



# A WEB BASED EFFICIENT HOME AUTOMATION SYSTEM USING IOT

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## Abstract

**In recent years, the Internet of Things (IoT) is widely used in home automation. It provides facility to have control over a wide range of home appliances and ensure securities. It also permits open access to a wide range of control of digital services. In this paper, we propose a web based home automation system using IoT that can control and automate most of the home appliances. The proposed system consists of an Arduino Uno board (ATmega32 IC), GSM module (SIM 300), PIR sensor, temperature sensor (LM 35), gas sensor (MQ-6), power select (7805) and web application. GSM module is used to establish communication between the microcontroller and the webpage developed. The design is user friendly and a safe system to control a wide varieties of home appliances, especially the aged and differently abled, and facilitates energy management. The paper also illustrates the experimental results to verify our proposed scheme. It monitors the status of a heterogeneous type of device encountered at home on a daily basis and activates the wide range of operations. The sensor parameters can be conveniently stored in the cloud. The system can be further modified to industrial automation, mobile health care, traffic management, and elderly assistance.**

**Index Terms:** GSM, Home automation, IoT, sensors.

## I. INTRODUCTION

In the 21<sup>st</sup> century, man is around new ideas which enable him to access all devices with his fingertips. The advancement in technology has created many changes in our surroundings and we can even access the internet even at a single

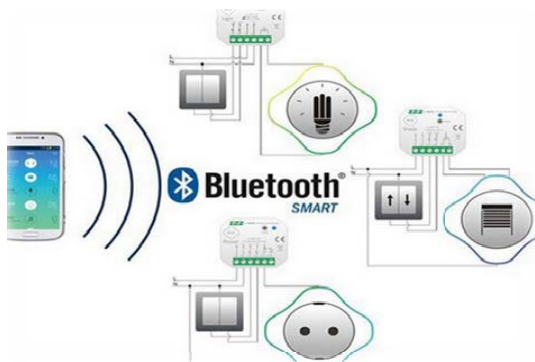
click. Home automation has become a tedious task with the wide range of equipments that utilizes[1] advanced technology. Home automation is an area related to automation of home equipment for safety and proper use of human.

The technology still grows beyond the limit of human thoughts so that one can simply access the home appliances. This paper will describe the implementation of home automation with the help of internet[5].

## II. LITERATURE SURVEY

Earlier, for controlling home appliances we need to switch it manually. Because of the difficulty in operation and difficult for remote access, this system was not considered as an efficient method. As the technology has advanced the home automation system become controlled by Bluetooth module which mark the beginning of wireless transmission era. The limitation of Bluetooth technology is that there is a chance of interference with other devices using Bluetooth and range is also limited for Bluetooth[1]. Advancement in technology has created an outburst on the development of the android platform which became an revolution in the cellular mobile system. It can be controlled by android mobile phone. In the case of android phone, it was platform dependent, i.e., we need an iOS for Apple phone android for working in android phone[4].

We have developed a system that we can control and monitor the home appliances using any devices having an internet connection[3].



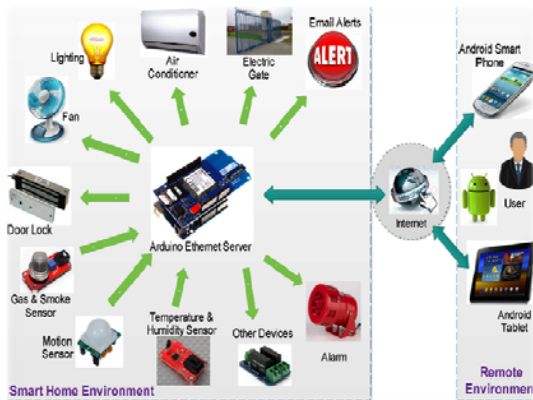
**Figure 1:** Home automation using Bluetooth module



**Figure 2:** Home automation using Android App

**III. PROPOSED METHODOLOGY**

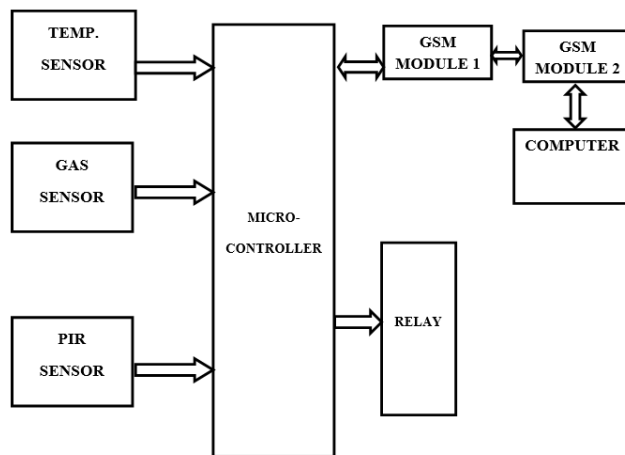
The existing systems has a number of disadvantages which are listed above. The system defined here has used internet for handling home automation. We have used GSM module which enable the user to interact with the controller via web[2]. A series of relay is established in the circuit so that they can be easily controlled over internet. A set of sensors will constantly monitor the home appliances and provide automation and control by full time monitoring. Efficient home automation system that we used here does not have any range limitations and are more advanced.



**Figure 3:** Home automation using internet

**3.1 Block Diagram**

Proposed project is having two main sections. First section is the sensor region which continuously monitor the home automation system. The second part of the project consist of a set of relays controlled by commands which are provided by making suitable changes in the web page. The system follows a separate operation for each of the components that are attached to the relay.



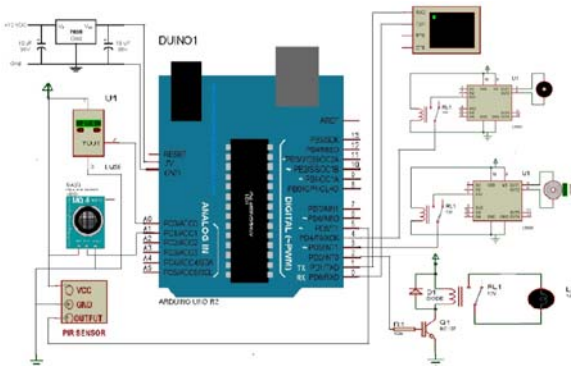
**Figure 4:** Block Diagram

As we have explained in the previous section, the core of our project is an Arduino Uno board. Power is supplied to the Arduino board and the computer. The sensors like gas sensor, temperature sensor, PIR sensor are attached to the corresponding pins of the controller.

A PC/laptop can be used as an user interface to control the components of home automation system. The status of each system will be displayed on the monitor. GSM is used as an interface between microcontroller and the webpage developed in the computer. The user can switch on and switch off appliances using the computer. The status of each sensor module will be displayed on the computer.

**IV. HARDWARE IMPLEMENTATION**

The hardware implementation was first tested on proteus and the error obtained was corrected accordingly. The circuit explains how a group of sensors interact with other kind of devices. Also, relay modules are used in controlling the switching circuit of the home.



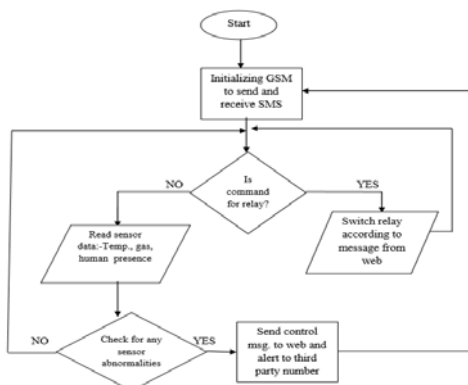
**Figure 5:** Circuit Diagram

Here an Arduino Uno board is used and an AtMega 328 microcontroller is used. Here we use relays to stimulate the control of home appliances. Firstly, we need to login to our home page and can switch on and off the equipment from the options given there. Also, if some abnormalities like temperature hike, gas leakage or human presence is detected messages will be send to user’s mobile and corresponding alert messages are shown in the webpage as popups.

Three sensors temperature sensor LM 35, gas sensor MQ-6, and PIR sensor connected to pins A0, A1, and 5 respectively. Relay is connected to pins 8,9 and 10 to stimulate the control of three appliances. For programming microcontroller, we used Arduino IDE software and Apache Tomcat for web application. For stimulating the temperature hike and gas leakage we use a lighter and in case of human detection also corresponding messages are received and alerts are shown in the webpage.

**4.1 Flowchart**

The flowchart of the system touches both hardware and software parts. Both parts have different operational modes which are controlled by separate components.



**Figure 6:** Flowchart of Home Automation system

At the beginning, we initialize the GSM module which enable us to receive and transmit the message. Micro controller will check whether any SMS has received or not for relay operations. If received, it will switch the appropriate relay according to the control message received from web and it will continue to monitor the external request. If no SMS is received, microcontroller will read the sensor data like temperature, gas leakage and human presence and check for any sensor abnormalities. If any abnormality is detected by the microcontroller, then it will send control message to web, and alert the user also to switch off the appliances. If it doesn’t detect any abnormality, it will return back and start checking for messages from web and repeat the whole cycle.

**V. RESULTS AND DISCUSSIONS**

The designed system has two section of output operation. The first section is one in which output is controlled by a relay which is operated from the web page. Second part is monitoring the sensor value and displaying the corresponding status on the webpage. After we search in the internet, we will be directed to a login page which has a unique username and password



**Figure 7:** Login page

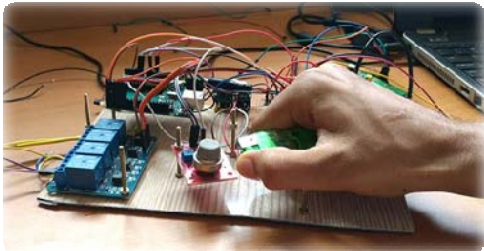
Then after the user is directed to a home page where we will display the device control switches and sensor status.



**Figure 8:** Home page

In the home page, we are provided with the button switches which can be altered as per the design, and the corresponding condition of the appliances are varied by clicking the send button.

While any sensor receives an abnormal condition, the corresponding dialog box will be displayed on the web page and the user will be also alerted.



**Figure 9** : Senses gas leakage



**Figure 10** : Dialog box displayed on the web



**Figure 11**: User gets alert on mobile

Similarly, all the other alerts that are caused by sensor abnormality can be easily displayed on the web page and corresponding message will be send to the user mobile to notify the situation.

## VI. CONCLUSION

In this project, we have successfully developed a prototype for web based home automation. Microcontroller monitors the sensor data, like temperature, gas, motion sensors and generate alerts. This project is very flexible and efficient as it can be accessed and controlled from anywhere using a device having an internet connection. The range of sensors are limited and for GSM it depends on geographical area for

proper functioning. i.e. it need coverage to work properly and effectively depending on the service provider.

We can automate a large-scale environment, such as offices and factories, also can do some in-house energy monitoring in house for controlling and saving energy use. It can be further modified to provide some security solutions thus allow greater control and safety for home owners. Now it is developed in such a way that there is nobody in home but in future we could modify its capabilities so that it can be worked even in presence of inhabitant at home. It can be implemented for a city so that everything in a city can be controlled by a single computer. It can also be connected with tsunami buoys deployed in sea to give warning to coastal population and authorities. An improved healthcare monitoring system also can be incorporated in future.

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