, sensors and actuators to the Internet where the devices are intelligently linked together enabling new forms of communication among them. Building IoT has advanced significantly in the present decade since it has added a whole new dimension to the universe of information and communication technologies.

Home automation can be explained as usage of technology within the home environment to provide convenience, comfort, security and energy efficiency to its people living. With the introduction of the Internet of Things (IoT), the implementation of home automation are getting more popular. However, at present it is limited to a very small scale. The benefit of the inter-connection is the concurrent controlling of smart devices. Home Automation can also be explained as a concept which involves controlling of the appliances in the home without human interventions too using sensors [1].

Home Automations are a very futuristic idea, which do have various benefits for the people like increased comfort, safety and security for people. It also focusses on the better and rational use of energy resources more efficiently. Along with a cost effective implementation these systems will become more affordable, portable and scalable so that new devices can be easily integrated in to systems. The technology of IoT being implemented here is very easy to use and targeted for implementing better life standards for the people of every section of the society.

The main principle of Home Automation is to design and implement a system that is capable of not only controlling most of the house appliances like AC, Lights, Fan etc but also to adjust their working accordingly for example controlling the .This application is an easy and manageable web interface for user to run Home Automation System.

The major benefit of the Home Automation is the increased comfort especially when employed in a private home. While incase automation systems installed in commercial buildings then do not only increase comfort, but also allow centralized control of heating, ventilation, air condition and lighting. Therefore, it leads to an overall cost reduction and also to energy saving which is a requirement of .today

The Home Automation can be used to its full potential if there is minimal Human physical intervention involved. The present form of the Home Automation practices involve the major use of Graphical User Interface (GUI) in form of an Android or iOS Application for controlling the appliances which are either controlled using Wi-Fi or Bluetooth Modules and require the user to take actions like for example Switching on Light, Air Conditioner using the application tools.

In 2003, Housing Learning & Improvement network published a smart home definition which stated that the smart home is about incorporating a communications network that is capable of connecting the key electrical appliances and services, and allows them to be remotely controlled or accessed"[2].

However, a more efficient and better form of Home Automation can be the one, which involves very less physical interaction with the Person, and the System is capable enough to perform the tasks automatically as per the conditions.

This can be implemented with the help of Sensors like Proximity Sensor, Temperature Sensor, and Motion tracking Sensors etc.

Using the Temperature Sensor the changes in the temperature of the room can be monitored and actions can be taken accordingly like Lowering down the working point of AC or Increasing it depending upon the increase or decrease in the temperature.

Similarly using the motion tracking sensor ot the proximity sensor will help to track down whether a person is entering a

International Journal of Research in Engineering, Science and Management
Volume-1, Issue-10, October-2018
www.ijresm.com | ISSN (Online): 2581-5792

794

room or not and switching on the Lights and other appliances can thus be facilitated.

Thus the implementation of Sensors with the Concept of Home Automation can make the process more efficient and less dependent over the physical actions of the person thus making it more Automatic.

Thus, with a proper implementation the Smart home Automation can be a very promising area, which has various benefits such as providing increased comfort, safety and security to people [5].

II. OBJECTIVE

The main objective of the project is to take a step forward in the direction of eradicating of limitations of existing Home Automation Systems by making the system more automatic using Sensors.

The project focusses on using the Sensor based Home Automation System, which will consequently decrease the dependency of the System on the Human interaction making it more automatic.

The project also focusses on saving the Power by more efficient use of the appliances.

III. EXISTING SYSTEM

Home Appliances are controlled using the commands received from the server computer, which operates according to the commands received from the user applications.

Allows remote control over the devices within a certain range.

Control over the devices from computers using the Graphical User Interface (GUI).

IV. PROBLEM STATEMENT

The major problem with the existing system is that it relies a lot on the Human intervention using basic Wi-Fi modules like ESP8266 Wi-Fi module or the Bluetooth Module.

Since both Wi-Fi and Bluetooth are limited to a certain range, so in case the person moves out of that range then he/she will no longer have the access to control the devices.

Moreover, the existing Home Automation System implies the use of a GUI application like an Android Application, which is problematic, and Security may be the concern regarding the controlling device and the GUI and most importantly, Control of every device is limitedly handed to a single device.

In addition, one of the demerits of the System is that no special importance given to saving of Electrical energy.

No usage of Sensors, providing less efficiency.

Home automation systems faces four major challenges like high cost, inflexibility, poor management, and difficulty related to security matters [3].

V. LITERATURE SURVEY

- The paper titled "Design and Implementation of Wi-Fi

based Smart Home System " in year 2017 uses methodology of The hardware interface module control its alarms and actuators with Wi-Fi that connects it with hardware interface modules with drawbacks like Limited Range of access, slow and limited communication, No sensor control.

- The paper titled "Intelligent Smart Home Automation and Security using Arduino and Wi-Fi" in year 2017 uses the methodology of An isolated WSN with one coordinator is integrated into PLC transceiver with drawbacks like Limited to Short distance, not suitable as a receiver, on battery based applications.

- The paper titled "Remote Controlled Home Automation using Android Application via Wi-Fi Connectivity" in year 2017 uses the methodology User has central control over home appliances by using Android smartphone app with a simple Relay and RJR Board with drawbacks like Data Rate is low along with limited Range of access with no automation.

- The paper titled "A low cost Home Automation System using Wi-Fi based Wireless Sensor Network Incorporating IoT" in year 2016 uses the methodology Consists of a WSN with sensor gateway or hub acting as the data coordination sensor with drawbacks like Slow data rate with high battery consumption and limited number of devices at a time.

- The paper titled "Raspberry Pi Home Automation with wireless sensor using smartphone" in year 2017 uses the methodology of Raspberry Pi microcontroller will interface with the android module to perform the automation with drawbacks like Limited Range of access, Slow data rate with high battery consumption.

- The paper titled "Design and Implementing of a Wi-Fi based Home Automation System" in year 2016 uses the methodology of Wi-Fi interface module control its hardware interface modules with drawbacks like Communicate with home appliances not possible from far away via internet.

VI. PROPOSED SYSTEM

The idea of the project is to make use of the present Sensors in an efficient and more effective way in collaboration with the Home Automation System to create a better model of the System which can provide much better benefits than the existing system.

The basic idea of this System is to make use of advanced and accurate sensors like Proximity Sensor, Motion Tracking Sensor or Temperature Sensor with combination of basic Home Automation System using an efficient Microcontroller

The data obtained from these Sensors can be analyzed and the implementation on the appliances can be made according to results obtained from the analysis of this data.

A basic example of the working is for a case of Temperature Sensor, which is used to monitor the temperature changes. The

![IJRESM logo] **International Journal of Research in Engineering, Science and Management**
Volume-1, Issue-10, October-2018
www.ijresm.com | ISSN (Online): 2581-5792

795

data produced by the Sensor is analyzed and if the result obtained by the analysis of the show an increase in the temperature then the working of AC will be increased Similarly in case the results show a decrease in temperature the working of AC will be decreased.

The system proposed is a vision to fully automate the human lifestyle at home.

The full automation will majorly make use of the sensors available through the present technological advancements.

The vision is a complete push towards zero human efforts, and also intelligently save power by automatic control.

The sensors automatically manage as to when & where the electronic equipment's or devices are required and switch accordingly.

The use of sensors in full automation will remove human effort & time and hence smartly save power, when not in use.

VII. Advantages of Proposed System

The system proposed would drastically reduce or remove the human effort and hence save time.

Automatic control over the regular devices using sensors would be highly effective in reducing power usage.

Would highly overcome the human tendency to forget things and leaving the devices unswitched.

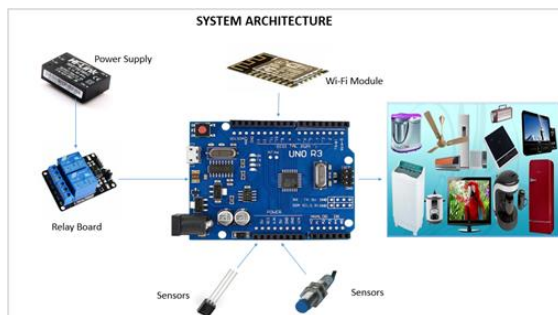## VIII. Implementation Overview

Fig. 1. System architecture

The System Architecture comprises of basic devices like a Battery for power supply, Relay Board, Arduino Microcontroller, Bread Board, Jumper Wires, Wi-Fi Module, and Temperature Sensor.

The implementation overview can be classified into 3 parts:

First part makes use of a basic Manual Working mode which makes use of a simple Wi-Fi Module which will be connected to the Arduino Microcontroller and Relay Board.

This part is simple and is dependent on manual commands given by the person & for this the GUI interface is required in the form of a Smartphone application.

Using this part we can switch the devices ON/OFF using the smartphone application which will be connected to the Home Automation System using the Wi-Fi.

Apart from this the next segment comes for the main Automation Process which makes the use of Proximity Sensor.

However the proximity sensor is not simply placed but instead of that a prototype of this Sensor is made using Bread Board.

Using the Bread Board a circuit has been designed which is made using a simple circuit comprising of the components like LM 358 IC, 1 Infrared LED Photodiode pair, Resistors: two 270 Ohm, one 10 X 10^3 ohm resistors, Potentiometer, Breadboard, Power Supply.

An infrared sensor is a sensor that either emits or receives infrared waves in the form of heat. While there are a majority of available infrared sensors dedicated for the purpose of transmitting and receiving infrared waves, there are several which can only receive them [4].

Passive Infrared (PIR): Detects body heat (infrared energy). They detect heat and movement creating a protective grid – if a moving object blocks multiple grid zones and the infrared energy levels change, the sensors are tripped [6].

The current which was generated when flows across the 100000 ohm resistor it causes a certain potential difference to be developed across. The magnitude of this voltage can be deduced by Ohm's law i.e. V=IR. As the value of resistance is fixed, the voltage across the resistor is directly proportional to the current flowing, which is directly proportional to the amount of IR waves are incident on the IR photodiode.

Therefore, when the object (say Door for example) is brought to the range of IR Sensor, the amount of Infra-Red rays from Proximity Sensor like model being made or IR Sensor, which get reflected and fell on the IR photodiode increases and therefore voltage at the resistor increases.

Here, LM358 IC is used for comparing the sensor and its corresponding reference voltages. The +ve terminal of photodiode is connected to non-inverting input of OpAmp and the reference voltage is then connected to inverting input of OpAmp.

So, now with adjustable range (using Potentiometer) the range at which the object can be detevted is in the user control to a large extent. An example for its implementation is like a door when opened then after a particular range of its opening is detected by Sensor and lights turn ON.
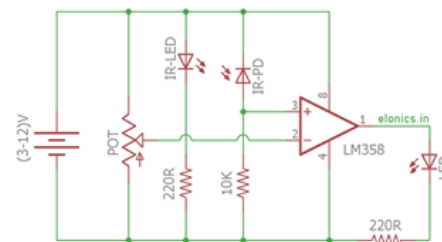

Fig. 2. IR proximity sensor schematic

Finally comes the last part of the implementation circuit i.e. the circuit with implementation of the Temperature Sensor.

The Temperature Sensor will be connected to an Arduino Microcontroller and the main function of the Sensor will be to note the temperature changes and provide the data to the system which will analyze the data and act accordingly.

A basic example of the working is for a case of Temperature Sensor, which is used to monitor the temperature changes. The data produced by the Sensor is analyzed and if the result obtained by the analysis of the show an increase in the temperature then the working of AC will be increased similarly in case the results show a decrease in temperature the working of AC will be decreased.

IX. Future Expectations

The future implementation of the Project can make use of Artificial Intelligence or Machine Learning in the current system to provide a better Home Automation experience. Since there can be certain loop holes with the data analyzation of the System which may cause unnecessary actions or wrong actions. This problem can possibly be solved if there is the implementation of AI which can understand the data analysis and come up with the best possible way to work in accordance to the data and provide the best and more efficient user experience.

X. Conclusion

In this project, the major objective is on the development of an advanced sensor based system which will be capable of providing a cost-effective system for Home Automation. A wide range of sensors are available which can be used to calculate the readings of motion track in the room,

It is an efficient system for security as well as for monitoring. The specifications of this system and the ease by which it can be implemented. The main advantage of the project is that even with a relatively small overall cost, this technology can prove helpful for everyone. The future scope of this work is implement a more advanced system which may be capable of performing tasks more efficiently using Artificial Intelligence.

References

[1] "Raspberry Pi Home Automation With Wireless Sensors Using Smart Phone"
[2] Design and Implementation of a WiFi Based Home Automation System"
[3] Remote Controlled Home Automation Using Android Application via WiFi Connectivity"
[4] http://www.tech-faq.com/infrared-sensors.html
[5] "Desgin and Implementation of Wi-Fi based Smart Home System"
[6] https://www.ibm.com/blogs/internet-of-things/sensors-smart-home/