

Arduino Based Home Automation System

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Abstract : This IoT based paper mainly focuses on developing a Smart Home System. This System helps to improve comfort and quality of life. As the technology is advancing, the cities are becoming more smarter and so are homes. Modern homes are shifting from switches to a centralized remote control. Switches which are used currently in houses are located at different parts of the house and makes it difficult for an elderly person or handicapped people to access it. Home automation system helps user to control maximum devices using a smartphone or a tablet with the help of a bluetooth connection which is connected to arduino. Remote controlled home automation system provides most modern solution with smartphones.

I. INTRODUCTION

Home Automation System is built using various sensors, motors, modules so that it can store access real time data and work accordingly. Main function of sensors is to constantly sense sound, temperature, light and other sensing elements which will send all the real time data to the controlling devices. The control devices will accept data, execute the function and will give the expected output.

Home Automation System is proposed to reduce the labour work. This system will help us to save time and energy. Nowadays smartphones are used by majority of the people and keeping that in mind this system is created where the majority of the tasks can be performed by Smartphones.[8]

Previously these systems were planned to replace labour work but nowadays these systems can be benefited to elderly and handicapped people. In wireless based home automation system different types of technologies such as ZigBee, Z-Wave , Global System for Mobile (GSM), General Packet Radio Service (GPRS) , Infrared wireless fidelity (Wi-Fi) and Bluetooth are used, each technology has their own pros and cons.[7]

The reason Bluetooth have been chosen is because it is low cost, wireless and can be easily used using smartphones.

The architecture and detailed information of the sensors and components used are discussed below.

II. SYSTEM DESCRIPTION

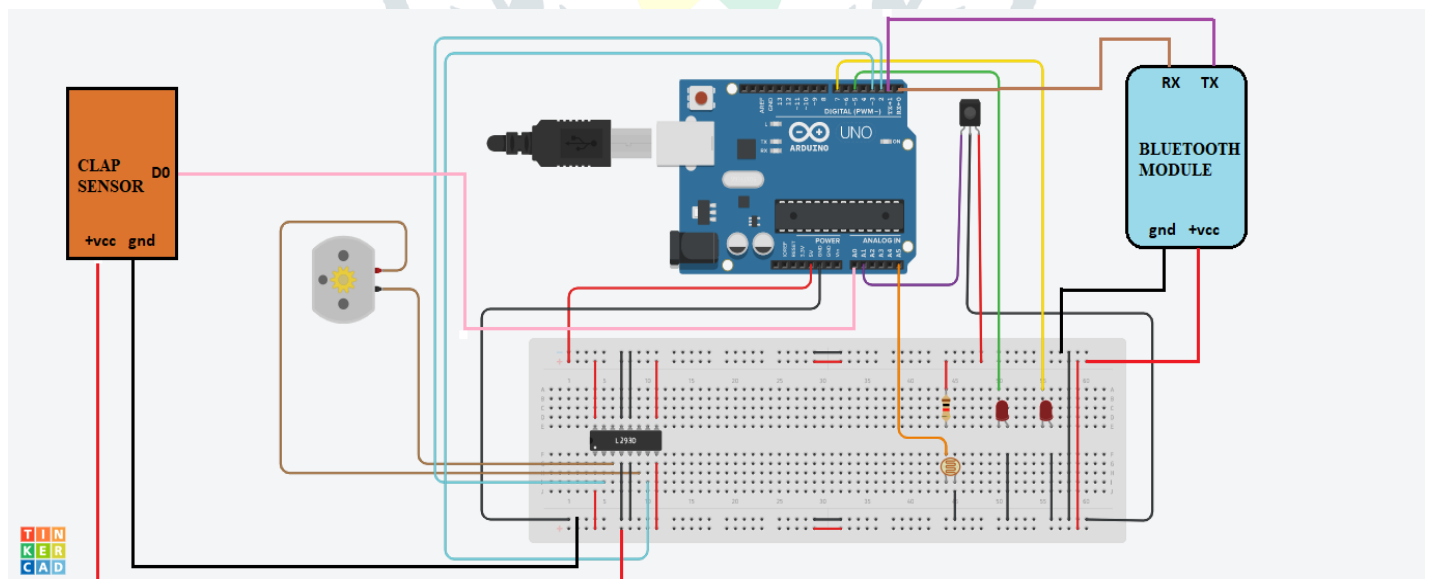


Fig.2.1: Circuit Diagram for Arduino based home automation system

2.1 Circuit Diagram for Arduino based Home Automation System

The Circuit diagram has been made using online circuit making tool Tinkercad .[3]

Components used : HC-05 Bluetooth module, IC L293D (as motor driver), clap sensor, IR sensor, DC motor, led's, ldr, arduino uno ,breadboard, register and some wires (M-M and M-F)

In bluetooth module RX pin is connected to pin 0 (TX pin) and TX pin is connected to pin 1 (RX pin) of arduino uno. Clap sensor is connected to pin A0 of arduino uno. IR sensor is connected to pin A1 of arduino uno. LDR is connected to pin A5 of arduino uno through a register. DC motor is connected to pin 2 and 3 of arduino uno using IC L293D as shown in fig 2.1 . Led's are connected

at pin 5 and 7 of arduino uno. All the vcc and gnd connections are given to vcc(+5v) and gnd(0v) pin of arduino uno through breadboard.

2.2 Components used for Home Automation System

A. ARDUINO UNO

Arduino UNO is a microcontroller which is completely based on ATmega328P Processor. The Arduino UNO consists of 14 digital pins which can be used either for Input or Output. Apart from that it contains 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It has 32 KB flash memory, 2 Kb SRAM and 1 KB EEPROM.[2]

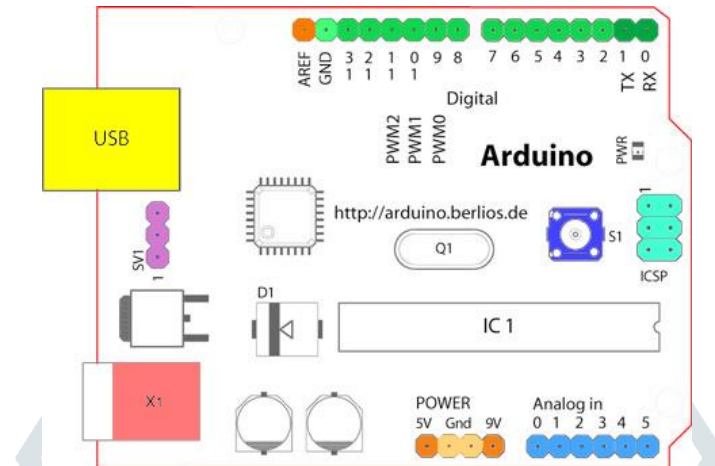


Fig.2.2: Arduino uno board pin diagram

B. HC-05 BLUETOOTH MODULE

HC-05 Bluetooth Module gives a full duplex wireless functionality. It is basically used to communicate between two microcontrollers or with and bluetooth functionality device such as a mobile phone.

It has two modes

1. Data mode: In this mode we can send or receive data.
2. AT Command mode: In this mode we can change the default settings.

The module communicates with the USART at a baud rate of 9600 , Thus, it is easy to interface with any microcontroller supports USART.[9]

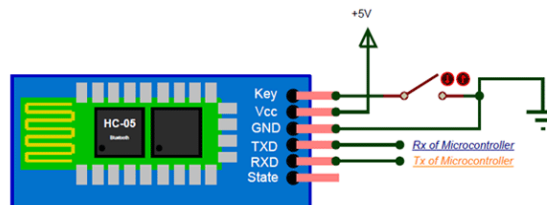


Fig.2.3: HC-05 Bluetooth module

C. LIGHT EMITTING DIODE

LED known as light emitting diode glows when current is passed through it. It is a semiconductor device. This effect is due to electroluminescence. Electroluminescence occurs when electrons in the semiconductor recombines with electron holes, releasing energy in the form of photons.They are available in different colors. These colors are determined by the energy required for electrons to cross the band gap of the semiconductor.[5]

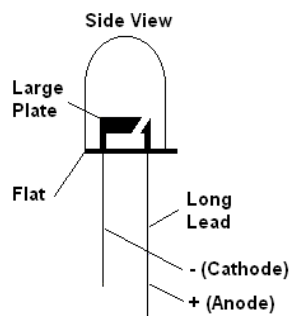


Fig.2.4: LED

D. DC MOTOR

DC motors known as Direct Current motors convert electrical energy into mechanical energy. DC motors produce a continuous movement which makes it useful in pumps, fans etc. It is the most commonly used actuator because of its continuous movement and easy control over its speed. It consists of two parts

1. Stator : It is a stationary part
2. Rotor: It is the rotating part. [9]

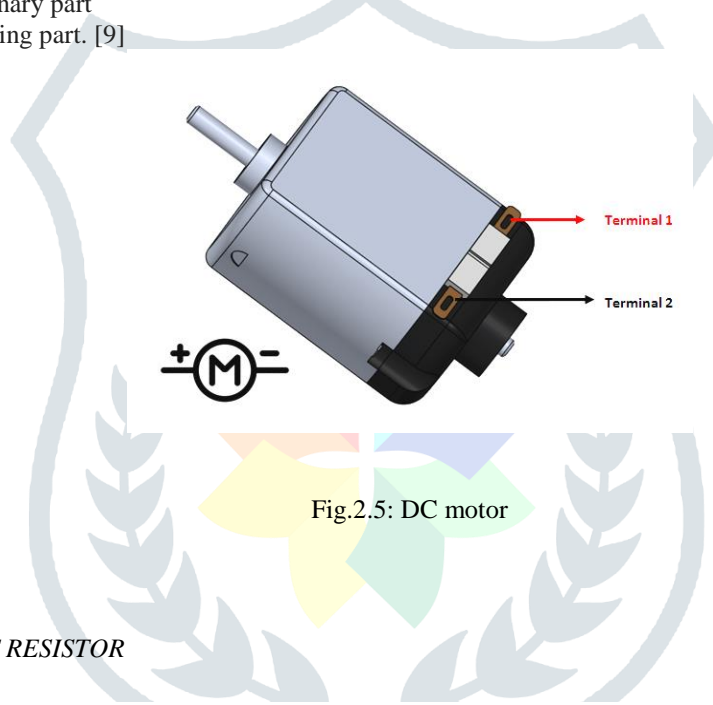


Fig.2.5: DC motor

E. LIGHT DEPENDENT RESISTOR

LDR or light-dependent resistor is a variable resistor controlled by light. It exhibits photoconductivity i.e The resistance decreases with increasing incident light intensity. The resistance can get up to several megaohms in dark and can get as low as few hundred ohms with exposed to light. [4]

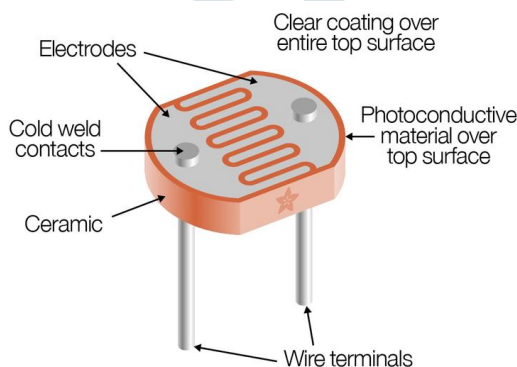


Fig.2.6: LDR

F. IR SENSOR

Infrared sensor or IR sensor is an electronic device which can detect the surrounding objects. It is generally used to measure heat or detect the motions. The infrared spectrum emits some kind of thermal energy which can only be detected by IR sensors. These energies are invisible to our eyes. IR consists of 2 parts

1. Emitter: It is an IR LED

2. Detector: It is simply a photodiode which is sensitive to the IR lights of same wavelength which is emitted by IR LED. When IR light falls on the photodiode, The resistances and these outputs, changes in proportion to the magnitude of the IR light received. [4]

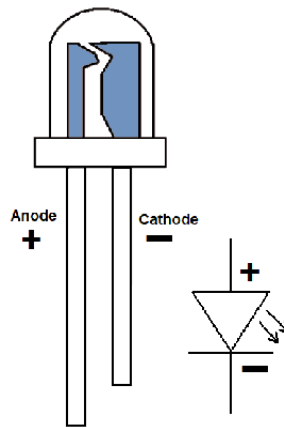


Fig.2.7:Infrared sensor

G. CLAP SENSOR

It consists of a microphone. Sound is detected through the microphone. It is used where the task is to be performed sensing a sound. It detects the hand claps or finger snaps without triggering for other loud ambient noises. It can detect approximately upto 9 feet.[9]

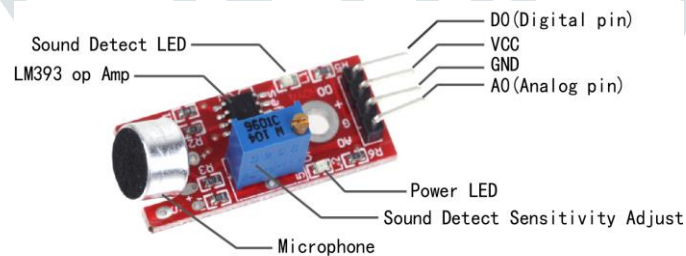


Fig.2.8: Clap sensor

III. WORKING OF THE SYSTEM

The full system is operated by Smartphone using Bluetooth. One LED light is connected using LDR. This LDR is generally connected outside the house. During daytime, the light connected to LDR is off and during night time the light automatically glows. Other LED light is connected using Clap Sensor. As the clap sensor detects first clap it will glow LED and on the second clap it will turn off the LED light. Both these Lights i.e. connected using LDR and Clap sensor also have Bluetooth access. The System has one fans which is connected using IR Sensor. When the user waves the IR Sensor the speed of the Fan increases. There are total five speeds starting from 0, followed by 1 upto 4.

IV. FUTURE SCOPE

There is a wide scope of improvement in this system such as,

1. We can add a soil moisture detector which will detect the level of water present and will sprinkle water whenever the water level goes down.
2. Gas Leakage and smoke detector will help to detect the presence of fire or hazardous gases.
3. The Security system can be improved using fingerprint scanner.

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2. We thank to the online circuit making tool Tinkercad for helping us to make a good circuit diagram.
3. We thank the college staff for providing all the components needed.
4. Special thanks to website Arduino.cc for providing us with information about the components.
5. We Thank Digital Library for helping us with relevant papers.

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