

# Smart Home Automation with Home Security using IoT

<sup>1</sup>Paul K V <sup>2</sup>John Selvaraj N S <sup>3</sup>Gokul Kumar G

<sup>1,2</sup>UG Scholar <sup>3</sup>Assistant Professor

<sup>1, 2,3</sup>Christ the King Engineering College, Karamadai, Coimbatore, Tamilnadu, INDIA

## Abstract

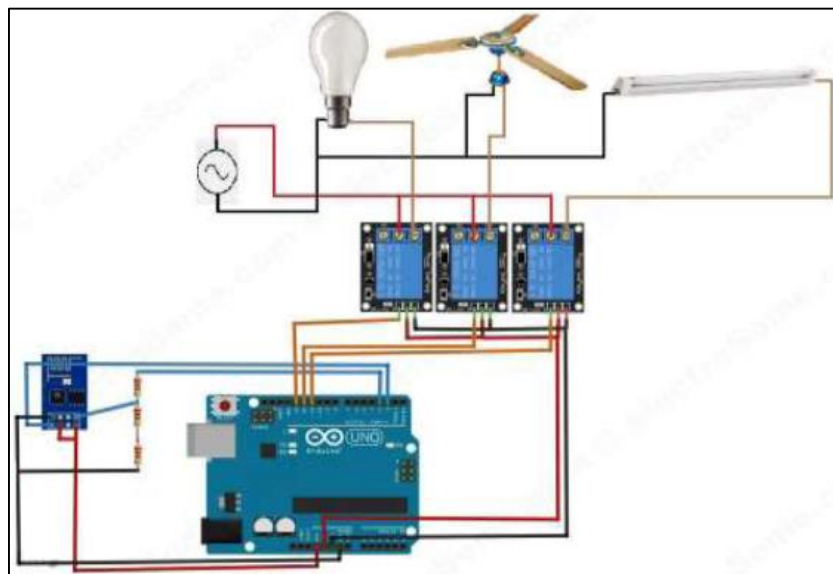
This project presents a design and prototype implementation of new home automation system that uses Wi-Fi technology as a network infrastructure connecting its parts. The proposed system consists of two main components; the first part is the server (web server), which presents system core that manages, controls, and monitors users' home. Second part is hardware interface module, which provides appropriate interface to sensors and actuator of home automation system. Unlike most of available home automation system in the market the proposed system is scalable that one server can manage many hardware interface modules as long as it exists on Wi-Fi network coverage. System supports a wide range of home automation devices like power management components, and security components. The proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

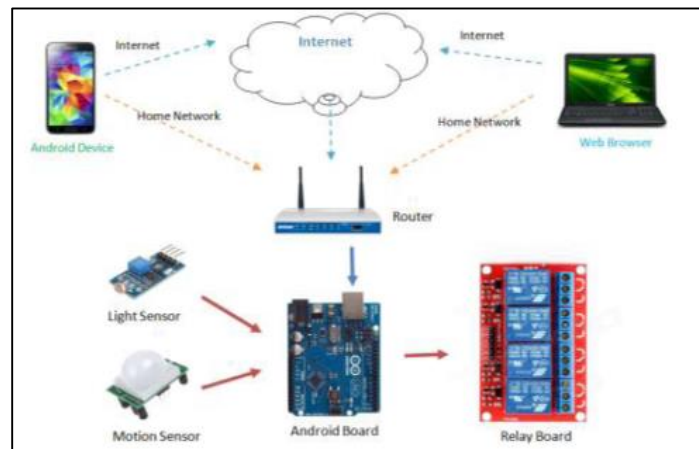
**Keyword- IoT, Wi-Fi, Arduino Uno**

## I. INTRODUCTION

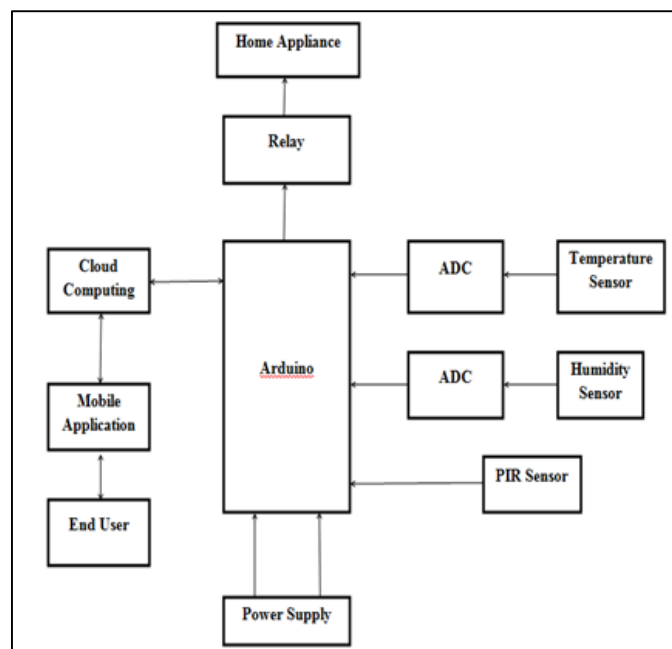
The project aims at designing an advanced home automation system using normal web server and Wi-Fi technology. The devices can be switched ON/OFF and sensors can be read using a Personal Computer (PC) through Wi-Fi. Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to its user-friendly nature. These can be used as a replacement of the existing switches in home which produces sparks and also results in fire accidents in few situations. Considering the advantages of Wi-Fi an advanced automation system was developed to control the appliances in the house. Wi-Fi (Short for Wireless Fidelity) is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology. Range of Wi-Fi technology is 40-300 feet. The controlling device for the automation in the project is a Arduino UNO. The data sent from PC over Wi-Fi will be received by Wi-Fi module connected Arduino UNO. Arduino UNO reads the data and decides the switching action of electrical devices connected to it through Relays.

## II. METHODOLOGY





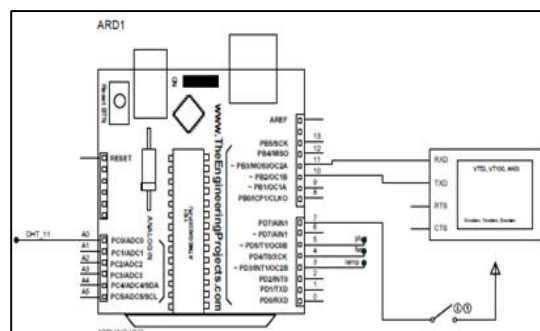
### III. BLOCK DIAGRAM

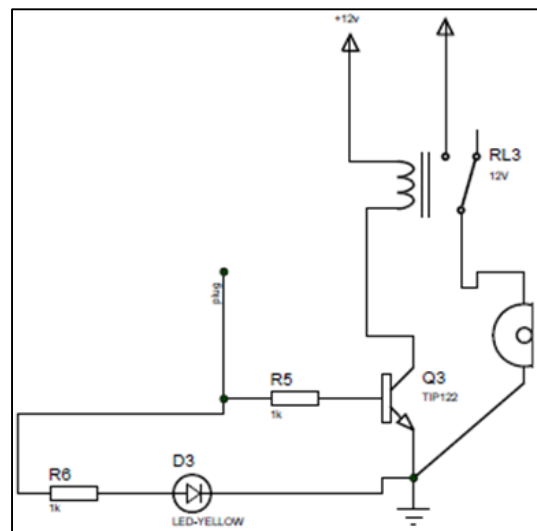
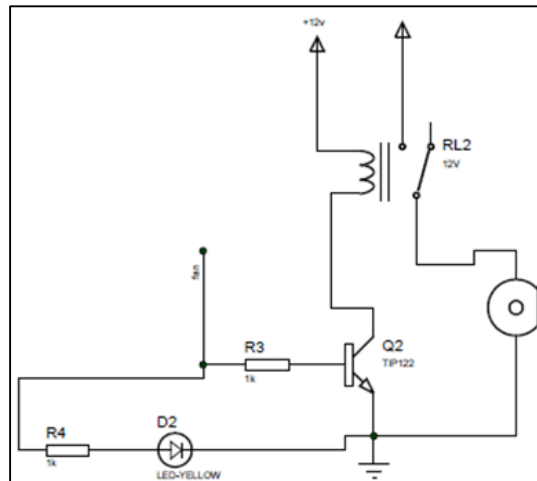
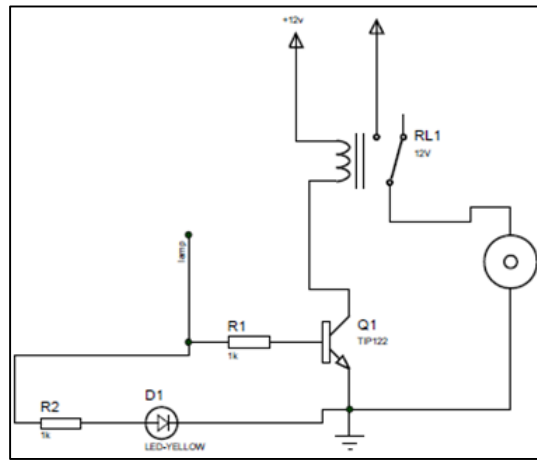


## IV. OPERATION

The data from the mobile application send to the cloud. From the cloud through internet the data send to the Arduino board. According to the program the arduino enables a switching transistor. The transistor activates the appropriate relay. The sensors send their output to the arduino and result can be monitored at the mobile application.

## V. CIRCUIT DIAGRAM



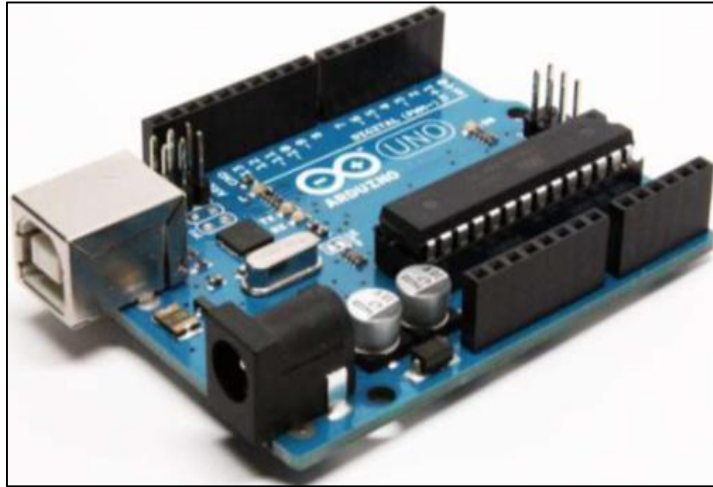


## VI. COMPONENTS USED

### A. Arduino Uno

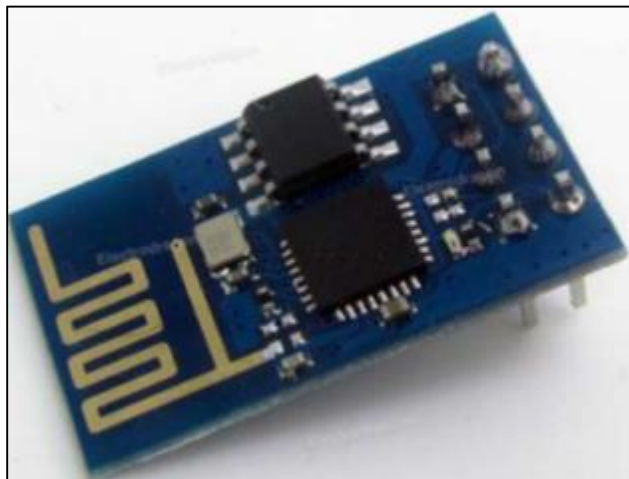
The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-

serial converter. The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards.



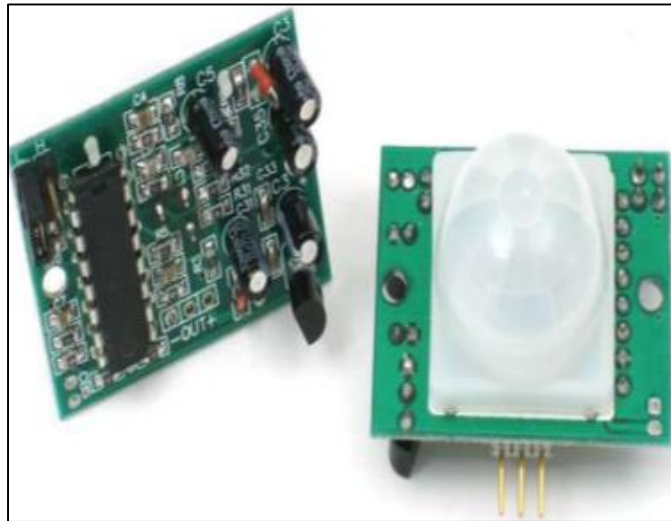
#### *B. Wi-Fi Module (ESP8266-01)*

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts. There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transforming this module into an IoT (Internet of Things) solution!



#### *C. PIR Sensor*

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.



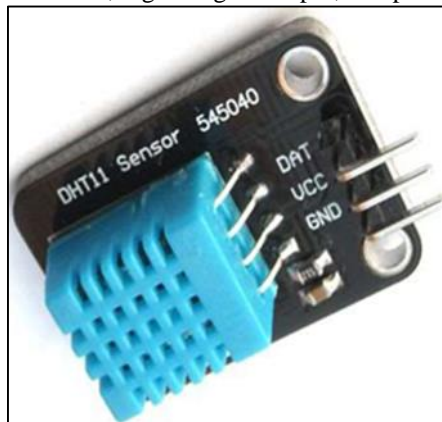
PIRs are basically made of a pyroelectric sensor (which you can see below as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low. Along with the pyroelectric sensor is a bunch of supporting circuitry, resistors and capacitors. It seems that most small hobbyist sensors use the BISS0001 ("Micro Power PIR Motion Detector IC"), undoubtedly a very inexpensive chip. This chip takes the output of the sensor and does some minor processing on it to emit a digital output pulse from the analog sensor. For many basic projects or products that need to detect when a person has left or entered the area, or has approached, PIR sensors are great. They are low power and low cost, pretty rugged, have a wide lens range, and are easy to interface with. Note that PIRs won't tell you how many people are around or how close they are to the sensor, the lens is often fixed to a certain sweep and distance and they are also sometimes set off by house pets.

#### D. Temperature and Humidity Sensor (DHT11)

DHT11 digital temperature and humidity sensor is a composite Sensor contains a calibrated digital signal output of the temperature and humidity. Application of a dedicated digital modules collection technology and the temperature and humidity sensing technology, to ensure that the product has high reliability and excellent long-term stability. The sensor includes a resistive sense of wet components and an NTC temperature measurement devices, and connected with a high-performance 8-bit microcontroller.

## VII. FEATURES

Low cost, long-term stability, relative humidity and temperature measurement, excellent quality, fast response, strong anti-interference ability, long distance signal transmission, digital signal output, and precise calibration.



#### A. Relay Board

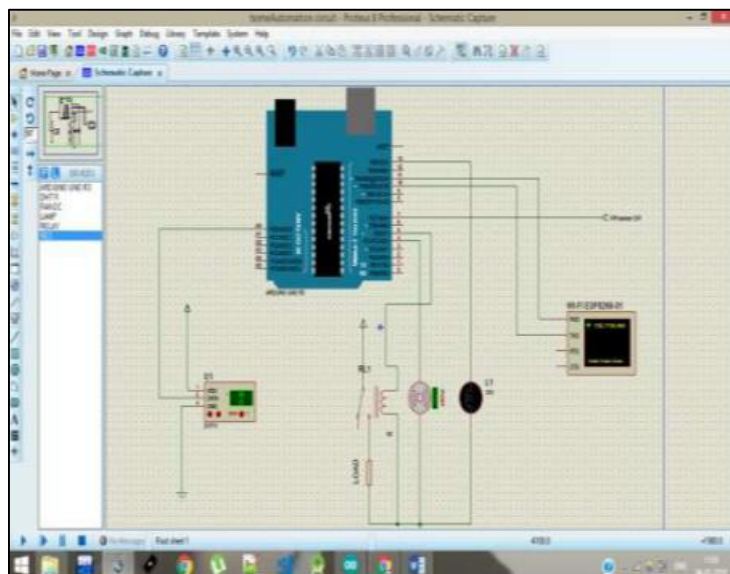
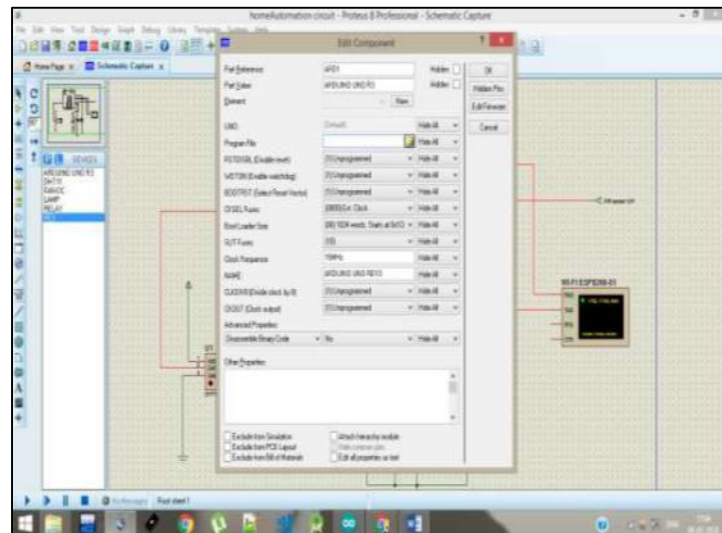
A relay is an electrical device which is generally used to control high voltages using very low voltage as an in this consists of a coil wrapped around a pole and a two small metal flaps (nodes) that are used to close the circuit. One of the node is fixed and other



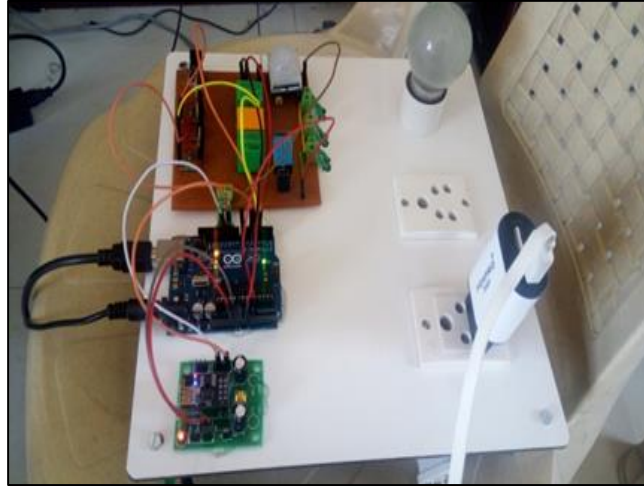
is movable. Whenever an electricity is passed through the coil, it creates a magnetic field and attracts the moving node towards the static node and the circuit gets completed. So, just by applying small voltage to power up the coil we can actually complete the circuit for the high voltage to travel. Also, as the static node is not physically connected to the coil there is very less chance that the Microcontroller powering the coil gets damaged if something goes wrong. This is Four Channel relay board controlled by computer USB port. The usb relay board is with 4 SPDT relays rated up to 10A each. You may control devices 220V / 120V (up to 4) directly with one such relay unit. It is fully powered by the computer USB port. Suitable for home automation applications, hobby projects, industrial automation.



## B. Simulation



### C. Hardware Model



## VIII. CONCLUSION

The home automation and home security provides better access to the home appliances and ensure home security, the project can be implemented in smart cities. Nowadays, home security is very important which can also be controlled by using this project.

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- [4] National Institute of Technology, Warangal