IOT BASED SMART HOME AUTOMATION USING ARDUINO

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ABSTRACT

Internet of Things(IoT) is fast becoming a disruptive technology increasingly development topic of conversation both in workplace and business opportunity, with standards rising primarily for wireless communication between devices and widget in day to day individual human life, in general referred to as Things. The Home Automation can be implemented using different types of wireless communication techniques such as ZigBee, Wi-Fi, Bluetooth, GSM, connecting any device with an on and off switch to the Internet. This includes everything from cell phones, coffee makers, washing machines, headphones, lamps, wearable devices and sensors and actuators to the internet.
The growing technology is most important to Everyone, Every time, everywhere connectivity of things with anticipation which will extend and create an entirely advanced dynamic network of IoT. The IoT technology can be used for new modernization concepts that can be wide used for development space for smart homes system in order to provide intelligence, comfort, safety and improved quality of life. The scheme focuses on controlling referred as Home Automation and providing Smart security by using "Node MCU" Module we are going to put into operation this project. This will be more helpful for physically challenged people and matured people.

Keywords: IoT, Arduino Uno, Node MCU, IR sensor, Wi-Fi, Relay Module

I. Literature Review

Home automation was first introduced into the global market in the 1970s, but it failed to meet the expectations of people and was failed. There were various reasons associated with the disappointment of the home automation system. The system was user friendly nor cost efficient. Currently, the leading point to be kept in mind when designing a home automation system is that it should be Cost–efficient and easy to install.
T.Tamura et. al. [1], in their research, constructed the welfare techno houses in Japan in 2003. The purpose behind the project was to monitor the health of the disabled and older people living in the home, thereby improving their superiority of life.
K.Y.Lee and J. W. Choi: [2], in their research on the Housing L earning and provident Network in 2003, defined a Smart Home as a "unit where all the appliances of the house are connected together and forbidden and monitored remotely."The following paragraphs will give a summary of the previous research works in the field of Smart Homes.

T.Tamura et. al. [3], in their research, constructed the welfare techno houses in Japan in 2003. The motive behind the project was to monitor the health of the disabled and older people living in the home, thereby improving the irquality of life.
D.J. Cook et. al. [4] successfully conducted the MavHome project at the University of Texas, Arlington. The project used sensors to detect the state of the environment, and with the help of controllers, took the necessary exploit to maintain stability. The sensors form an extemporized network to make the decisions.
H.Kanma et. al. [5] conducted a medical research to monitor people who require edical help and present a wireless solution at the University of McGill in Canada. The project ready to use of cell phones and inexpensive sensors. It worked by making use of wireless Protocols such as ZIGBEE, Bluetooth as well as GSM and analyzing data through an adaptive architecture.

II.Overview of IoT

IoT can be a global nervous system. It is Internet connected objects (things) working together to solve a business problem. It has been around for quite a while, but only recently has become affordable for personal use. The Internet of things is the set of connections of devices, vehicles, and home appliances that contains electronics, software, actuators, and sensors, connectivity which allows these things to connect, interact and exchange data. The main advantage of this IOT is even though Wi-Fi is not available we can go throughout 3G or 4G services. The safety measures system will use a microcontroller known as Arduino Uno to interface between the components, a Magnetic Read Sensor (MSR) to monitor the status, a smart signal for sounding the alarm system, and a Wi-Fi module, ESP8266 to connect and communicate using the Internet.

III.Capabilities of IoT

- Addressability
- Actuation
- Communication & Cooperation
- Embedded Information Processing
- Identification
- Localization
- Sensing
- User Interfaces

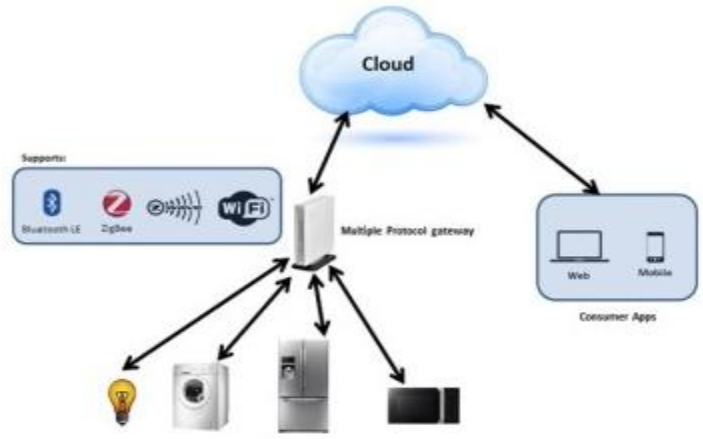

Fig.1 IoT for Home and Personal use

IV.Arduino Uno

The Arduino UNO is an open source electronics prototyping platform based on the Microchip ATmega328P microcontroller. Arduino is an on flexible, easy-to-use hardware and software. The board is prepared with sets of digital and analog I/O pins that may be interfaced to various development boards and other circuits.

Arduino Uno is a very valuable addition in the electronics that consists of USB interface, 6 analog pins, 14 digital I/O pins and Atmega328 microcontroller and also supports serial communication using Tx and Rx pins.

There are many versions of Arduino boards introduced in the support like, Arduino Uno, Arduino Due, Arduino Leonardo, Arduino Mega; the most common versions are Arduino Uno and Arduino Mega.

The software used for Arduino devices is called IDE (Integrated Development Environment) which is free of charge to use and mandatory some basic skills to learn ,it can be programmed using C and C++ language. It allows the developers to control and sense the external electronic devices in the real world.

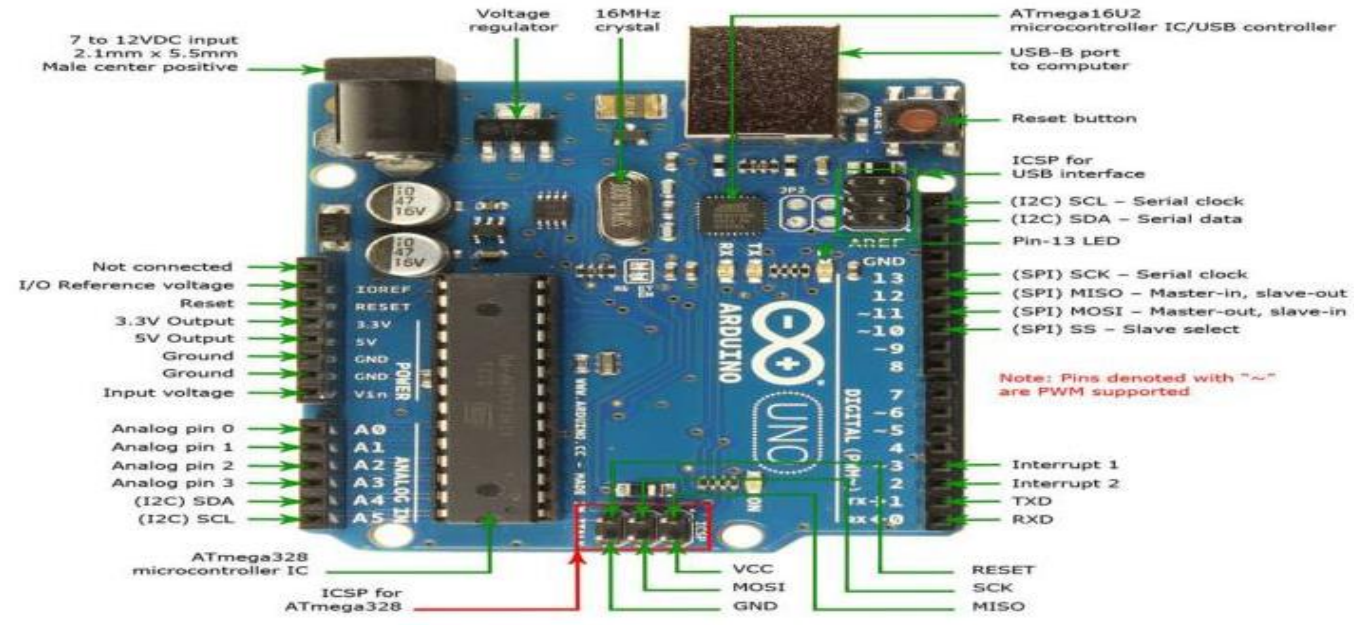

Fig.2 Arduino Uno

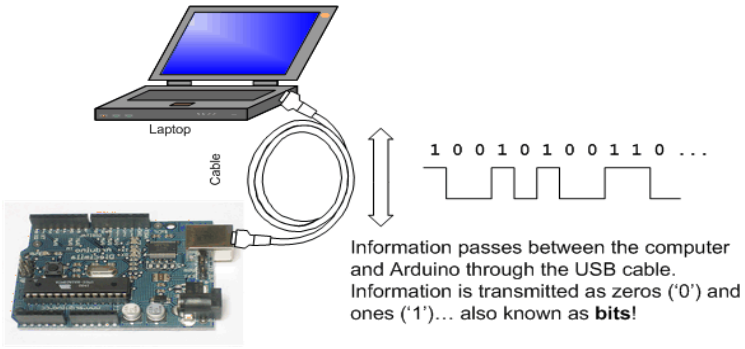

Fig.3 Serial Communication

V.Home Automation System

A home automation system using a simple Android app, which you can use to control electrical appliances with clicks to Arduino Uno. This controls the relay operation (ON or OFF).

1.Techniques

Control house appliances from everywhere in world *via* Internet to make your home smart with Arduino and ESP8266 Wi-Fi Module. Control home appliances such as IOT based home automation over the cloud, home automation under Wi-Fi through android apps from any Smartphone, Arduino based home automation, Automation by android application based remote control, using digital control, RF based home automation system, touch screen based home automation.

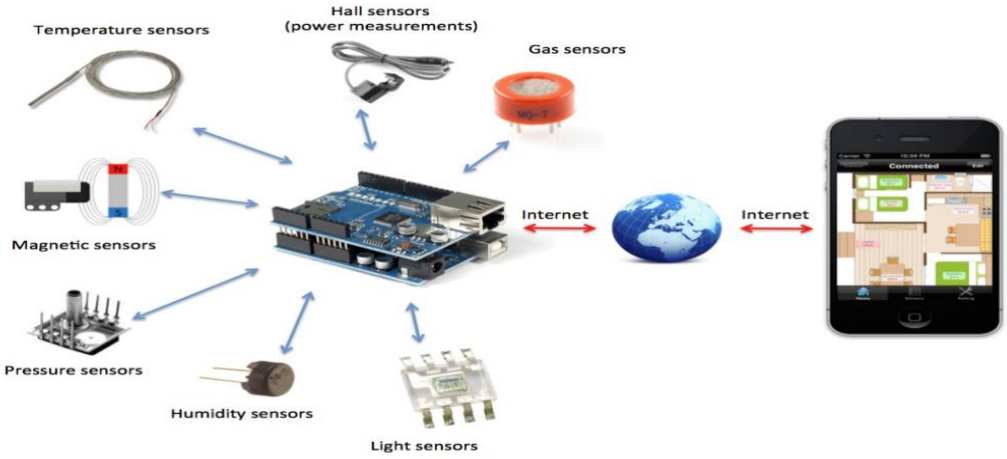

Fig.4 Aurdino App-Home Automation

2. Components of Home Automation

- Node MCU
- Relay
- Wi-Fi Module
- An android Phone
- Voltage Regulator

2.1 Node MCU

Node MCU is an open source IoT platform that is specifically designed for IoT task. This small board is based on ESP8266 Wi-Fi module which is specifically designed for working with or without micro controllers which uses Lua scripting language. These modules have 10 GPIO, all of which can be used as PWM, IIC, 1-Wire and Analog to Digital Converters all in one board. It also has a PCB antenna fixed in the board, which extensively improves the connectivity.

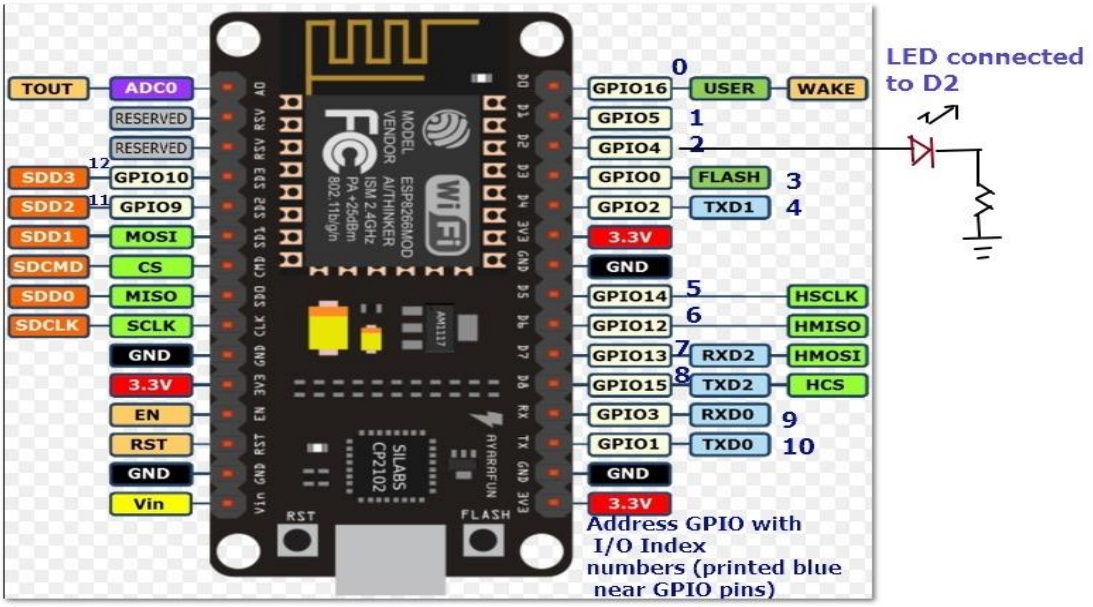

Fig.5 Node MCU

2.2 Relay

A Relay is Simplest for on/off home automation an electro - magnetic switching device. It consisting of an armature which is moved by an electromagnet to operate one or more switches links. USB Relay Controllers consent to computer controlled switching using the USB port of your computer. We were using 5v 4-channel relay line board, and each channel needs a 15-20mA driver current. It can be able to be used to control various appliances and tools with large current relays that work under AC250V 10A or DC30V 10A.It has a set interface that can be controlled directly by Microcontroller. It is generally used to control high voltages using very low voltage as an Input.

Applications of Relay

- Digital Household Electrical Appliances,
- OA Equipment
- Automobile Devices
- Security Devices
- White Goods
- Industrial Equipment
- Medical Devices

Fig.6 Relay Board and USB Relay board

2.3 Wi-Fi Module Wireless Fidelity is a wireless networking technology used for exchanging the in sequence between two or more devices without using cables or wires. In attendance are various Wi-Fi technologies like Wi-Fi 802.11a, 802.11b, 802.11g and 802.11n. Wi-Fi module is used to receive commands from the internet and activate loads through TRIAC and Optocoupler by executing a program written within the Wi-Fi module.

Fig.7 Home Automation Node MCU with Wi-Fi

2.4 Voltage Regulator VR is an electronic device used for regulating voltage in a power system, It have various types of voltage regulators such as variable voltage & fixed voltage regulators which are again subdivided into several types like electro-mechanical, automatic voltage, linear, hybrid regulator. It have 3.3V voltage regulator is used to provide required power supply to a Wi-Fi module from 5V SMPS power supply.

Fig.8 Voltage Regulator

VI. Goal of Home Automation System (HAS)

➢ **Controlling Home Appliances by the use of Application:** To develop an application that includes the features of switches mode application and Switch Mode can be used to control the switches of home appliances.

➢ **Real Time HD Video Streaming from Web Camera:** To receives the quality video for the camera to the android application. Internal block diagram of Wireless Temperature sensor.

➢ **Secure Connection Channels between Application and Aurdino*:*** Use of secure protocols over Wi-Fi so that other devices cannot control the home appliances. There are several Options for securing the Connection in SSL over TCP, SSH.

➢ **Wireless Relay Controlled (Android, IOS, and PC):** To make the home appliances flexible in control, any device can be capable of using Wi-Fi based connectivity which will control the home appliances from remote location.

➢ **Platform Extensibility enhancement:** The application is to be highly extensible, with possibility of adding features in the future as needed.

VII. Circuit Diagram Of the Development Implemented Using Arduino UNO, PIR Sensor and Relay Module

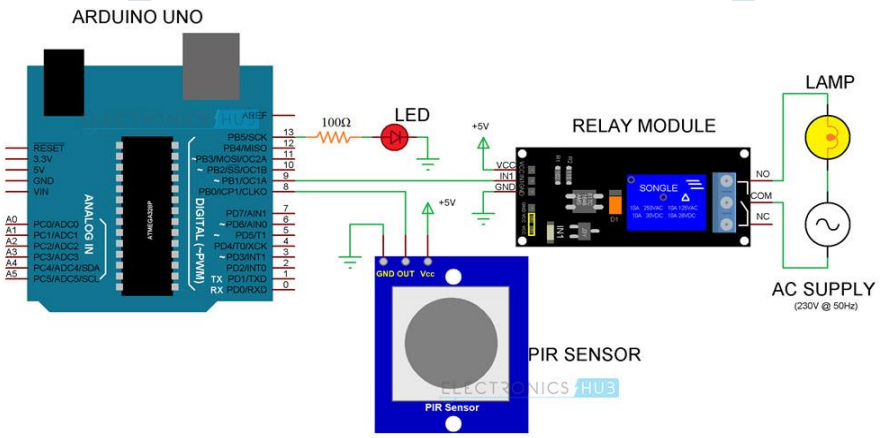

Fig.9 Circuit Diagram Arduino UNO, PIR Sensor and a Relay Module

PIR sensors allow you to sense motion. The PIR motion sensor is ideal to detect movement, they are used to detect whether a human has moved in or out of the sensor's range. PIR expand “Passive Infrared", "Pyroelectric", or "IR motion" sensors. Fundamentally, the PIR motion sensor measures infrared light from objects. The component actually consists of a Pyroelectric sensor which generates energy when exposed to heat.

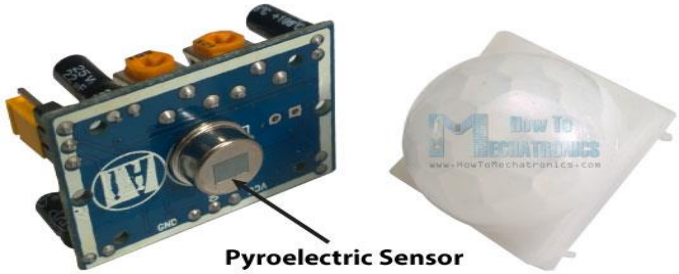

Fig.10 Pyroelectric Sensor

Which means when a human being or animal body will get in the range of the sensor will detect a movement because the human, animal body emits heat power in a form of infrared radiation. That's wherever the name of the sensor comes from, a Passive Infra-Red sensor and the term "passive" means that sensor is not using any energy for detecting purposes; it just works by detecting the power given sour by the other objects.

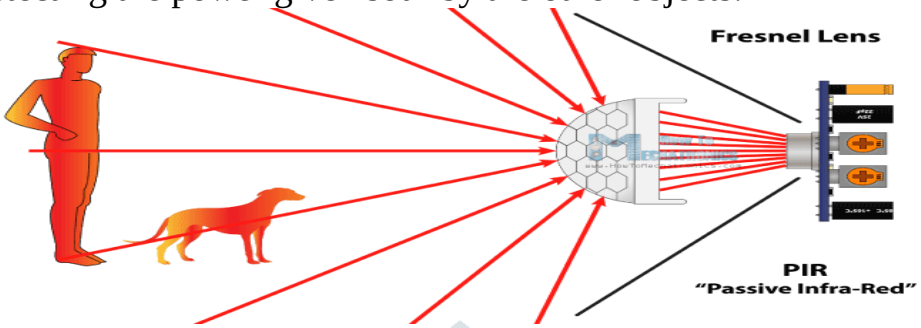

Fig.11 How its PIR Sensor Works.

VIII.Conclusions

Home Automation is an undeniably a resource which can a home environment automated. People can control their electronic devices through this home automation and set up controlling actions via smart phone.. A system is developed to integrated different facilities controls some home appliances like light, fan, door cartons, , level of the Gas cylinder using various sensors like LM35, energy burning up, IR sensors, LDR module, Node MCU ESP8266, and Arduino UNO. To connect to the Arduino Board must be connected over Wi-Fi, within a local network through a Smart Phone or a Laptop. The ESP8266 Wi-Fi Module and interface to Arduino through Serial Communication. Arduino will command the ESP8266 module to find connected to a Wi-Fi network and receive data from the client.

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