

# WIRELESS HOME AUTOMATION SYSTEM USING IOT ELIMINATING ELECTROMAGNETIC INTERFERENCE

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## ABSTRACT

Automation is a technique or a system of controlling a process by electronics device with reducing human involvement to a minimum. This paper presents a design of monitoring and controlling of home automation system from an android application based on Arduino. This system uses Wi-fi technology as a communication protocol to connect system components; the first part is android application that give orders to units that one wishes to control by locally or remotely and the second part is Arduino that has an appropriate interface to sensors and appliances of a home automation system and communicates with an android application through wireless technology. The automation system can have a vital role in reducing the total energy consumed by home appliances. The advantage of home automation is to help handicapped and old aged people who will enable themselves in controlling home appliances.

**Keywords:** Arduino, ESP8266 Wi-Fi module, Light control, Temperature Controcos

## I.INTRODUCTION

The home automation systems are gaining popularity day by day due to their ease of use and wide operations capabilities. Some require home automation system to satisfy their needs and comfort while for physically challenged people it can provide great assistance. There have been several researches and developments on the home automation systems. In the present times, we can find most of the people clinging to their mobile phones and smart devices throughout the day. Hence with the help of his companion- a mobile phone, some daily household tasks can be accomplished by personifying the use of the mobile phone. To develop an Automatic control system that helps in controlling the devices connected to it, with the help of W-Fi interconnection [1]. To ease the way of accessing the devices in controlling it, and maintaining the proper log of the data which the device senses. To develop a system which would be very useful for handicapped persons in doing works on their own without seeking any help.

## II.REVIEW OF LITERATURE

The design of Internet of Things based home automation system using Raspberry pi supports large number of peripherals. Raspberry pi is having different communication media like Ethernet port, HDMI port, USB port, Bluetooth low energy. Here local server is created on Raspberry pi [1].The design and implementation of a low cost but yet flexible and secure cell phone on a stand-alone Arduino BT board and the home appliances are connected to the input/output port of this board via relays. The system is designed to be low cost and scalable [2].

The controlling of home appliances remote system uses GSM technology thus provides universally access to the system for automated appliances control. [3].Automation is the technique or a system of controlling a process by electronic devices. This system uses Wi-Fi technology as a communication protocol to connect system components and to help handicapped and old aged people who will enable themselves in controlling home appliances [4].Home automation system uses the technology of Internet of Things for monitoring and controlling of the electrical and electronic appliances. Implementation of a low cost, flexible home automation system is presented. It enhances the use of wireless communication which provides the user with remote control of various electronic and electrical appliances [5].Communication takes place via a dedicated telephone line not via a Bluetooth technology. There are few issues involved when designing a home automation system [6].

The web-based automation systems are low cost. However, they are not too feasible to be carried out as a low-cost solution [7] Appliances at home are connected to the Arduino BT board. The communication between the cell phone and the Arduino BT board is wireless. Additional devices can be connected into the system with little modifications [8].

In automation system Electromagnetic Interference may leads to malfunction of the system [9], which should be avoided by proper method of insulating the components. These errors can be avoided by implementing proper structure of design methodology, guidelines and life cycle models for hardware design [10], [11]. The power consumption of the automation devices must be designed to be low and effective modulation techniques can be applied to reduce the power during transmission [12], [13]. On demand power consumption during peak hour hours is an effective method that will be considered along with the design for effective power saving [14].

In the embedded Bluetooth technology, digital devices form a network in which the appliances and devices can communicated with each other. Operating over unlicensed, globally available frequency of 2.4GHz, it can link digital within a range of 10m at the speed of up to 3Mbps depending on the Bluetooth device class.[15], [16].

### III.SYSTEM METHODOLOGY

Home automation system using IOT consists of three major parts. IOT home automation illustrates such a platform which consists mainly of data acquisition, transmission, processing and display.

#### A. Data Sensing and Acquisition

To ensure a good comfort level, the typically monitored parameters in houses are temperature, humidity, luminosity and air quality.

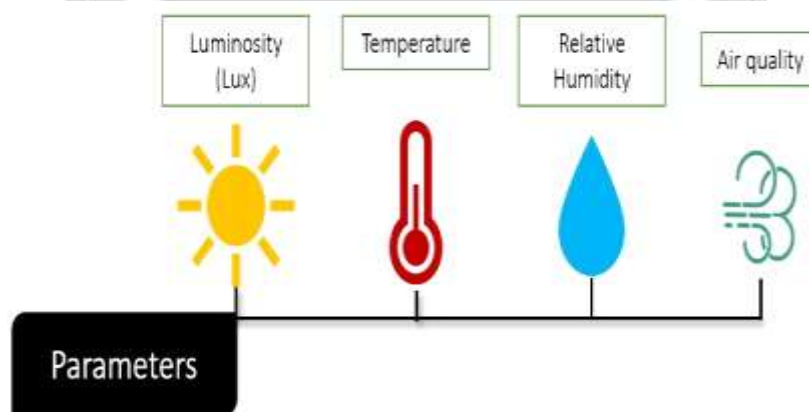


Figure1. Measured parameters in the monitoring system

“big data “ is often associated with IOT and refers to the large number data collected from a large number of sensors and device should be processed.

### **B. Data Transmission**

Transmitting data between devices and controllers is done using one or more communication technologies. These include Bluetooth, Zigbee, Wi-Fi, Ethernet or GSM. Additionally, Wi-Fi has the advantages of mobility, making it more wide spread in most systems. Wi-Fi technology consumes more energy than alternative such as Bluetooth or Zigbee.

### **C. Data Processing**

The data collected in a home automation system usually processed and managed by a microcontroller such as Arduino, Raspberry pi and NodeMCU. Arduino is a single-board microcontroller that can be simply programmed to execute commands.

Arduino comes in a variety of models with on board flash memory ranging from 32kb to 512kb, and a typically a Ram of 2kb. Most Arduino models are cheaper, easier to handle, and powerful enough to deal with home automation tasks. Another option is use the NodeMCU. It is an Arduino based microcontroller but with the addition of the ESP8266 Wi-Fi chipset. This microcontroller has a memory of 128kb and a 4 Mb storage. It is mostly used for a single IOT application, or to eliminate the need for central processing unit.

The biggest advantage of the NodeMCU over the other alternatives is the significantly low price for a controller that can connect to the internet directly using Wi-Fi, without the need for any additional peripherals or modules. An issue is that the NodeMCU board has only one analog input, which limits its applications to as data monitoring system.

### **D. Data Display & User Interface**

The interaction between the user and the system can be done in several ways. There are many simple means to create a web-based app to display data, even with a limited knowledge of programming. This control method requires a special GSM module added to the circuit.

## **IV. PROPOSED SYSTEM**

With the ever increasing adoption rate of Internet enabled devices (also known as Internet of Things (IOT) devices) in applications such as smart home, smart city, smart grid and health care applications, we need to ensure the security and privacy of data and communications among these IOT devices and the underlying infrastructure. For example, an adversary can easily tamper with the information transmitted over a public channel, in the sense of modification, deletion and fabrication of data-in-transit and data-in-storage. Time-critical IOT applications such as health care may demand the capability to support external parties (users) to securely access IOT data and services in real-time. This necessitates the design of a secure user authentication mechanism, which should also allow the user to achieve security and functionality features such as anonymity and un-traceability. In this paper, we propose a new light weight anonymous user authenticated session key agreement scheme in the IOT environment.

### **A. Working**

The proposed scheme uses three-factor authentication, namely home control section, user application. The proposed scheme does not require the storing of user specific information at the gateway node. We then demonstrate the proposed scheme's security using JWT logic, and other features. In addition, through our simulations, we demonstrate that the proposed scheme out performs existing related user authentication schemes, in terms of its security and functionality features, and computation costs.

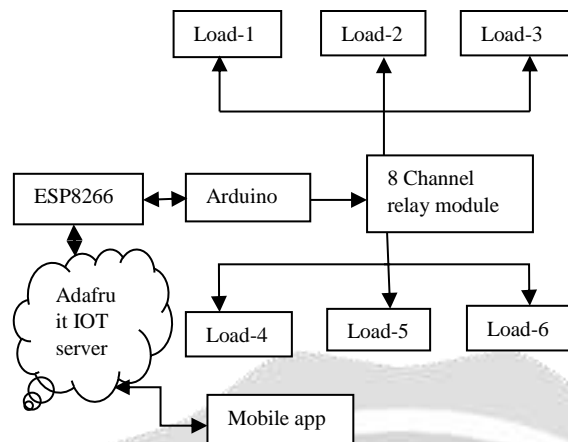


Figure 2. Functional representation of system

Home automation system using IOT consists of three major parts. The first part is the sensing and data acquisition part. This is done by placing sensors or devices at several locations. The second part is data transmission. Transmitting data between devices and controllers is done using one or more communication technologies. The third part of the system is the data processing. Sensors provide data in raw form. The last part of IOT automation is data display and user interface.

### B. System Architecture

The system architecture is a computational representation of a set of concepts, that are part of an architecture, including their principles, elements and components.

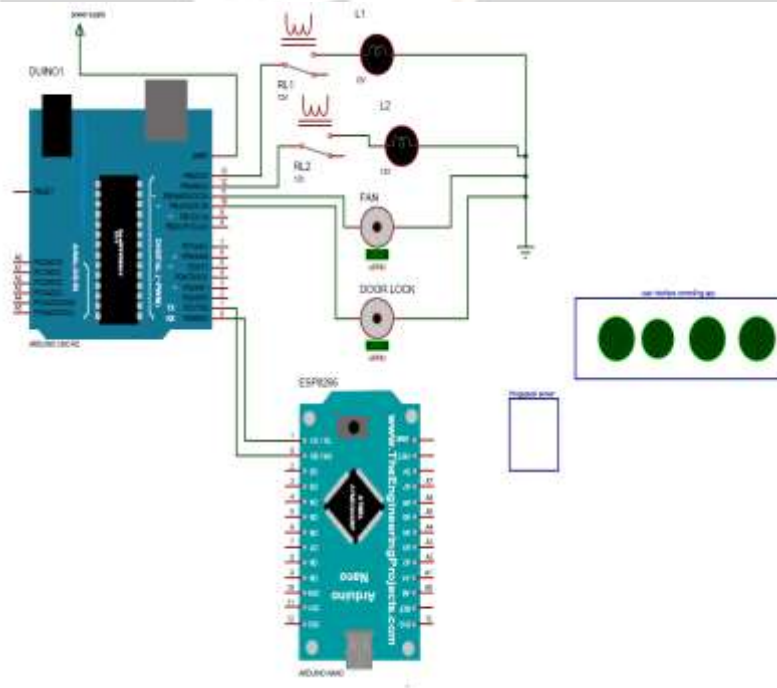


Figure3. Computational representation of system

### **Arduino UNO Microcontroller**

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins which support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The board can operate on an external supply of 6 to 20 volts. The ATmega328 has 32 KB of flash memory for storing code; It has also 2 KB of SRAM and 1 KB of EEPROM. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX).

### **Sensors**

The system uses low cost DHT temperature & humidity sensors.. The DHT sensors are made of two parts, a capacitive humidity sensor and a thermistor. There is also a very basic chip inside that does some analog to digital conversion and spits out a digital signal with the temperature and humidity. The digital signal is fairly easy to read using any microcontroller.

### **LCD Display**

The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. We will discuss about character based LCDs, their interfacing with various microcontrollers, various interfaces (8-bit/4-bit), programming, special stuff and tricks you can do with these simple looking LCDs which can give a new look to your application.

### **C. Design Flow**

A flow chart is a diagram that depicts a process, system or computer algorithm. While Arduino get powered, it initializes the Wi-fi module, sensors, relay module and LCD display. If the Wi-fi module detects any wifi network it's displayed at the LCD display and while we connected it's IP address with password, the LCD displays the "Connected Successful". After that it's automatically connected with Adafruit IOT server which is configured initially. When the user is giving the ON/OFF commands by the switches from Adafruit server, it sends the data signal to the Wi-fi module that we used through internet. According to the data signal the Arduino triggers the relay module and that turn ON and OFF the LOAD's. At the same time the temperature sensor senses the room temperature and transmits it to Adafruit IOT server. Where the temperature value is displayed, all data's are simultaneously displayed to the displayed to the LCD display

## **V.RESULTS AND DISCUSSION**

The proposed design of the home automation system that is used for controlling the home appliances through android application. Adafruit is used as a web server. It makes the data faster and the processing of data much faster than other technology. The sensor is used to monitor the temperature and humidity and the levels are displayed in LCD. The main advantage of the proposed design is to operate home appliances from any part of the globe.

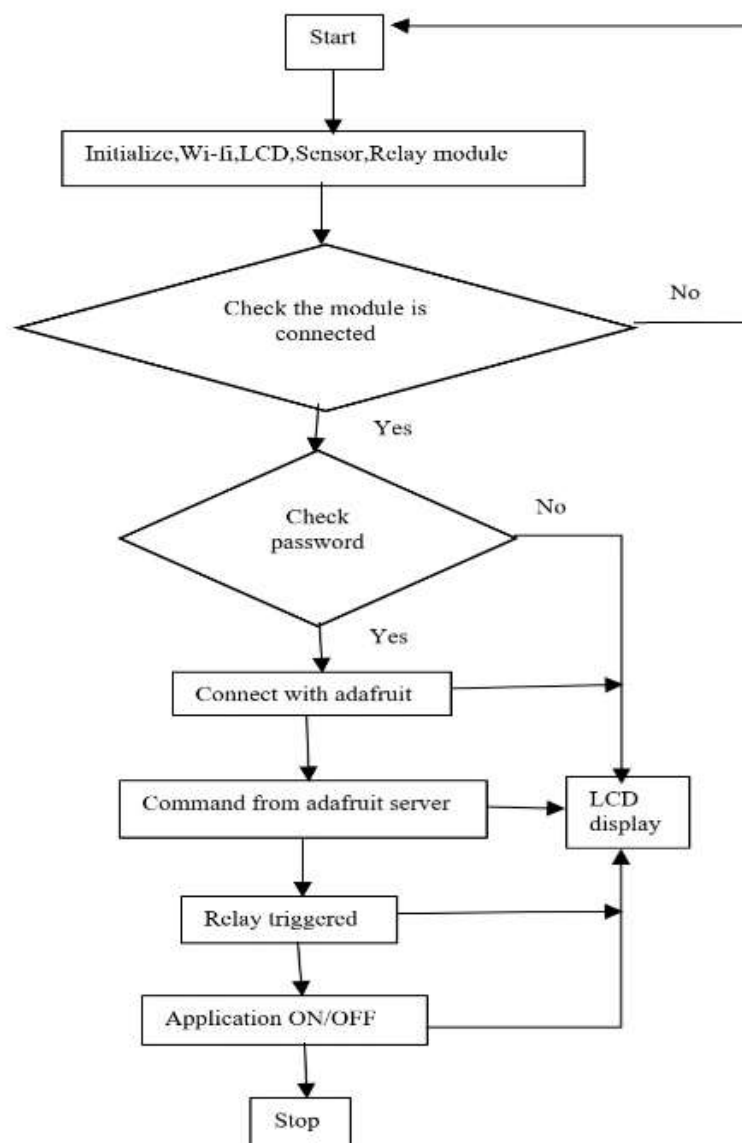


Figure 4.System Design flow

## VI. CONCLUSION

Home automation system will bring more convenience and comfort to people's life. The android -based smart home application communicated with the Wi-Fi module ESP8266 which acts as an access point. Using android application user could control and monitor the smart home environment. Arduino provides an economic and efficient platform to implement the smart home automation system. This system can be used to communicate with many numbers of devices. It minimizes the wastage of electricity and it consumes less time, also it helps the old aged and disabled people in doing the basic domestic works on their own.



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