Design & Implementation of Microcontroller based ‘‘Home Automation and Security System with Solar Power”



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Declaration

It is declared hereby that this thesis paper or any part of it has not been submitted to anywhere else for the award of any degree.

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This is to certify that this project entitled ‘‘Home Automation And Security System With Solar Power” is done by the following students under my direct supervision. This project work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering, Sonargaon University (SU) in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

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ABSTRACT

Home automation allows us to control household electrical appliances like light, door, fan, AC etc. It also provides home security and emergency system to be activated. Home automation not only refers to reduce human efforts but also energy efficiency and time saving. The main objective of home automation and security is to help handicapped and old aged people who will enable them to control home appliances and alert them in critical situations. This project put forwards the implementation of home automation and security system using Arduino microprocessor and Android smart phone. Home appliances are connected to the microprocessor and communication is established between the Arduino and Android mobile device or tablet via Bluetooth module. We would develop an authentication to the system for authorized person to access home appliances. The device with low cost and scalable to less modification to the core is much important. It presents the design and implementation of automation system that can monitor and control home appliances via android phone

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LIST OF ABBREVIATIONS

DC	Direct Current
AC	Alternating Current.
LDR	Light Dependent Resistor
ADC	Analog-to-Digital Converter
IR	Infrared Receiver
IC	Integrated Circuit
LED	Light Emitting Diode
PCB	Printed Circuit Board

CHAPTER-1
INTRODUCTION

1.1.1 Home automation

Home automation or demotic is building automation for a home, called a smart home or smart house. A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems.

Home security system

A home security system is designed to detect intrusion – unauthorized entry – into a building or other area. Security alarms are used in residential, commercial, industrial, and military properties for protection against burglary (theft) or property damage, as well as personal protection against intruders.

Solar Power System

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaic (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect. It Can track sun and enshour more power.

Remotely control your home

After your home network is connected to other networks, such as the Internet, Bluetooth you can suddenly do amazing things from almost any interconnected spot. The ability to control a device after it is hooked up to the network is limited only by the openness of the device itself. (In other words, the only limit is the degree of controllability of the device - your home‘s infrastructure won‘t hold you back.)Want to turn on the kitchen lights and fire up the coffeepot from your bed? Click your remote control, and out go the lights. Want to check the babysitter while you‘re at your neighbor‘s party? Log into your home‘s controller from your neighbor‘s computer (or on your cell phone) and check up on things.

Save time

Think about how much time it takes every day to open the shades, turn on the morning news, and let the dog out, and so on. Wouldn‘t you like to do all that (and more) with one command? By programming these chores into task profiles, you can.

Save money on electronics

With a true home network, you have to buy fewer devices to outfit your home. Instead of having a VCR hooked to every TV set, for instance, you can centralize this functionality and distribute the signal around the house through remote control as you need it. The same is true of almost any network-connected device, such as a DSS satellite receiver, PVR, and cable bo

Save money on communications costs

By centralizing access to certain telecommunications services, you can cut monthly service costs. For instance, with a home-network backbone, both you and your spouse can connect to the Internet on separate computers while sharing one line and one account. What‘s more, you can share a high-bandwidth option — such as a cable modem, DSL link, or Hughes Net-type satellite service — with the entire family.

Save money on your home expenses

A wired home can turn back those thermostats when you‘re away on vacation or cuddled under your blankets at night. It can turn lights off automatically, too. Over time, you may save a surprising amount in heating, cooling, and electricity costs.

Be more flexible and comfortable assets

A home network frees you from being tied to one spot for one activity. For instance, when working late at night, you might want to move the laptop to a comfy recliner instead of a damp basement office. And you can with a distributed means to access the Internet — and therefore your centralized e-mail, calendar, and contact database. The latest home networking technology will route your HDTV signals around your house, freeing your TV set to be anywhere a wireless signal can reach!

1.1.2 The advantage of home automation and security system.

- **Savings:** Smart thermostats and smart light bulbs save energy, cutting utility costs over time. Some home automation technologies monitor water usage, too, helping to prevent exorbitant water bills. Certain devices even offer rebates.

- **Safety:** Many home automation technologies fall under the umbrella of home security. Consumers purchase these devices because they want to make their homes safer and more secure. Automated lighting thwarts would-be burglars, and motion sensors help people enter doors and walk hallways late at night. Security cameras offer benefits through either remote monitoring of package deliveries or real-time video of home inhabitants or unwanted visitors.

- **Convenience:** Because home automation technology performs rote tasks automatically, end users experience great convenience. Lots of smart gadgets are compatible with one another, and you can set different triggers between devices to automate regular home processes. For instance, you could set your smart locks to turn on your smart lighting when you unlock the front door.

- **Control:** Consumers also choose smart home devices to better control functions within thehome. With home automation technology, you can know what‘s happening inside your home at all times.

- **Comfort:** Some people use smart technology to record shows or to play music throughout the home. Connected devices can also help create a comfortable atmosphere—they provide intelligent and adaptive lighting, sound, and temperature, which can all help create an inviting environment.

- **Peace of Mind:** Finally, many consumers invest in home automation technology for peace of mind. A new mom or dad can check on their little one thanks to smart cameras and othertechnologies. Or, if you can‘t remember whether you closed the garage after you left, you can verify remotely with an app.

1.2.3 Objectives

This solar panal work through LDR and Arduino .The basic aim of Home automation is to control or monitor signals from different appliances, or basic services. A smart phone or web browser can be used to control or monitor the home automation system.

CHAPTER II

THEORY OF THE PROJECT

2.1.1 Arduino Uno

The Arduino UNO is a widely used open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits

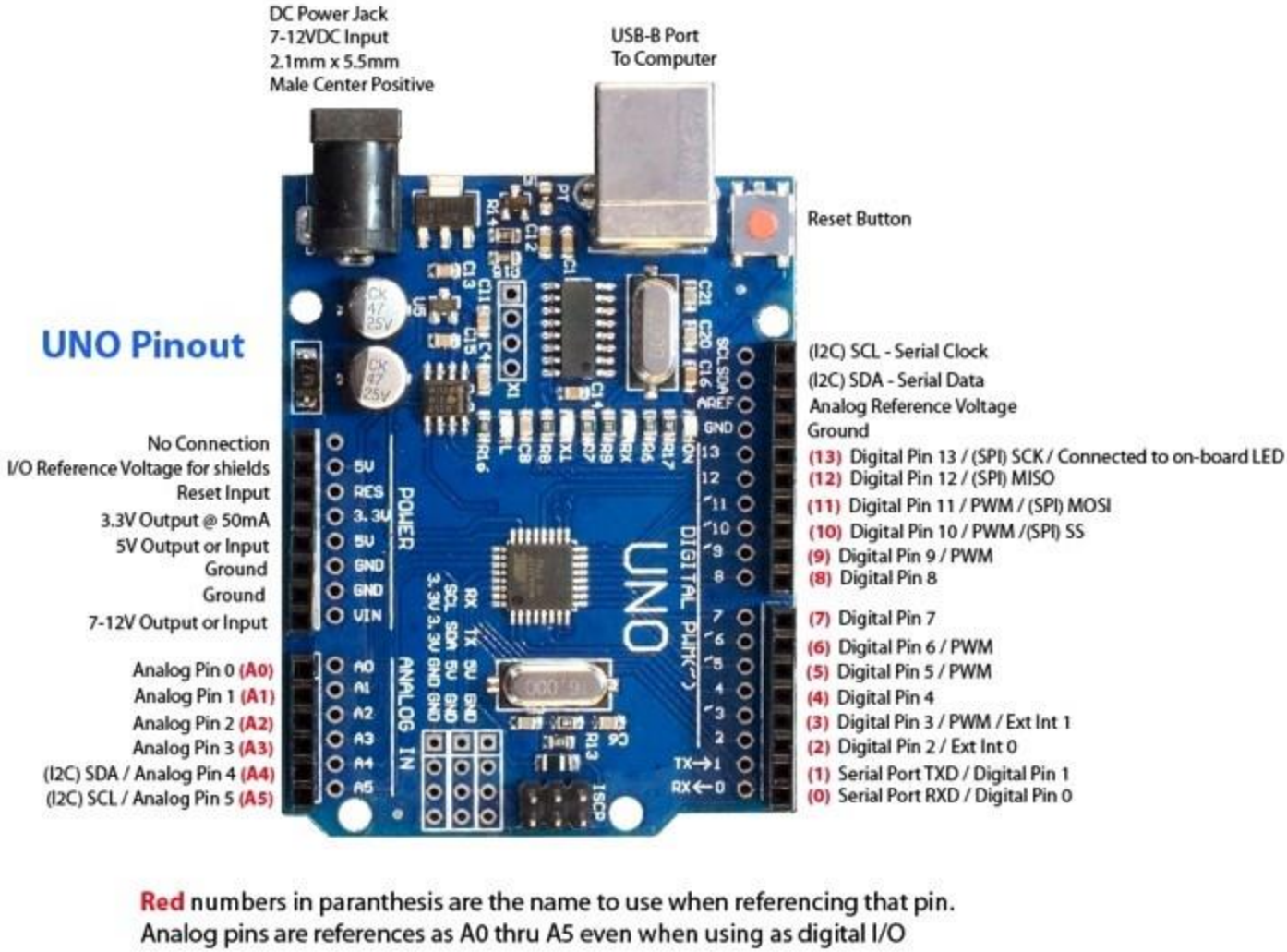


Fig: F.1.1.1: Arduino UNO

Power

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non USB) power can come either from an AC to DC adapter (wall wart) or battery. The adapter can be connected by plugging a 2.1mm contrapositive plug into the board's power jack.

Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat

and damage the board. The recommended range is 7 to 12 volts.

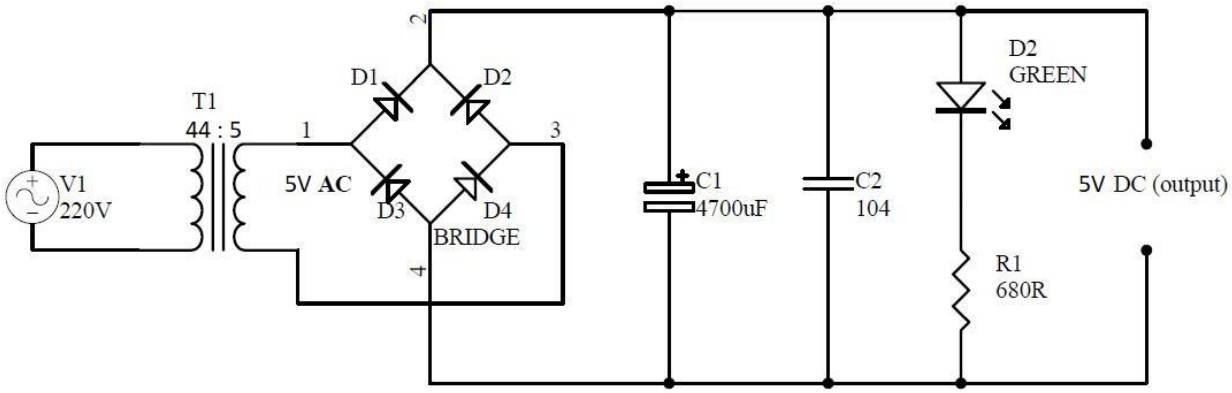


Fig: F.1.1.2 : AC to DC Circuit

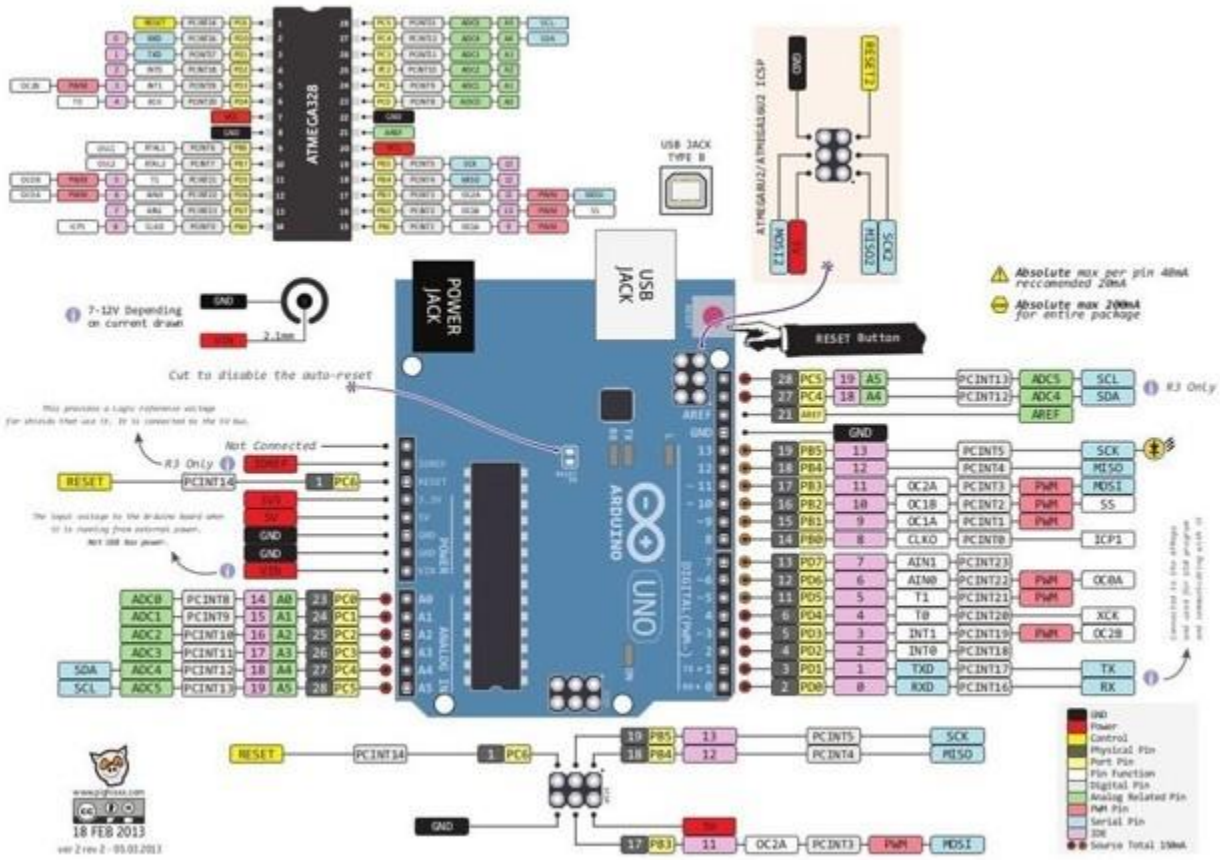


Fig: F.1.1.3 : Arduino Pin Diagram

Arduino Uno Pin Detail

•VIN.

The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

•5V.

The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.

•**3V3**.
A 3.3 volt supply generated by the on board regulator. Maximum current draw is 50 mA.
•GND. Ground pins.

Memory:
The ATmega328has 32 KB (with 0.5 KB used for the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output.
Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode()
,
digitalWrite()
, and
digitalRead()
Functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40mA and has an internal pull-up resistor (disconnected by default) of 20-50 k Ohms. In addition, some pins have specialized functions:

•**Serial:**
0 (RX) and 1 (TX).Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

•**External Interrupts:**
2 and 3.These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt () function for details.

•**PWM:**
3, 5, 6, 9, 10, and 11.Provide 8-bit PWM output with the analogWrite()function.

•**SPI:**
10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK).These pins support SPI communication using the SPI library

•LED:

13.There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

•I2C:

4 (SDA) and 5 (SCL).Support I2C (TWI) communication using the Wire library. There are a couple of other pins on the board:

•AREF.

Reference voltage for the analog inputs. Used with analog Reference ().

•Reset.

Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board

Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 Firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a in file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LED son the board will flash .When data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

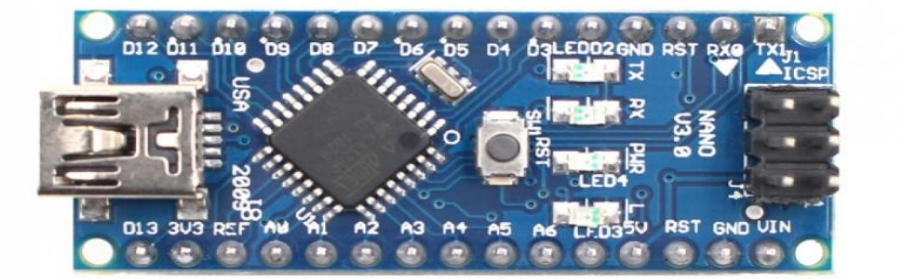


Fig: F.1.1.4 : Arduino Nano Diagram

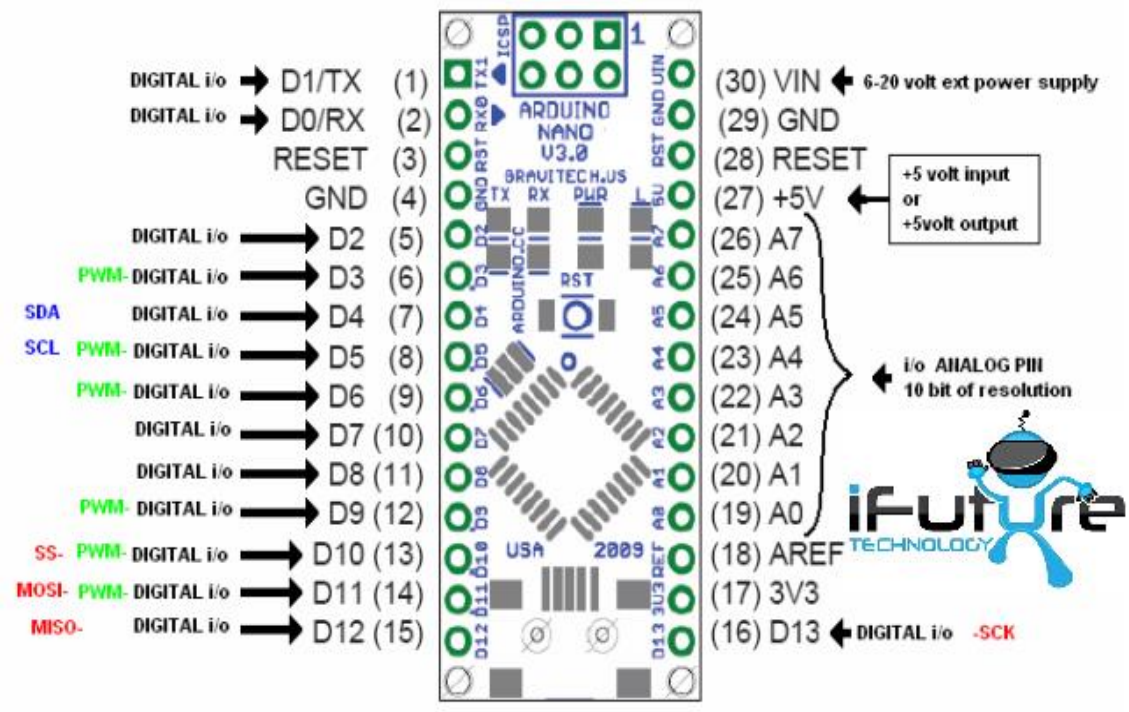


Fig: F.1.1.4 : Arduino Nano Pin Diagram

Specification of Arduino

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The ATmega16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (not for serial communication on pins 0 and 1). A SoftwareSerial library allows for serial communication on any of the Uno's digital pins. The ATmega328P also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

2.1.2 Bluetooth Module HC-05

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project, etc. Just go through the datasheet for more details

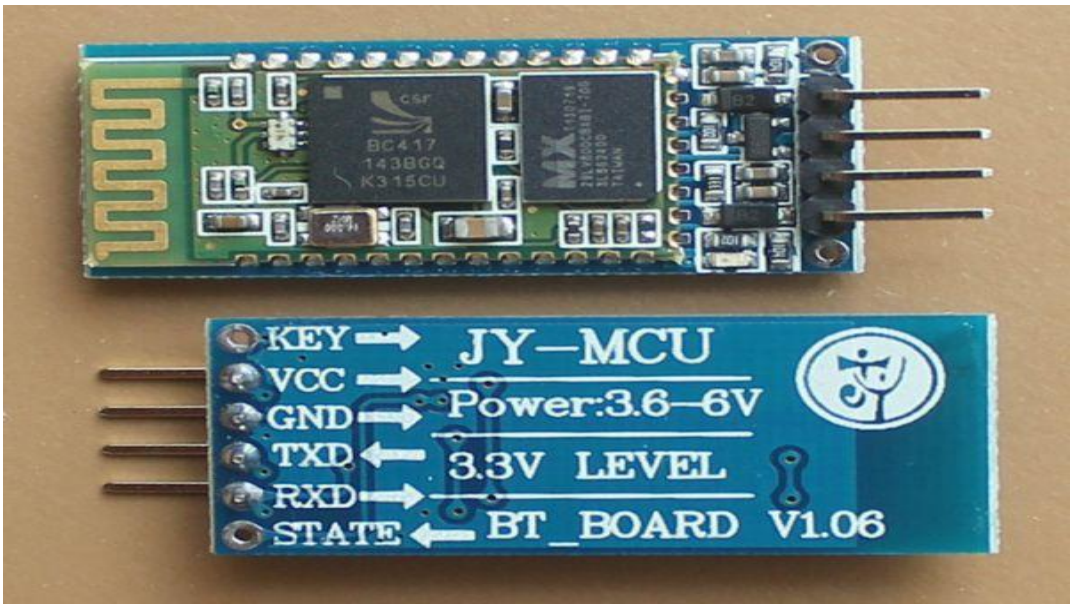


Fig: F.1.1.5 : Bluetooth Device

This version of the popular Bluetooth uses the HC-05 module. These modems work as a serial (RX/TX) pipe. Any serial stream from 9600 to 115200bps can be passed seamlessly from your computer to your target.

The remote unit can be powered from 3.3V up to 6V for easy battery attachment. All signal pins on the remote unit are 3V-6V tolerant. No level shifting is required. You can directly connect it to a 3.3V/5V microcontroller. You'll need a USB to serial converter to connect it to a computer.

By default, this Bluetooth module is set to be on SLAVE mode. But you can reconfigure it with proper AT commands to use it as a MASTER device.

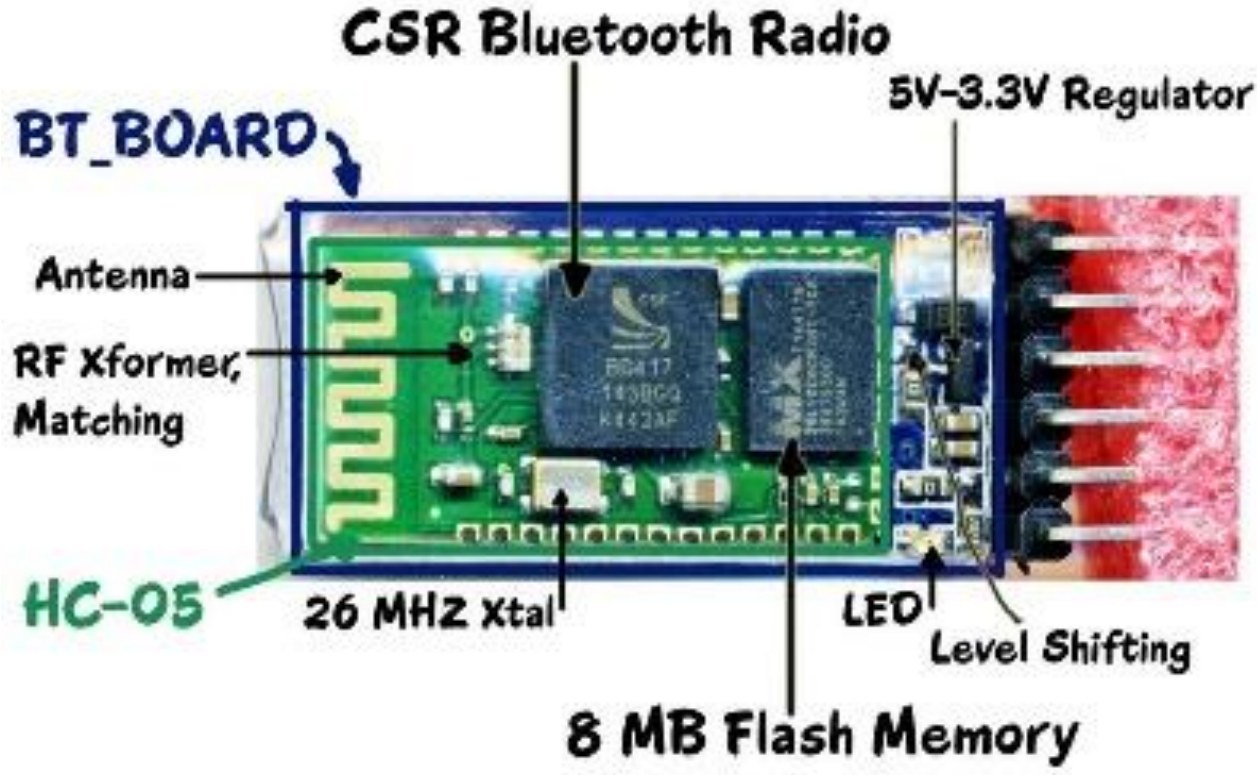


Fig: F.1.1.6 : Bluetooth Device Detail

Specification of HC 05

● **Bluetooth protocal**: Bluetooth Specification v2.0+EDR
● **Frequency**: 2.4GHz ISM band
● **Modulation**: GFSK(Gaussian Frequency Shift Keying)
● **Emission power**: ≤4dBm, Class 2
● **Sensitivity:** ≤-84dBm at 0.1% BER
● **Speed: Asynchronous**: 2.1Mbps(Max) / 160 kbps, Synchronous: 1Mbps/1Mbps
● **Security**: Authentication and encryption
● **Profiles**: Bluetooth serial port
● **Power supply**: +3.3VDC 50mA
● **Working temperature**: -20 ~ +75 Centigrade
● **Dimension**: 26.9mm x 13mm x 2.2 mm

Hardware Features

- Typical -80dBm sensitivity.
- Up to +4dBm RF transmit power.
- 3.3 to 5 V I/O.
- PIO(Programmable Input/Output) control.
- UART interface with programmable baud rate.
- With integrated antenna.
- With edge connector.

Software Features

- Slave default Baud rate: 9600, Data bits:8, Stop bit:1,Parity:No parity.
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto-pairing PINCODE:"1234" as default.

2.1.3 Transistors

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.



2N2222A	
1	Emitter
2	Base
3	Collector

Fig: F.1.1.7 : Transistor

PIN Name	PIN #	Pad type	Description	Note
GND	13 21 22	VSS	Ground pot	
3.3 VCC	12	3.3V	Integrated 3.3V (+) supply with On-chip linear regulator output within 3.15-3.3V	
AIO0	9	Bi-Directional	Programmable input/output line	
AIO1	10	Bi-Directional	Programmable input/output line	
PIO0	23	Bi-Directional RX EN	Programmable input/output line, control output for LNA(if fitted)	
PIO1	24	Bi-Directional TX EN	Programmable input/output line, control output for PA(if fitted)	

TAB: T.1.1.1 : Transistor Data Sheet

A transistor is a miniature electronic component that can do two different jobs. It can work either as an amplifier or a switch: When it works as an amplifier, it takes in a tiny electric current at one end (an input current) and produces a much bigger electric current (an output current) at the other.

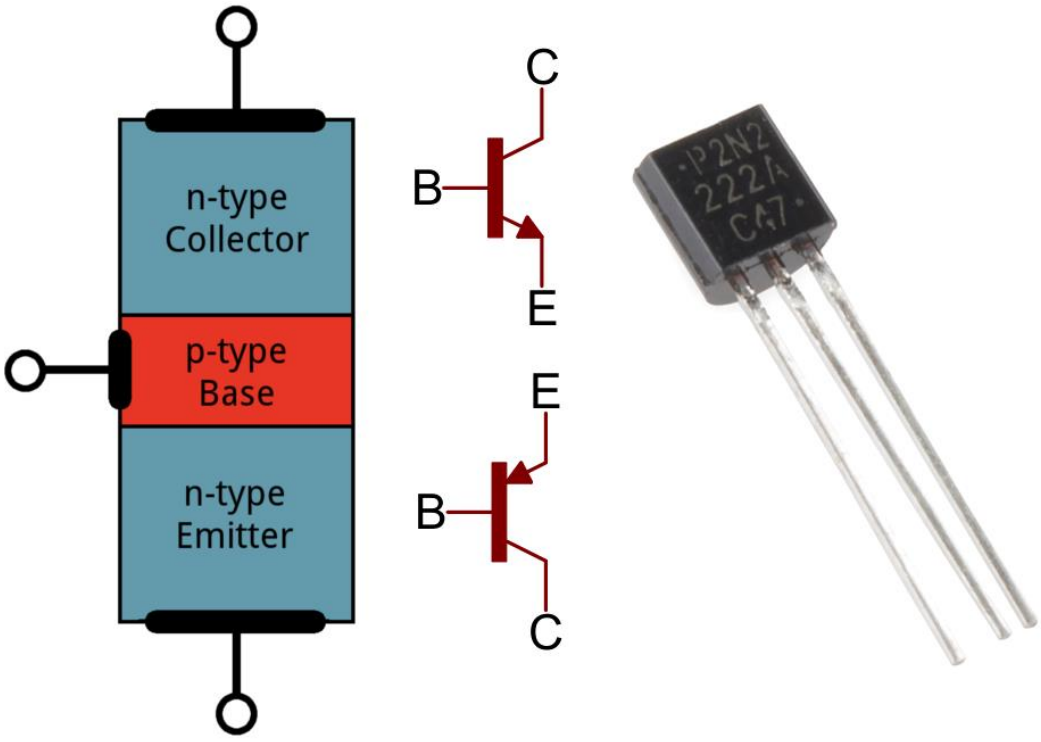


Fig: F.1.1.8 : Transistor Pin Diagram

Specification Of 2N222

- Collector-base Voltage (IE = 0) 60 V
- Collector-emitter Voltage (IB = 0) 30 V
- Emitter-base Voltage (IC = 0) 5 V
- Collector Current 0.8 A

2.1.4 IR sensor

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.

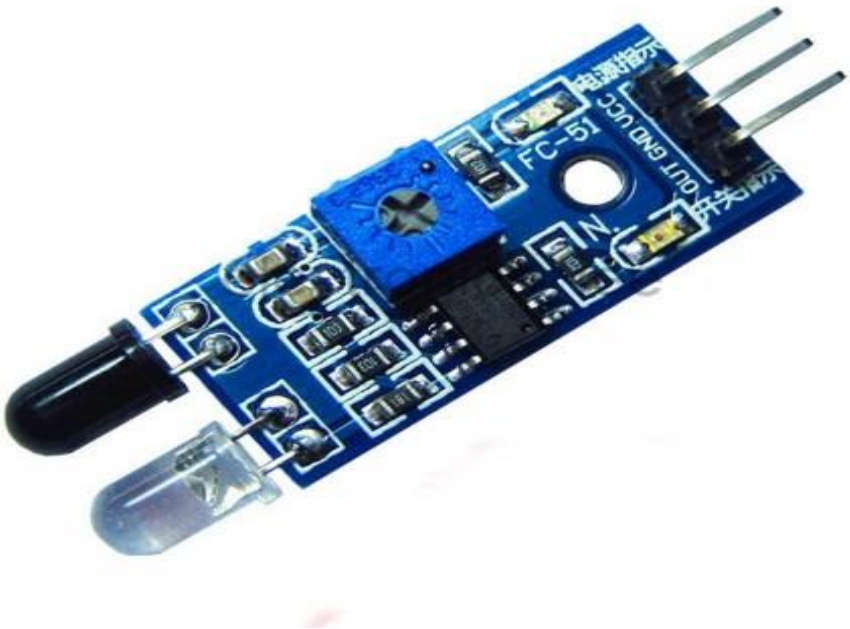
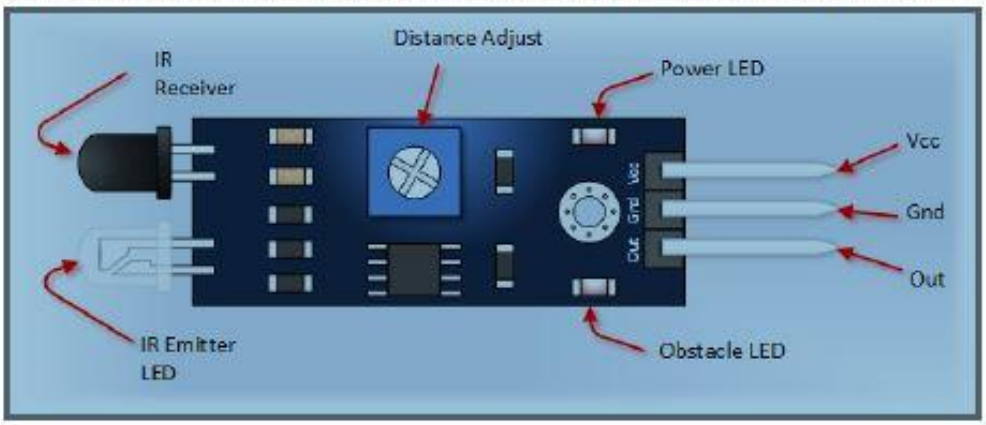


Fig: F.1.1.9 : IR Sensor

This is yet another one of those modules with cool possibilities. You could for example, sound an alarm when something got too close or you could change the direction of a robot or vehicle. The device consists of an Infrared Transmitter, an Infrared Detector, and support circuitry. It only requires three connections. When it detects an obstacle within range it will send an output low.

IR Obstacle Detection Module Pin Outs

The drawing and table below identify the function of module pin outs, controls and indicators.



Pin, Control Indicator	Description
Vcc	3.3 to 5 Vdc Supply Input
Gnd	Ground Input
Out	Output that goes low when obstacle is in range
Power LED	Illuminates when power is applied
Obstacle LED	Illuminates when obstacle is detected
Distance Adjust	Adjust detection distance. CCW decreases distance. CW increases distance.
IR Emitter	Infrared emitter LED
IR Receiver	Infrared receiver that receives signal transmitted by Infrared emitter.

Fig: F.1.2.0 : IR Sensor Pin Diagram

Specification Of IR sensor

- If there is an obstacle, the green indicator light on the circuit board.
- Detection distance: 2 ~ 60cm
- Detection angle: 35 °
- Comparator chip: LM393
- 3mm screw holes for easy mounting
- Dimensions: 3.1 x 1.5cm
- Working Voltage:3.3 V to 5 V.

2.1.5 Wireless Remote Control

315MHz 4 Channel Wireless Remote Control kit. It consists of an RF transmitter and receiver.

Receiver Output Pin State:

Low, when no button of the remote is pressed

High, when the corresponding button of the remote is pressed



Fig: F.1.2.1 : Wireless Remote

Remote control:

- Operating voltage: DC12V (27A/12V battery x1)
- Operating Current: 10mA @ 12V
- Radiated power: 10mw @ 12V
- Modulation mode: ASK (Amplitude Modulation)
- Transmitting frequency: 315MHZ
- Transmission distance :50-100M (Open field, the receiver sensitivity of -100dbm)
- Encoder types: fixed code

Receiver board:

- The operating voltage DC5V, receiver sensitivity is-98db. Leg 7 bits, respectively, VT, D3, D2, D1, D0, the +5 V and GND. VT is a valid signal high output pin Upon receiving a valid signal, the pin output high, may also drive the relay.
- Size: 6.6*22*41mm

2.1.6 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.



Fig: F.1.2.2: Relay

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults.

In modern electric power systems these functions are performed by digital instruments still called "protective relays".

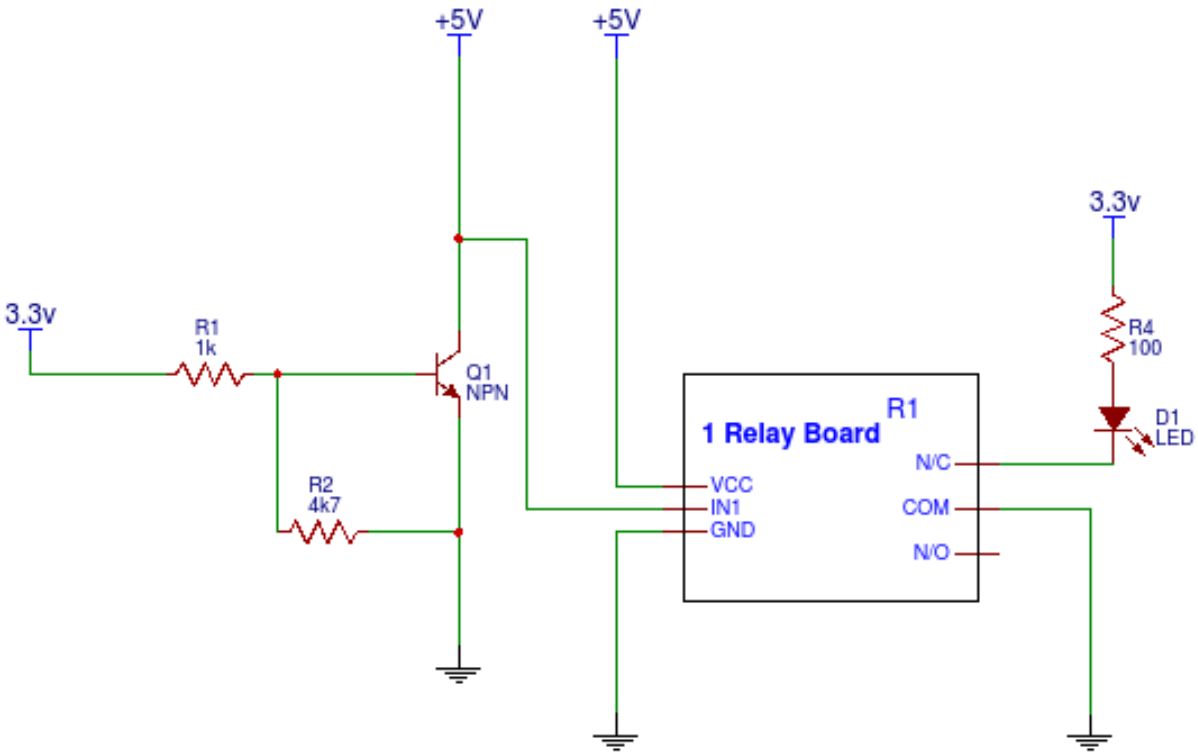


Fig: F.1.2.2: Relay Circuit Diagram

Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts.

Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands.

2.1.7 Relay interface board

This is a 5V 4-Channel Relay interface board, Be able to control various appliances, and other equipment's with large current. It can be controlled directly by Micro-controller (Arduino , 8051, AVR, PIC, DSP, ARM, ARM, MSP430, TTL logic) .

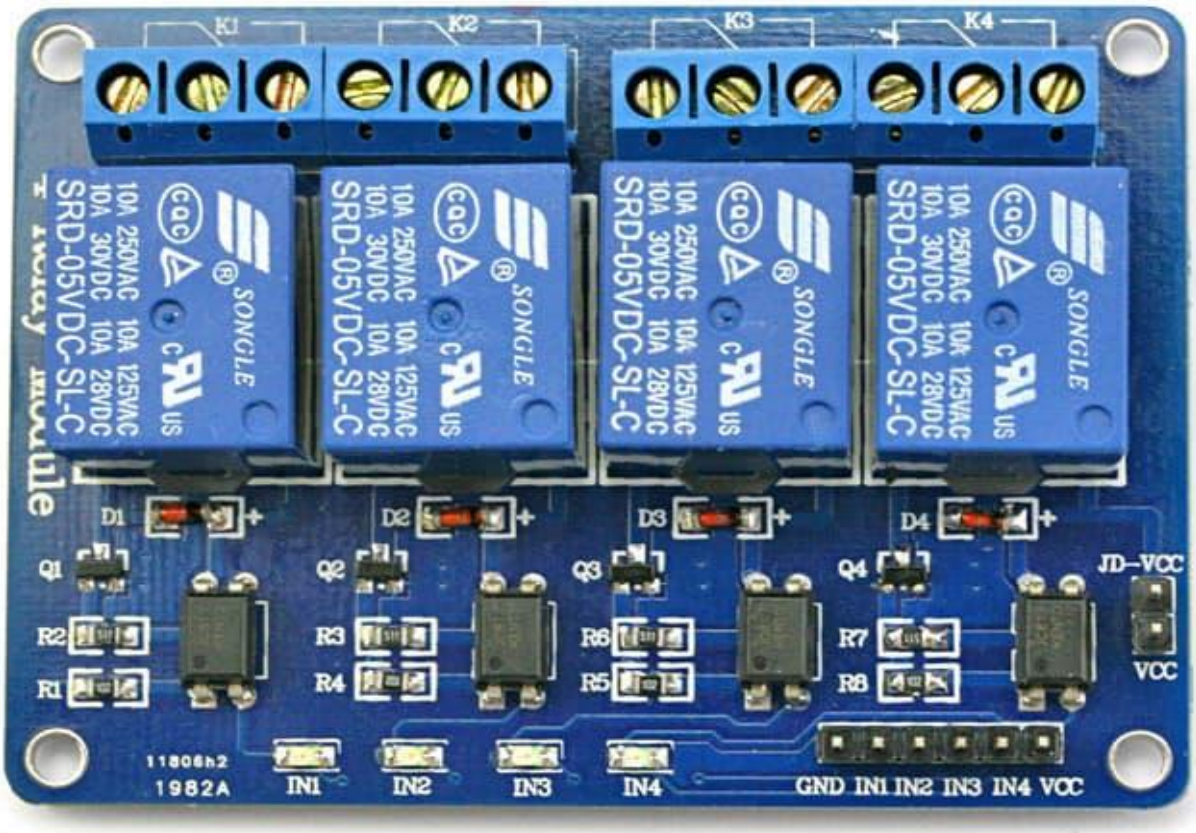


Fig: F.1.2.3: Relay interface board

Specification

- Rated coil Voltage:5V DC
- Operating Frequency:50/60HZ
- Nominal Current:10A AC, 10A at 30V DC
- Maximum Switching Voltage:250V AC, 30V DC.

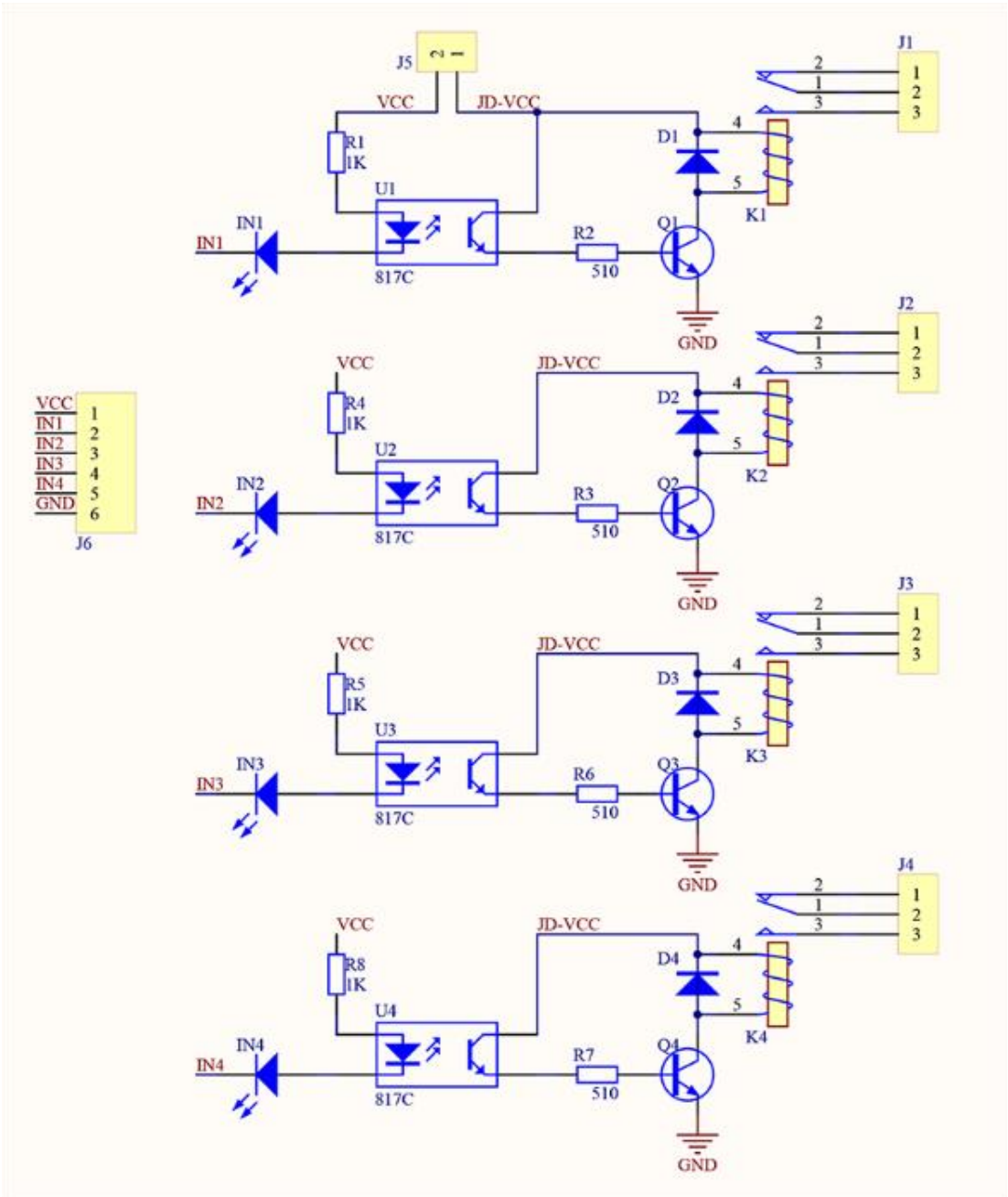


Fig: F.1.2.3: Relay interface board Circuit Diagram

2.1.8 Solar Cell

A **solar cell**, or **photovoltaic cell**, is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect, which is a physical and chemical phenomenon.[1] It is a form of photoelectric cell, defined as a device whose electrical characteristics, such as current, voltage, or resistance, vary when exposed to light. Individual solar cell devices can be combined to form modules, otherwise known as solar panels. The common single junction silicon solar cell can produce a maximum open-circuit voltage of approximately 0.5 to 0.6 volts.

Solar cells are described as being photovoltaic, irrespective of whether the source is sunlight or an artificial light. In addition to producing energy, they can be used as a photo detector (for example infrared detectors), detecting light or other electromagnetic radiation near the visible range, or measuring light intensity.

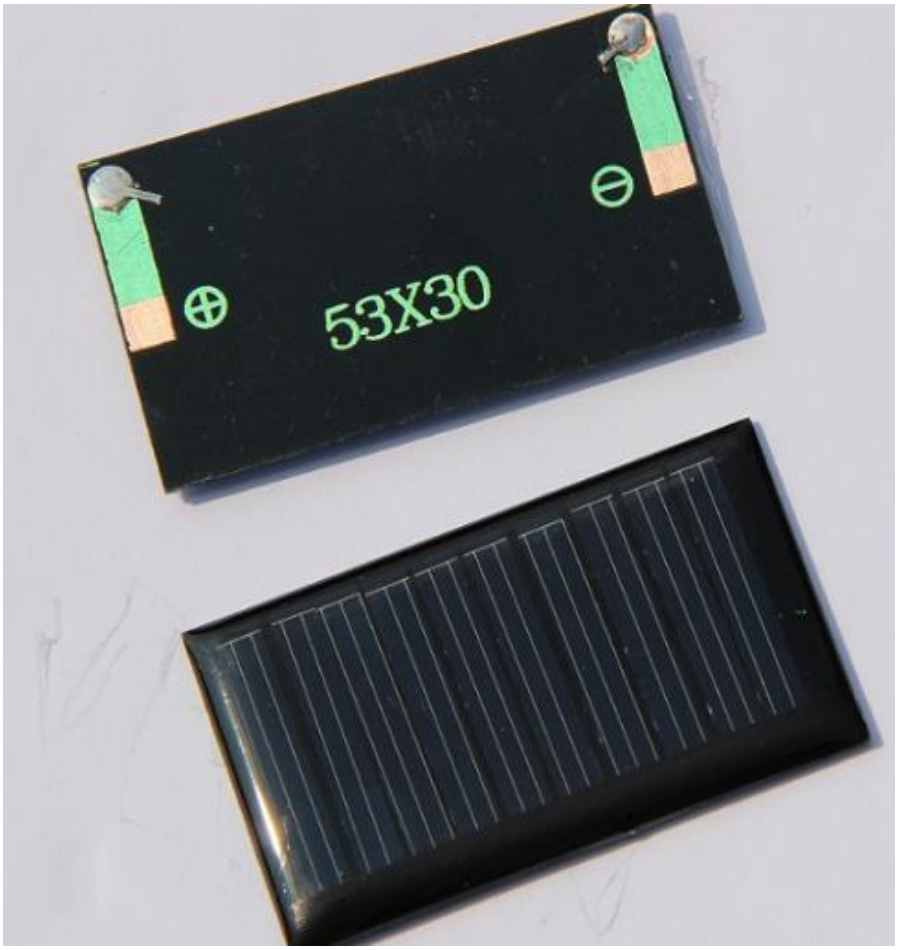


Fig: F.1.2.4: Solar Panal

2.1.9 Servomotor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.[1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.



Fig: F.1.2.5: Servo Motor

Servomotors are not a specific class of motor although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

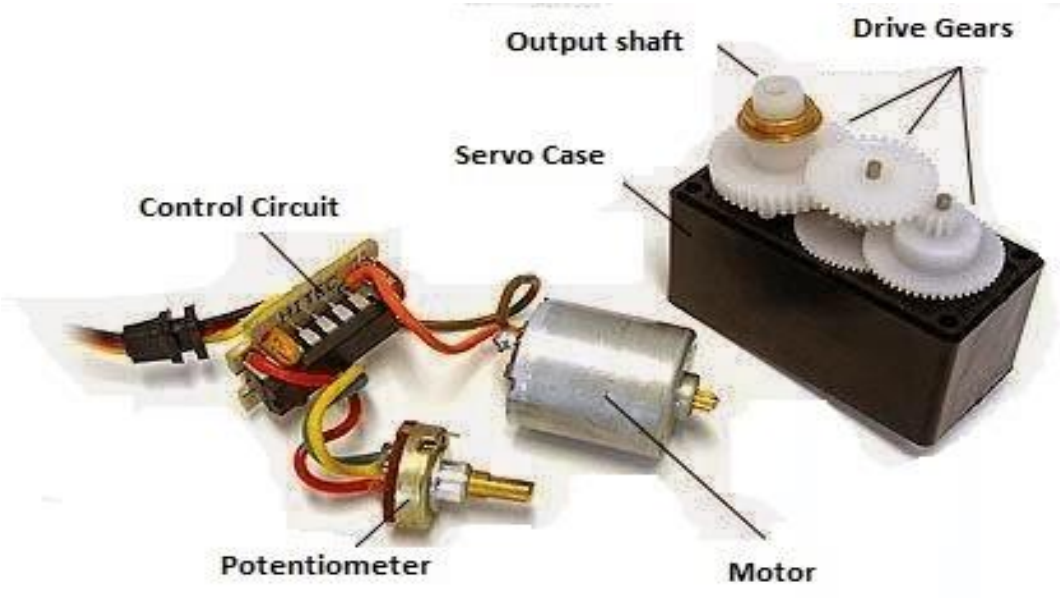


Fig: F.1.2.6: Part view Of Servomotor

Specification & Connection

- Weight: 9g
- Dimension: 23x12.2x29mm
- Stall Torque: 22.2 oz/in (1.6 kg/cm)
- Operating Speed (4.8V no load): 0.12sec/60 degrees
- Operating Voltage: 4.2-6V
- Temperature Range: 0℃_ 55℃
- Dead Band Width: 10us

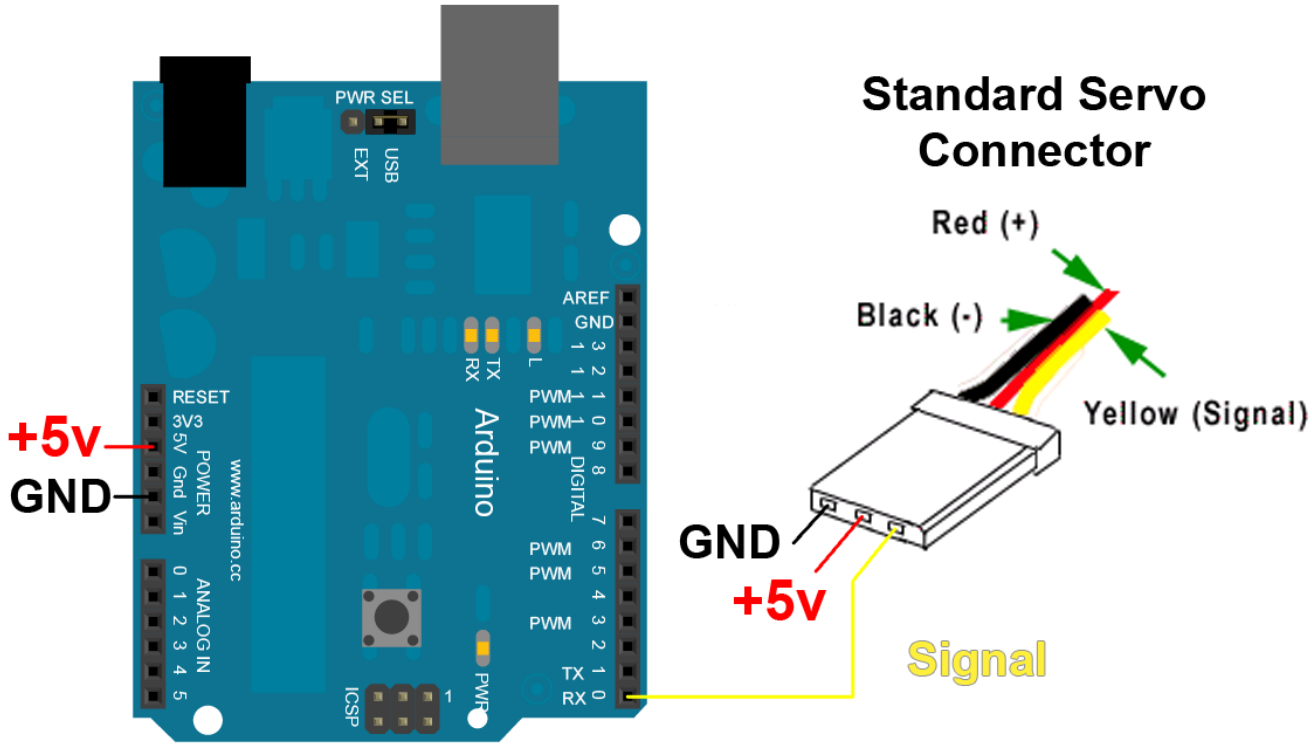


Fig: F.1.2.7: Connection Diagram Of Servo Motor

2.2.1 LDR Or Light Dependent Resistors

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 20000 ohms, but when they are illuminated with light resistance drops dramatically.



Fig: F.1.2.8: LDR

A photo resistor (or light-dependent resistor, LDR, or photo-conductive cell) is a light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light-activated and dark-activated switching circuits.

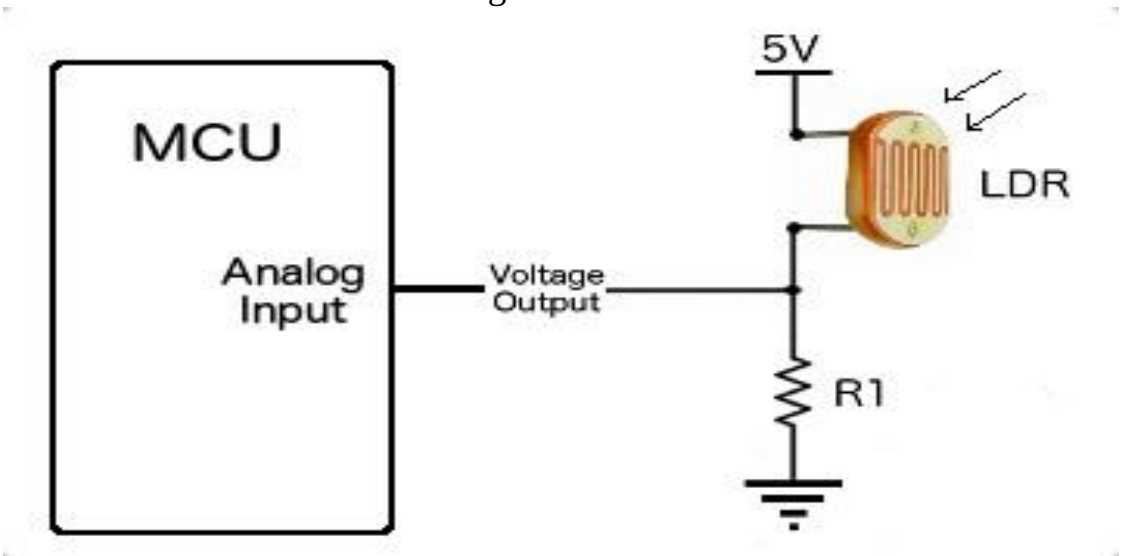


Fig: F.1.2.9: LDR Connection Diagram

A photo resistor is made of a high resistance semiconductor. In the dark, a photo resistor can have a resistance as high as several mega ohms (MΩ), while in the

light, a photo resistor can have a resistance as low as a few hundred ohms. If incident light on a photo resistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photo resistor can substantially differ among dissimilar devices.

2.2.2 Gas Sensor Module

This Gas sensor is suitable for detecting NH3,NOx, alcohol, Benzene, smoke,CO2 ,etc. It is used in air quality control equipments for buildings/offices.



Fig: F.1.3.0: Gas Sensor

Specification

- Circuit voltage :5V±0.1
- Heating voltage :5V±0.1
- Load resistance: can adjust
- Heater resistance :33Ω±5%
- Heating consumption: less than 800mA

2.2.3 Voltage Regulator

LM7806/ LM7805 three terminal positive regulators are available in the TO-220 package and with 5V output voltage. If adequate heat sinking is provided, they can deliver over 1A output current.

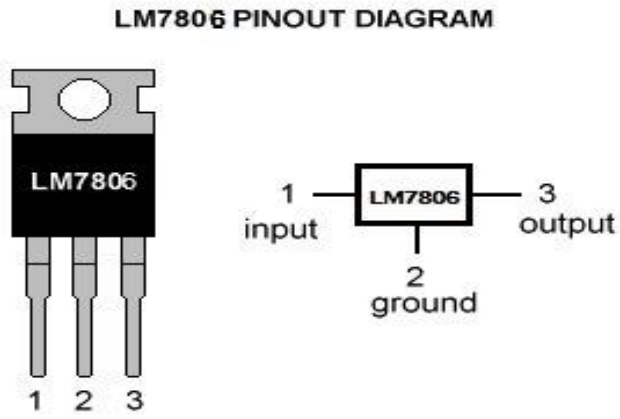


Fig: F.1.3.1: Pin Diagram Of LM7806

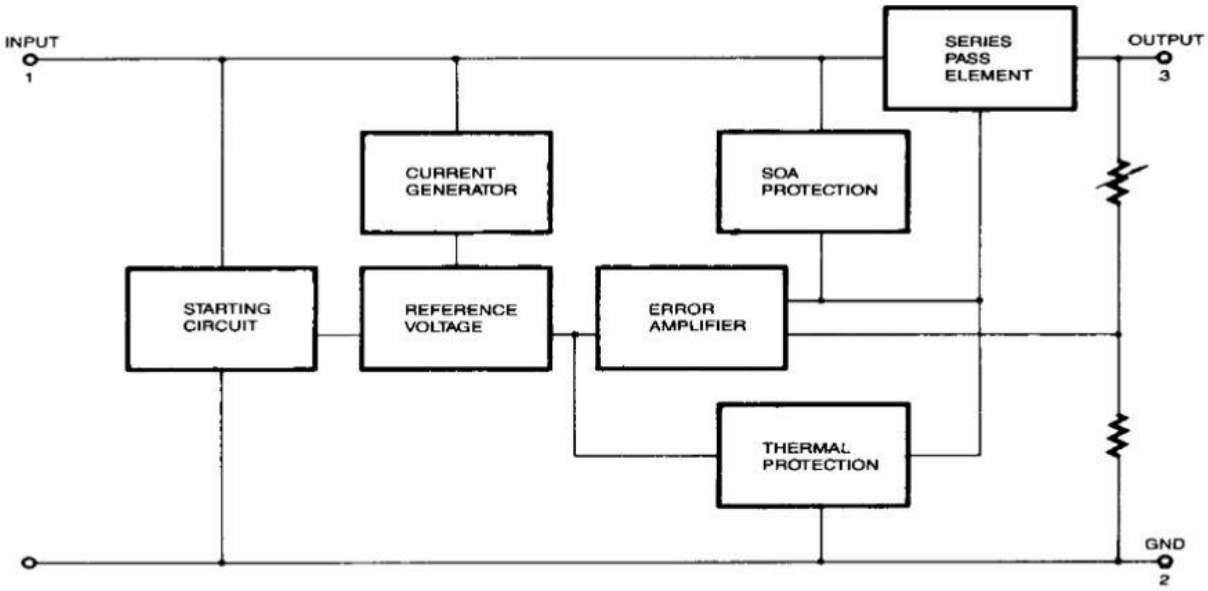


Fig: F.1.3.2: Block Diagram Of LM7806

Datasheet

Parameter	Symbol	Conditions		MC7806			Unit
				Min.	Typ.	Max.	
Output Voltage	V_O	T_J =+25 °C		5.75	6.0	6.25	V
		5.0mA ≤ I_O ≤ 1.0A, P_O ≤ 15W V_I = 8.0V to 21V		5.7	6.0	6.3	
Line Regulation (Note1)	Regline	T_J =+25 °C	V_I = 8V to 25V	-	5	120	mV
			V_I = 9V to 13V	-	1.5	60	
Load Regulation (Note1)	Regload	T_J =+25 °C	I_O =5mA to 1.5A	-	9	120	mV
			I_O =250mA to750A	-	3	60	
Quiescent Current	I_Q	T_J =+25 °C		-	5.0	8.0	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1A		-	-	0.5	mA
		V_I = 8V to 25V		-	-	1.3	
Output Voltage Drift	$\Delta V_O/\Delta T$	I_O = 5mA		-	-0.8	-	mV/ °C
Output Noise Voltage	V_N	f = 10Hz to 100KHz, T_A =+25 °C		-	45	-	μV/Vo
Ripple Rejection	RR	f = 120Hz V_I = 9V to 19V		59	75	-	dB
Dropout Voltage	V_{Drop}	I_O = 1A, T_J =+25 °C		-	2	-	V
Output Resistance	r_O	f = 1KHz		-	19	-	mΩ
Short Circuit Current	I_{SC}	V_I= 35V, T_A=+25 °C		-	250	-	mA
Peak Current	I_{PK}	T_J =+25 °C		-	2.2	-	A

TAB: T.1.2. : Voltage Regulator Data Sheet



Fig: F.1.3.3: Connection Diagram Of Power Supply

2.2.4 Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.



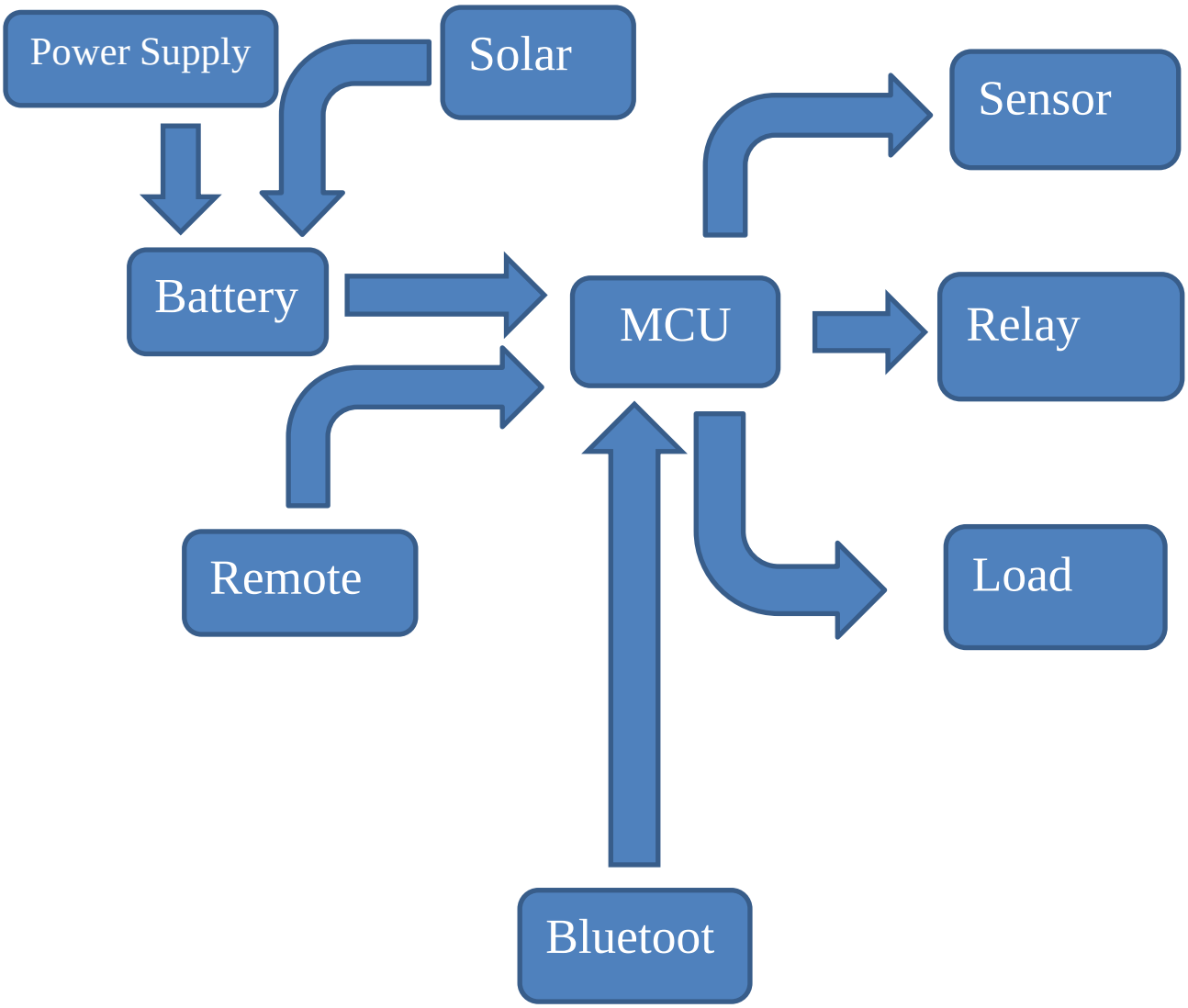
Fig: F.1.3.4: Buzzer

Sound Pressure Level	82dB
Mounting Type	Through Hole
Capacitance @ Frequency	-
Frequency	2.3kHz
Packaging	Tray
Operating Mode	Continuous
Voltage Range	2 ~ 5VDC
Voltage - Rated	3VDC
Current Rating	30mA
Termination	Solder Pins/Posts
RoHS Status	RoHS Compliant

TAB: T.1.3. : buzzer Data Sheet

CHAPTER III

3.1.1 Block Diagram Of This Project



Pic B1.1. : Block Diagram

3.1.2 Android App

An Android app is a software application running on the Android platform. Because the Android platform is built for mobile devices, a typical Android app is designed for a smartphone or a tablet PC running on the Android OS.
We build this app from MIT app Inventor.

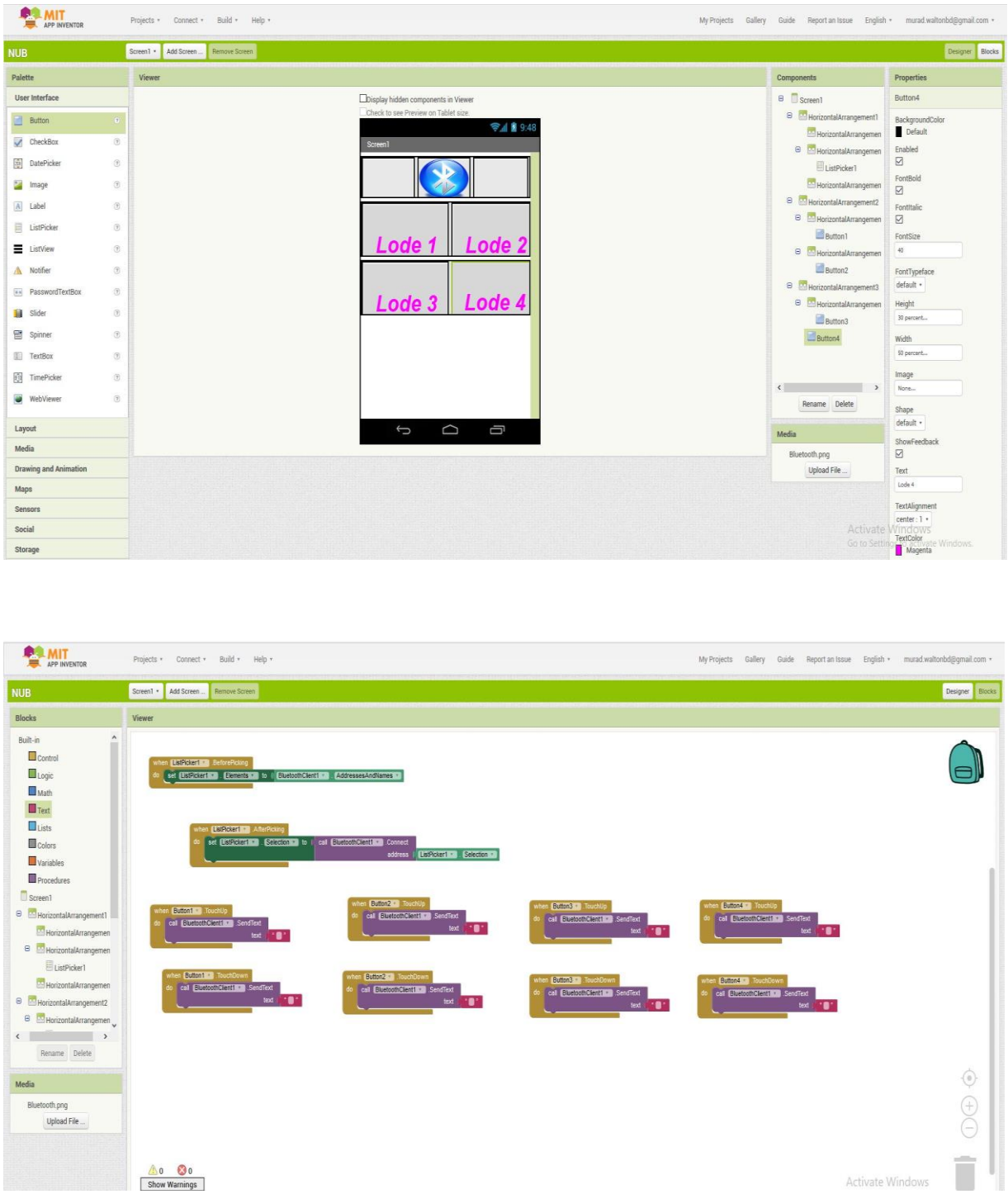


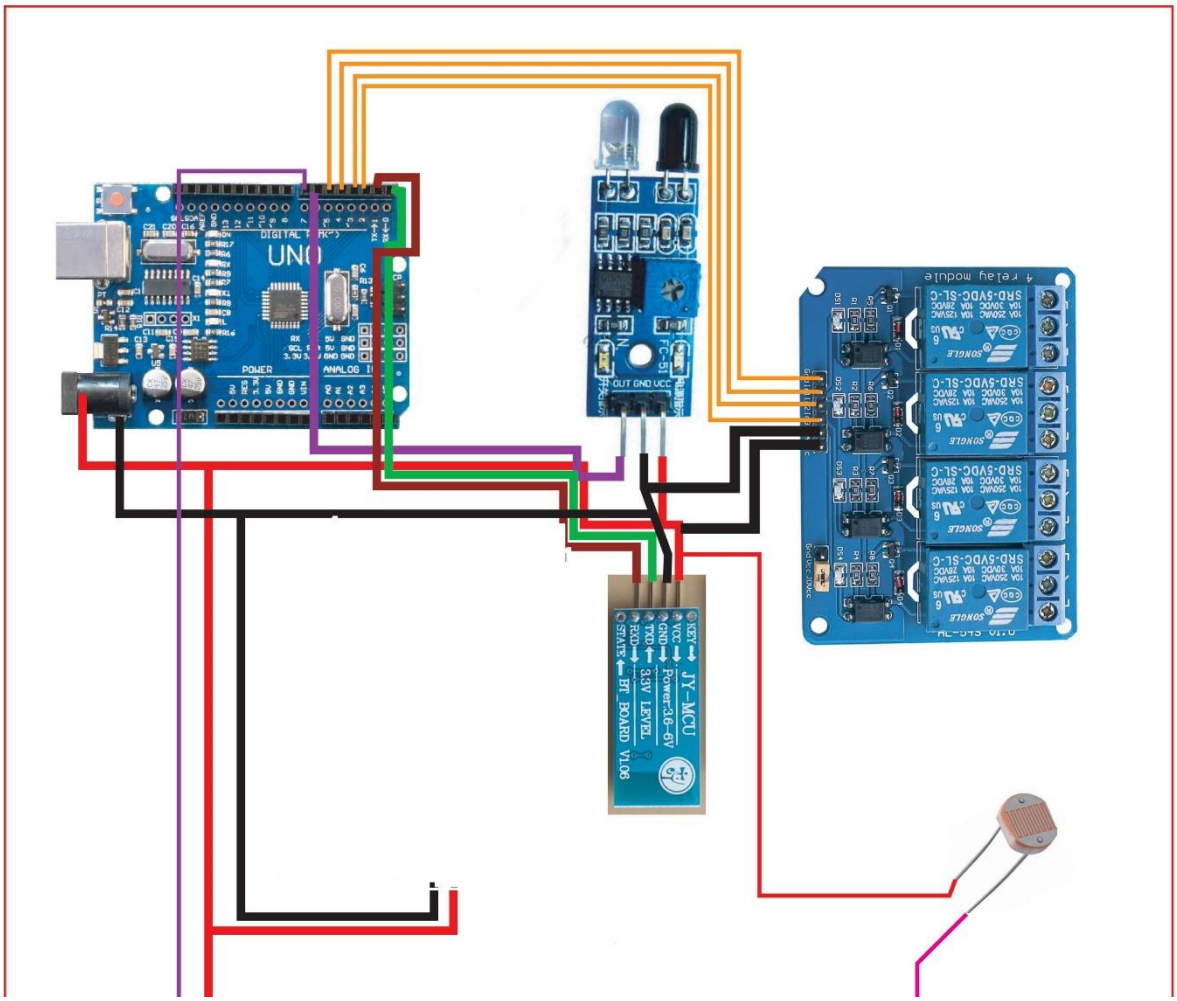
Fig: F.1.3.5: Android App

3.1.3 Android Software Outlook



Fig: F.1.3.6: Android App Outlook

3.1.4 Circuit Diagram 1



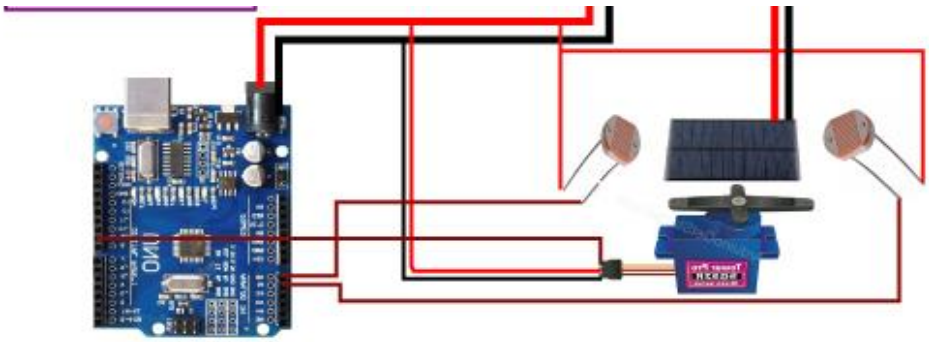


Fig: F.1.3.7: Circuit Diagram

3.1.4 Circuit Diagram 2

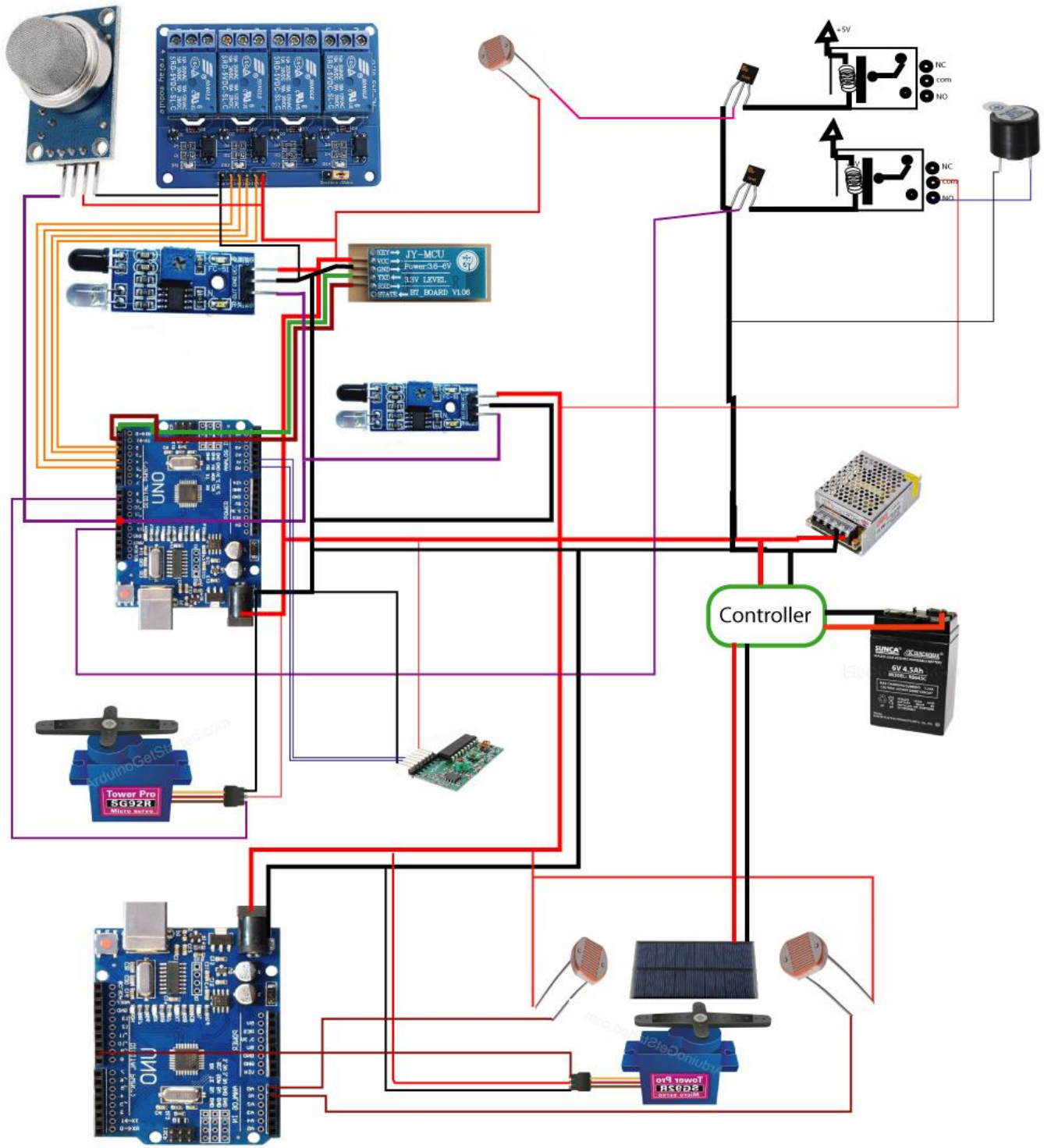
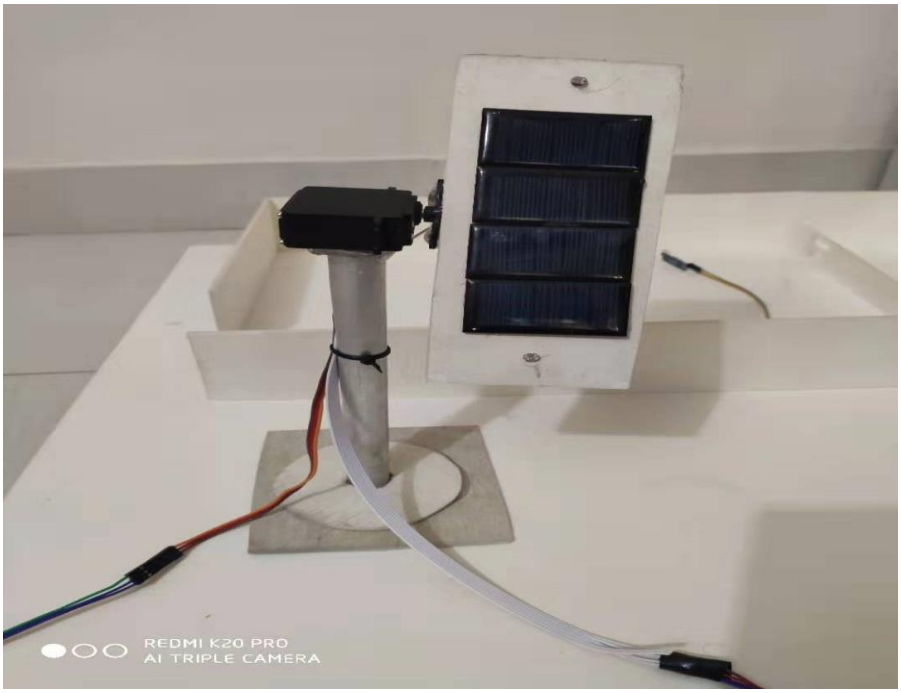


Fig: F.1.3.7F: Circuit Diagram

3.1.5 Image of Project

- **Project Outlook**



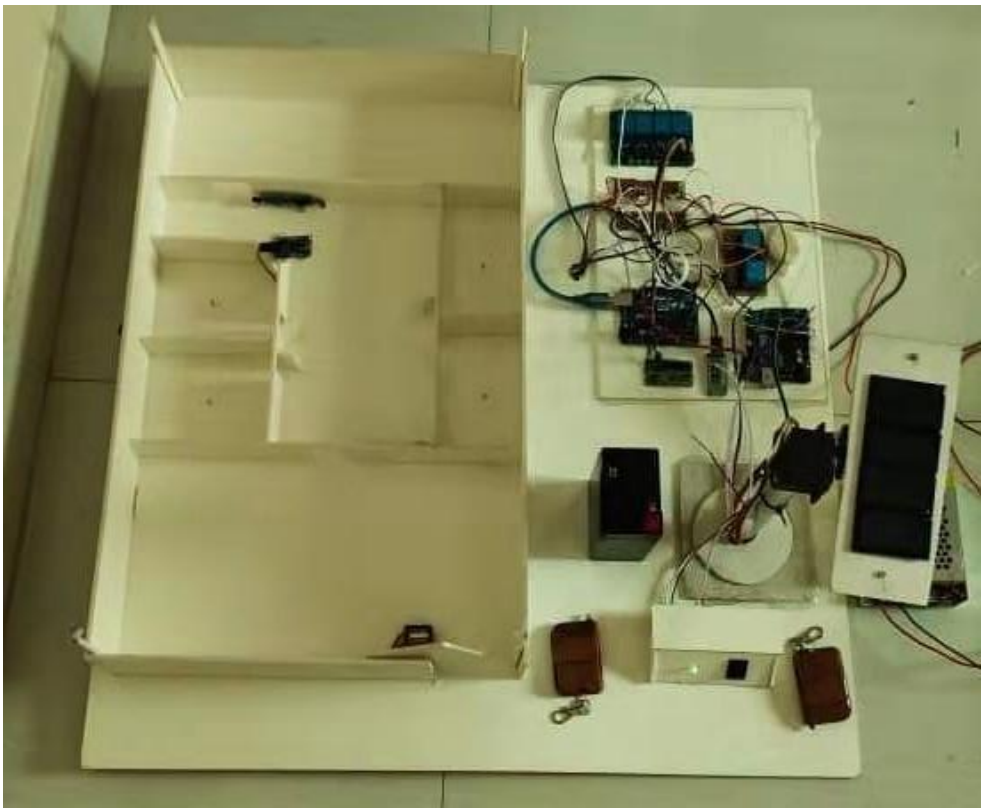


Fig: F.1.3.7: Project Outlook

CHAPTER IV

4.1.1 Applications

- This project can be used to control various Home Appliances.
- It can control device from a long distance thus it gives ease of access.
- Faster and efficient operation.
- It can control via smart phone.
- The Bluetooth module and connected relays are initialized first.
- Can Control overhead light automatically.

4.1.2 Advantages:

- ✓ The main advantage of ―Home Automation through Android Mobile‖ is that the ―Physically Challenged and Disabled People‖.
- ✓ Home automaton has been around for several years, with systems that let you control the lighting, temperature, door locks, appliances and much more.
- ✓ Home automation technologies fall under the umbrella of home security. Consumers purchase these devices because they want to make their homes safer and more secure. Automated lighting thwarts would-be burglars, and motion sensors help people enter doors and walk hallways late at night.
- ✓ The cameras offer benefits through either remote monitoring of package deliveries or real-time video of home inhabitants or unwanted visitors.
- ✓ It is a robust and easy to use system.
- ✓ There is no need for extra training of that person who is using it.
- ✓ All the control would be in your hands by using this home automation system.
- ✓ This project can provide the facility of monitoring all the appliances with in the communication range through Bluetooth or GSM System

4.1.3 Disadvantages:

1) Automation of the home is widely related to the financial costs.

2)If there is any damage due to rupturing of cables or the fibers the entire system gets crashed.

3)In the past few years there are so many inventions in the field of consumer electronics such as cellular phone, air conditions, home security devices and home theaters.

4)All these appliances can be easily controlled by a single controller, using personal area network in a home environment.

5)Busy environment and personal limitation the market is going towards the home automation and networking and Bluetooth is an ideal solution for this purpose.

- In buildings, temperature and other electronic devices can be easily controlled by home automation but high degree of computer work is involved.

CHAPTER V

5.1.1 Reference

- Wikipedia.
- www.google.com
- Library, Sonargaon University
- www.techshopbd.com
- www. bdspeedytech.com
- www.arduino.cc
- ai2.appinventor.mit.edu/

5.1.2 Future Modification

- Add Somke sensor
- Add GSM System
- 2 axis solar tracker
- More update security system.

5.1.3 Arduino Code For Solar System

```
#include <Servo.h>      //including the library of servo motor
Servo sg90;             //initializing a variable for servo named sg90
int initial_position = 90;   //Declaring the initial position at 90
int LDR1 = A0;          //Pin at which LDR is connected
int LDR2 = A1;          //Pin at which LDR is connected
int error = 5;          //initializing variable for error
int servopin=9;
void setup()
{

  sg90.attach(servopin);  // attaches the servo on pin 9
  pinMode(LDR1, INPUT);   //Making the LDR pin as input
  pinMode(LDR2, INPUT);
  sg90.write(initial_position);   //Move servo at 90 degree
  delay(2000);            // giving a delay of 2 seconds
}

void loop()
```

```
{
  int R1 = analogRead(LDR1); // reading value from LDR 1
  int R2 = analogRead(LDR2); // reading value from LDR 2
  int diff1= abs(R1 - R2);   // Calculating the difference between the LDR's
  int diff2= abs(R2 - R1);
  if((diff1 <= error) || (diff2 <= error)) {
    //if the difference is under the error then do nothing
  } else {
    if(R1 > R2)
    {
      initial_position = --initial_position;  //Move the servo towards 0 degree
    }
    if(R1 < R2)
    {
      initial_position = ++initial_position; //Move the servo towards 180 degree
    }
  }
  sg90.write(initial_position); // write the position to servo
  delay(100);
}
```

5.1.4 Arduino Code For Control

```
int led =3;
int lamp=8;
int vent=9;
int light=10;
const int buttonPin = 2;
const int ledPin =  13;
int Received=0;
int light_state =0;
int vent_state = 0;
int pc_state = 0;
int lamp_state = 0;
int data = 0;
int buttonState = 0;
int pwm1_state= 0;
int pwm2_state= 0;
int pwm3_state= 0;
void setup(){

  Serial.begin(9600);
  pinMode(lamp,OUTPUT);
  pinMode(vent,OUTPUT);
  pinMode(light,OUTPUT);
  pinMode(pc,OUTPUT);
   pinMode(led, OUTPUT);
   pinMode(ledPin, OUTPUT);
   pinMode(pwm1, OUTPUT);
   pinMode(pwm2, OUTPUT);
   pinMode(pwm3, OUTPUT);
```

```
  pinMode(buttonPin, INPUT);
}
void loop(){
 if(Serial.available()>0)
 {
   Received = Serial.read();
 }
  if(Serial.available()>0) {
    data = Serial.read();
    Serial.println(data);
    analogWrite (led,  data);
  }
  buttonState = digitalRead(buttonPin);
  if (buttonState == HIGH) {
    // turn LED on:
    digitalWrite(ledPin, HIGH);
    delay(5000);
    digitalWrite(ledPin, LOW);
  }
////////////////LIGHT////////////////////
if (light_state == 0 && Received == 'A')
  {
    digitalWrite(light,HIGH);
    light_state=1;
    Received=0;
  }
if (light_state ==1 && Received == 'A')
  {
    digitalWrite(light,LOW);
```

```
    light_state=0;
    Received=0;
  }
//////////////////////////////////////////
////////////////VENT////////////////////
if (vent_state == 0 && Received == 'C')
  {
    digitalWrite(vent,HIGH);
    vent_state=1;
    Received=0;
  }
if (vent_state ==1 && Received == 'C')
  {
    digitalWrite(vent,LOW);
    vent_state=0;
    Received=0;
  }
//////////////////////////////////////////
////////////////PC////////////////////
if (pc_state == 0 && Received == 'E')
  {
    digitalWrite(pc,HIGH);
    pc_state=1;
    Received=0;
  }
if (pc_state ==1 && Received == 'E')
  {
    digitalWrite(pc,LOW);
    pc_state=0;
    Received=0;
```

```
  }
////////////////////////////////////////
////////////////////////////////////
if (lamp_state == 0 && Received == 'G')
  {
    digitalWrite(lamp,HIGH);
    lamp_state=1;
    Received=0;
  }
if (lamp_state ==1 && Received == 'G')
  {
    digitalWrite(lamp,LOW);
    lamp_state=0;
    Received=0;
  }
////////////////////////////////////////
////////////////////////////////////
if (pwm1_state == 0 && Received == 'I')
  {
    digitalWrite(pwm1,HIGH);
   pwm1_state=1;
    Received=0;
  }
if (pwm1_state ==1 && Received == 'I')
  {
    digitalWrite(pwm1,LOW);
    pwm1_state=0;
    Received=0;
  }
////////////////////////////////////////
```

```
////////////////////////////////////
if (pwm2_state == 0 && Received == 'K')
  {
    digitalWrite(pwm2,HIGH);
   pwm2_state=1;
    Received=0;
  }
if (pwm2_state ==1 && Received == 'K')
  {
    digitalWrite(pwm1,LOW);
    pwm2_state=0;
    Received=0;
  }
//////////////////////////////////////////
////////////////////////////////////
if (pwm3_state == 0 && Received == 'M')
  {
    digitalWrite(pwm3,HIGH);
   pwm3_state=1;
    Received=0;
  }
if (pwm3_state ==1 && Received == 'M')
  {
    digitalWrite(pwm3,LOW);
    pwm3_state=0;
    Received=0;
  }
//////////////////////////////////////////
 }
```