SOLAR POWERED, STAND-ALONE,

REVOLVING CUSTOMIZABLE SMART STANDEE

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report "SOLAR POWERED, STAND-ALONE, REVOLVING CUSTOMIZABLE SMART STANDEE "is the Bonafide work of "RAHUL RAJA R, RAKKESH S, RAMJI R, SRI SARAN V" who carried out the project work under my supervision.

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ON.....................

INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

The paper aims at iterating the results of a project focused on developing a wireless electronic notice board, which offers the flexibility to control information display within a given range on multiple displays. The notice board will display information being transmitted to it from a central controlling unit, using a serial communication protocol. An effective advertising strategy that can be used to help increase sales of products and reduce ad rate is to push special advertisement to selected potential customers. Applying intelligent agents to improve targeted advertising in electronic commerce is attractive. In this paper the methods and strategies of web advertising are introduced briefly. This proposed technology can be used in colleges, many public places, to enhance the security system and also make awareness of the emergency situations and avoid many dangers.

This technical paper provides a discussion on present trends in technology and how exactly, simple carry-to-use devices play a vital role in day-to-day life. Using the present technological devices, how an efficient and smart notice board can be made is explained in this paper. This model can be used where any information to be given to a large number of people. For Example in public places like railway stations, bus stations, colleges, banks etc.

FIG NO	LIST OF FIGURES	PAGE NO.

CHAPTER 1
INTRODUCTION

As technology improves, efficient, financially affordable and highly productive output becomes an absolute necessity, and this leads us to be more inclined towards using automated control systems. Human intervention, although it offers variety, adaptability and interactivity, could lead to errors, as it is a natural and inevitable result of this variability.

Hence, automation of a system is an accepted means to minimize human error and its impact. Applying this to the situation under scrutiny now, the traditional methods of writing/ typing the notice on paper, and having a man/woman deliver the notice to the respective groups, or having him/her paste the notice on the notice board, is prone to errors. The person delivering could deliver it to the wrong group, or tamper with the information being sent, etc. With the electronics industry moving at a fast pace, we are able to solve many such problems with digital replacements.

Our project, Multi Electronic Notice Board, aims at eliminating the use of paper in offices, schools & colleges, and other institutions; also minimizing the risk of errors, by replacing paper with LCD displays. The wired electronic notice boards today, which can be found in shopping malls, educational institutes, traffic control, banks etc., are controlled by a microcontroller. The microcontroller contains the program code to show the message on the display, which is static. To change the message on the display, one needs to change the code on the microcontroller. All these processes are generally hardwired and complex.

The electronic Notice boards that are there today display static messages, and if the message has to be changed, the code on the controlling unit must be changed. This is definitely not an efficient method of displaying notices in real time. In this world Mobile Phones and the related technologies are becoming more and more prevalent. Various technical arenas in the field of Telecommunication and Embedded Systems are becoming omnipresent in the people. Notice boards are one of the widely used ones ranging from primary schools to major organizations to convey messages at large. The whole process can be described from the transmitter and receiver section. Serial to parallel communication is used for the entire process from Bluetooth module to Microcontroller and from microcontroller to the display. Power assisted by renewable energy. Operated in 5 modes (mode 0 to mode 4) and Customizable for various shapes and applications. Designed as a standalone and portable apparatus.

1.1   ADVANTAGES

- Personalized Customer Experience and industrial working purposes.
- A standee billboard prototype that is flexible.
- Cost-Effective Pricing and Marketing Display.
- It is portable and Self standee and easily carry model.
- It is renewable source, Working under solar powered energy

CHAPTER 2
HARDWARE DESCRIPTION

2.1 ARDUINO UNO

- Arduino Uno is a microcontroller board based on the ATmega328P (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 (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button.

- Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED,
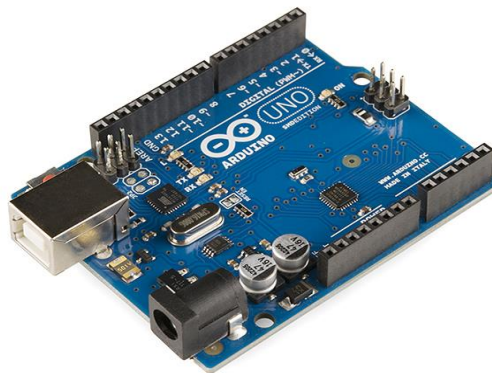
Fig.2.1 Arduino UNO

2.1.1 General pin functions

- LED: There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is on, when the pin is low, it is off.

- Vin: The input voltage to the Arduino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). Supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

- 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 20V), the USB connector (5V), or the Vin pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.

- GND: Groundpins.

- IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to work with the 5V or 3.3V.

- Reset: Typically used to add a reset button to shields that block the one on the board.

2.1.2 Special pin functions:

- Each of the 14 digital pins and 6 Analog pins on the Uno can be used as an input or output, under software control (using pin Mode (), digital Write (), and digital Read () functions).

- They operate at 5 volts. Each pin can provide or receive 20 mA as the recommended operating condition and has an internal pull-up resistor (Disconnected by default) of 20-50Kohm.

- A maximum of 40mA must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

- The Uno has 6 Analog inputs, Labeled A0 through A5; each provides 10 bits of resolution (1024 different values).

In addition, some pins have specialized functions:

- Serial /UART
- External interrupts
- PWM (pulse-width modulation)
- SPI (Serial Peripheral Interface)
- TWI (two-wire interface)
- AREF (Analog reference)

2.1.3 Features of Arduino Uno:

- Microcontroller: ATmega328.

- Operating Voltage:5V.

- Input Voltage (recommended):7-12V.

- Input Voltage (limits):6-20V.

- Digital I/O Pins: 14 (of which 6 provide PWMoutput)

- Analog Input Pins:6.

- DC Current per I/O Pin: 40mA.

- DC Current for 3.3V Pin: 50mA.

The Arduino integrated development environment (IDE) is a cross platform application written in Java, and derives from the IDE for the Processing programming language and the Wiring projects.

2.1.4 Applications:

- Weighing Machines.

- Traffic Light Count Down Timer.

- Parking Lot Counter.

- Embedded systems.

- Home Automation.

- Industrial Automation.

- Medical Instrument.

- Emergency Light for Railways.

2.2 Bluetooth Module HC-05

2.2.1 Introduction

- It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications.

- It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions.

- It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air.

- It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART).

2.2.2 HC-05 Bluetooth Module

- HC-05 is a Bluetooth module which is designed for wireless comunication. This module can be used in a master or slave configuration.
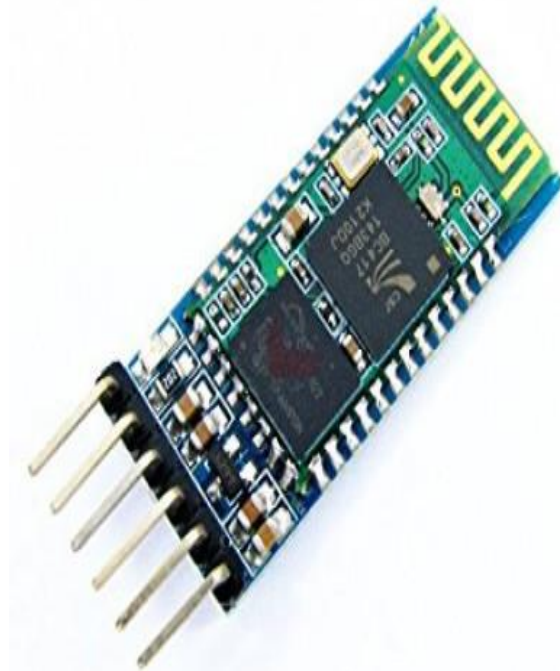
Fig.2.2 HC-05 Module

2.2.3 Pin Description

Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.

Pin 1: State
Pin 2: RXD
Pin 3: TXD
Pin 4: GND
Pin 5: VCC
Pin 6: Enable
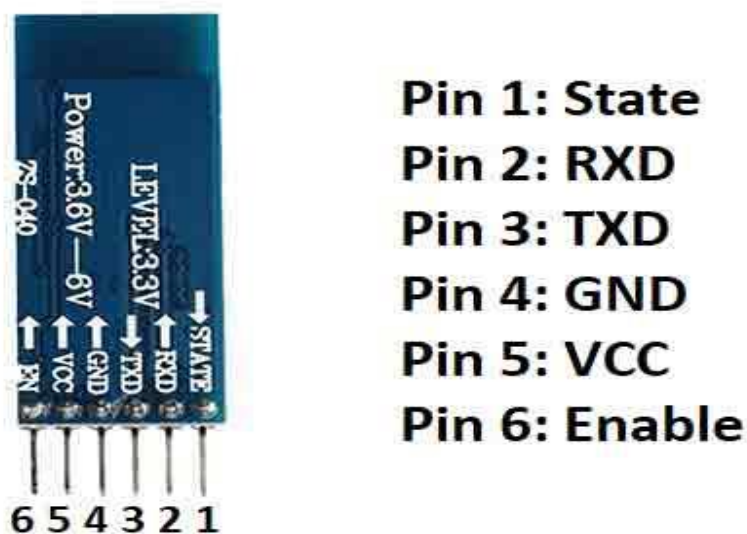
Fig.2.3 Pin description

It has 6 pins,

1. Key/EN: It is used to bring Bluetooth module in AT commands mode. If Key/EN pin is set to high, then this module will work in command mode. Otherwise by default it is in data mode. The default baud rate of HC-05 in command mode is 38400bps and 9600 in data mode.

HC-05 module has two modes,

1. Data mode: Exchange of data between devices.

2. Command mode: It uses AT commands which are used to change setting

To send these commands to module serial (USART) port is used.

2. VCC: Connect 5 V or 3.3 V to this Pin.

3. GND: Ground Pin of module.

4. TXD: Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)

5. RXD: Receive data serially (received data will be transmitted wirelessly by Bluetooth module).

6. State: It tells whether module is connected or not.

2.2.4 HC-05 module Information

- HC-05 has red LED which indicates connection status, whether the Bluetooth is connected or not. Before connecting to HC-05 module this red LED blinks continuously in a periodic manner. When it gets connected to any other Bluetooth device, its blinking slows down to two seconds.

- This module works on 3.3 V. We can connect 5V supply voltage as well since the module has on board 5 to 3.3 V regulator.

- As HC-05 Bluetooth module has 3.3 V level for RX/TX and microcontroller can detect 3.3 V level, so, no need to shift transmit level of HC-05 module. But we need to shift the transmit voltage level from microcontroller to RX of HC-05 module.

2.2.5 Bluetooth communication between Devices

- E.g Send data from Smartphone terminal to HC-05 Bluetooth module and see this data on PC serial terminal and vice versa.

- To communicate smartphone with HC-05 Bluetooth module, smartphone requires Bluetooth terminal application for transmitting and receiving data. You can find Bluetooth terminal applications for android and windows in respective app store.

- Default settings of HC-05 Bluetooth module can be changed using certain AT commands.

- As HC-05 Bluetooth module has 3.3 V level for RX/TX and microcontroller can detect 3.3 V level, so, there is no need to shift TX voltage level of HC-05 module. But we need to shift the transmit voltage level from microcontroller to RX of HC-05 module.
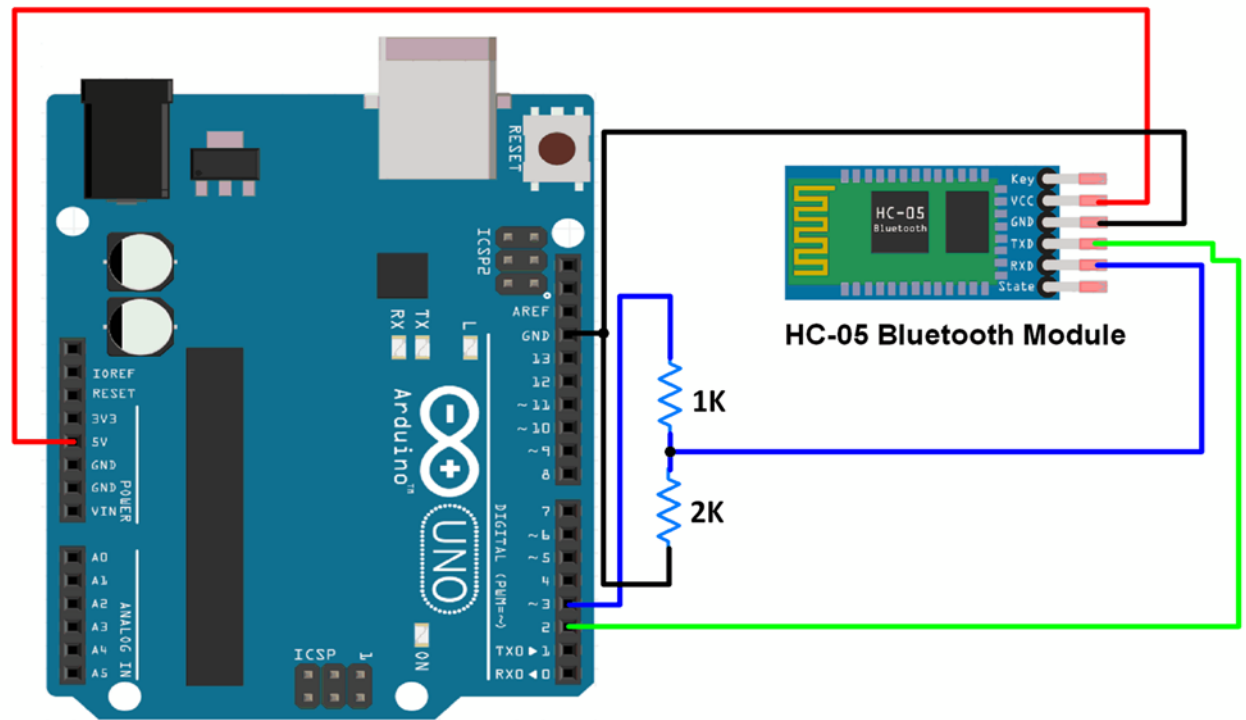
2.2.6 INTERFACING DIAGRAM

Fig.2.4 Interfacing HC-05

- Here, we will transmit data from Smartphone via Bluetooth to the Arduino Uno and display it on Serial Monitor of PC.
- Download and install a Bluetooth terminal application on your phone and use it to connect to the HC-05 Bluetooth module.
- Data is sent from the Smartphone using the Bluetooth terminal application.

2.3   DC MOTOR

DC motors consist of rotor-mounted windings (armature) and stationary windings (field poles). In all DC motors, except permanent magnet motors, current must be conducted to the armature windings by passing current through carbon brushes that slide over a set of copper surfaces called a commutator, which is mounted on the rotor.

The commutator bars are soldered to armature coils. The brush/commutator combination makes a sliding switch that energizes particular portions of the armature, based on the position of the rotor. This process creates north and south magnetic poles on the rotor that are attracted to or repelled by north and south poles on the stator, which are formed by passing direct current through the field windings. It's this magnetic attraction and repulsion that causes the rotor to rotate.
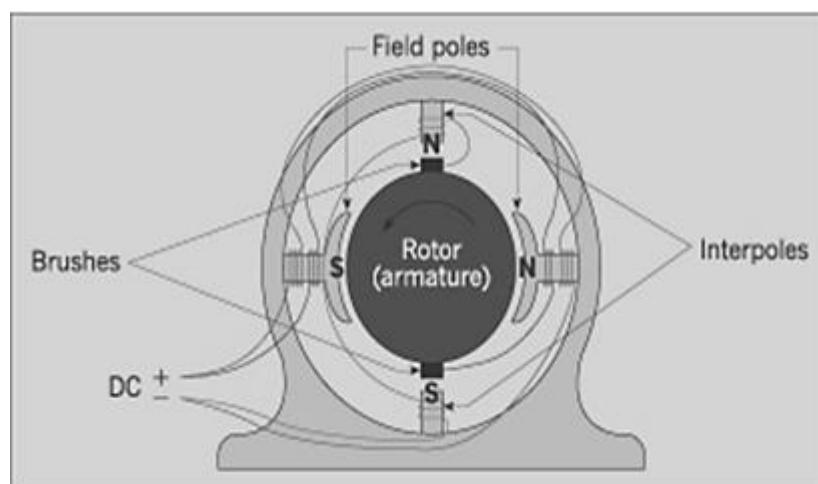

Fig.2.5 DC Motor

2.3.1 Dc Gear Coupled Motor

- The most widely used type of DC motor is, the permanent magnet commutator type, which is simply designed to rotate at some approximate speed when powered from an appropriate DC voltage. This type of motors are often used as fixed speed drivers in tape cassette recorders and record/disc players and as wide range motive etc.

- The DC motor has a rotating armature in the form of an electromagnet. A rotary switch called a commutator reverses the direction of the electric current twice every cycle, to flow through the armature so that the poles of the electromagnet push and pull against the permanent magnets on the outside of the motor. As the poles of the armature electromagnet pass the poles of the permanent magnets, the commutator reverses the polarity of the armature electromagnet. During that instant of switching polarity, inertia keeps the classical motor going in the proper direction.
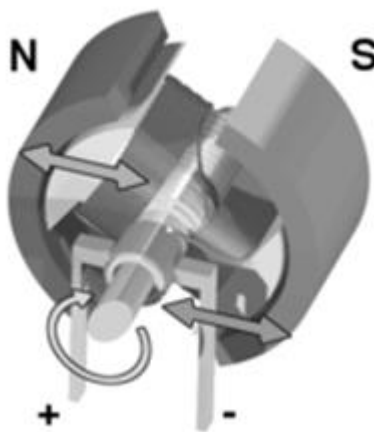
Fig.2.6 Gear coupled motor

2.3.2 SPECIFICATION

DC Gear Coupled Motor

Voltage	:	12V
Current	:	4.5A
Torque	:	.5Kg Cm

2.3.3 TYPES OF DC MOTOR

There are five types of brushed DC motor:

A. DC shunt-wound motor

B. DC series-wound motor

C. DC compound motor (two configurations):

- Cumulative compound
- Differentially compounded

D. Permanent magnet DC motor

E. Separately excited (sepex)

2.3.4 ADVANTAGES OF DC MOTOR

- Speed of rotation of DC Motor can be easily controlled.
- Used for drives requiring large power outputs.
- Direction of the motor can be easily changed.

2.4 Solar Electric Panels

Photovoltaic (PV) panels, which use sunlight to produce electricity, are much more efficient for their purpose than their solar thermal cousins. They are also much more useful in northern climates. While the manufacturing process and the mechanism by which they work are more technical than solar thermal, they are much simpler to install and maintain in actual use. Following is an overview of the function and purpose of photovoltaic panels, as well as the many benefits they have in alternative energy systems.

2.4.1 Sunlight to Electricity

A typical solar cell consists of a glass cover to seal the cell, an anti-reflective layer to maximize incoming sunlight, a front and back contact or electrode, and the semiconductor layers where the electrons begin and complete their voyages. The electric current stimulated by sunlight is collected on the front electrode and travels through a circuit back to the solar cell via the back electrode.
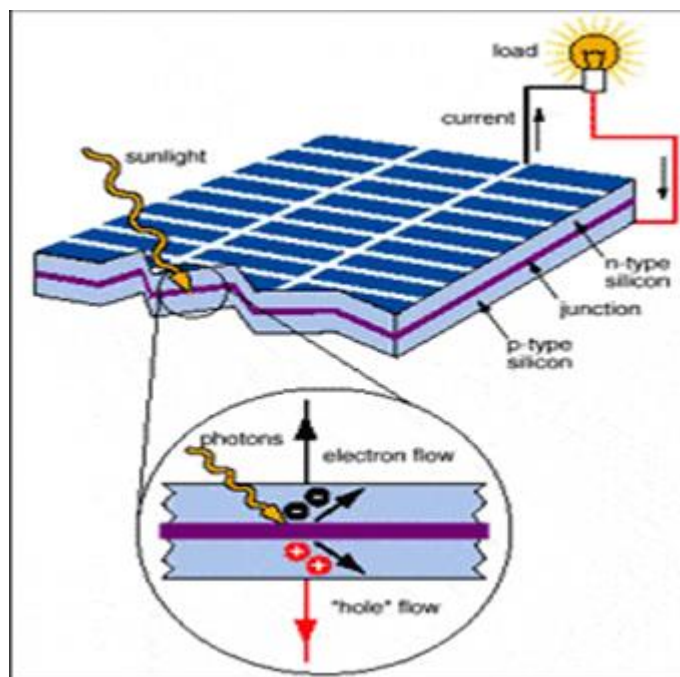

Fig.2.7 Dc To Ac Conversion

The other problem is that the electricity generated by your PV modules, and extracted from your batteries if you choose to use them, is direct current, while the electricity supplied by your utility (and the kind that every appliance in your house uses) is alternating current. You will need an inverter, a device that converts DC to AC. Most large inverters will also allow you to automatically control how your system works. Some PV modules, called AC modules, actually have an inverter already built into each module, eliminating the need for a large, central inverter, and simplifying wiring issues.

Throw in the mounting hardware, wiring, junction boxes, grounding equipment, over current protection, DC and AC disconnects and other accessories and you have yourself a system. Electrical codes must be followed (there's a section in the National Electrical Code just for PV), and it's highly recommended that the installation be done by a licensed electrician who has experience with PV systems. Once installed, a PV system requires very little maintenance (especially if no batteries are used), and will provide electricity cleanly and quietly for 20 years or more.

If photovoltaic are such a wonderful source of free energy, then why doesn't the whole world run on solar power? Some people have a flawed concept of solar energy. While it's true that sunlight is free, the electricity generated by PV systems is not. As you can see from our discussion of a household PV system, quite a bit of hardware is needed. our primary source of power by solar power panels Attached bottom of the frame of apparatus and mounted on control circuit (Microcontroller). We placed our apparatus outside of shops hotels supermarkets etc.

2.4.2 PV System architecture

- Solar cells alone cannot produce usable power. They need to be interconnected with other system components that ultimately serve a specific electrical demand, or 'load'. PV systems can either be stand-alone, or grid-connected. The main difference between these two basic types of systems is that in the latter case, the PV system produces power in parallel with the electrical utility, and can feed power back into the utility grid if the onsite load does not use all of the PV system's output.

- When the sun is shining, the direct current electricity (DC) from the PV modules is converted to alternating current (AC) by the power of an electronic inverter, and then fed directly into the building power distribution system where it supplies electric power. Any excess solar power is exported to the utility power grid and any shortfall is made up with electricity supplied by the grid. During non-sun hours, the building load is supplied by utility power alone.
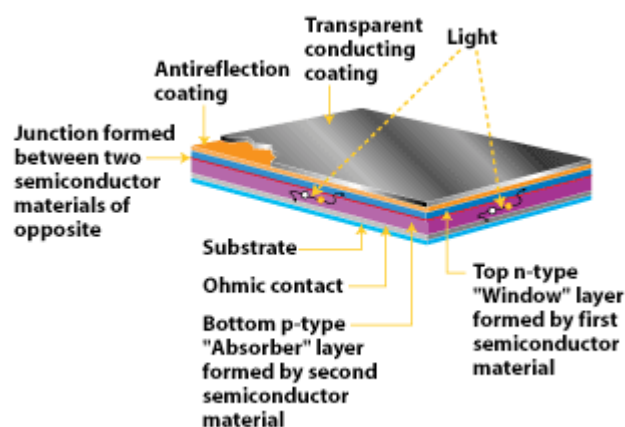

Fig.2.8 PV Architecture

2.5 Battery

2.5.1 Lithium ion Battery

Batteries are an integral part of any automotive, RV, marine or home power electrical system. Since most people are fairly familiar with automotive batteries, we will concentrate on deep-cycle power storage batteries used in home power, RV and marine applications, with brief comparisons between deep-cycle and automotive batteries.

Fig.2.9 6v 5ah lithium ion battery

In an alternative energy system, battery charging is usually accomplished through charge controllers attached to the various power generators. A good quality charge controller will use a three stage, pulse width modulated charging system. We use Lithium ion battery for secondary charging purpose for safety backup and continuously working condition.

2.6 Toggle Switch

Fig.2.10 Toggle Switch

A toggle switch is a class of electrical switches that are actuated by a mechanical lever, handle, or rocking mechanism. Toggle switches are available in many different styles and sizes, and are used in countless applications. Many are designed to provide, e.g., the simultaneous actuation of multiple sets of electrical contacts, or the control of large amounts of electric current or mains voltages. The word "toggle" is a reference to a kind of mechanism or joint consisting of two arms, which are almost in line with each other, connected with an elbow-like pivot. In the phrase "toggle switch" it specifically refers to one kind of mechanism that can be used to implement a positive "snap-action." However, the word "toggle switch" has come to mean any kind of switch with a short handle and a positive snap-action, whether it actually contains a toggle mechanism or not. In electronics, the word "toggle" has come to mean circuits that embody an electronic Analog of a mechanical snap-action.

toggle flip-flop, a circuit in which an impulse causes a transition from whichever state to another state and it´s depends of the output Q. By further extension, in software, the act of switching from one to the other of two states can be called "toggling", as in "He toggled the switch, and the computer's lights blinked". When used in computer programs, the term "toggle" is used to indicate turning a feature on, or off, typically by pressing one key to turn the feature on, and then pressing the same key again, to turn the feature off.

The advantages of such a switch are quite simple. The light is quite handy to turn on and off. But the disadvantages are that the lever which protrudes form the actual switch may become stiff and then harder to use.
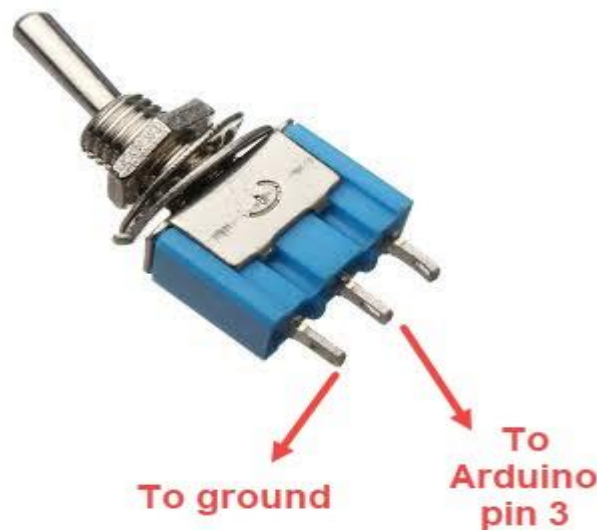

Fig.2.11. Connecting Pins

2.7 ISD1820 Voice Recorder Module

The Voice Record Module is based on the ISD1820 and is a multiple-message record/playback device. It module offers true single-chip voice recording with no-volatile storage and playback capability for 8 to 20 seconds. The sample rate can be set as low as 3.2k and allows for a total of 20 seconds of recording. The module is easy to use with buttons on the board to perform the functions, as well as the option to control with a Microcontroller such as Arduino.

2.7.1 FEATURES:

- Push-button interface, playback can be edge or level activated
- Automatic power-down mode
- On-chip 8Ω speaker driver
- Signal 3V Power Supply
- Can be controlled both manually or by MCU
- Sample rate and duration changeable by replacing a single resistor
- Records up to 20 seconds of audio
- Dimensions: 37 x 54 mm

2.7.2 APPLICATION:

If you want to change the recording duration, an external resistor is necessary to select the record duration and sampling frequency, which can range from 8 – 20 seconds (4-12kHz sampling frequency). The module by default has a 100k resistor with a default recording length of 10s.
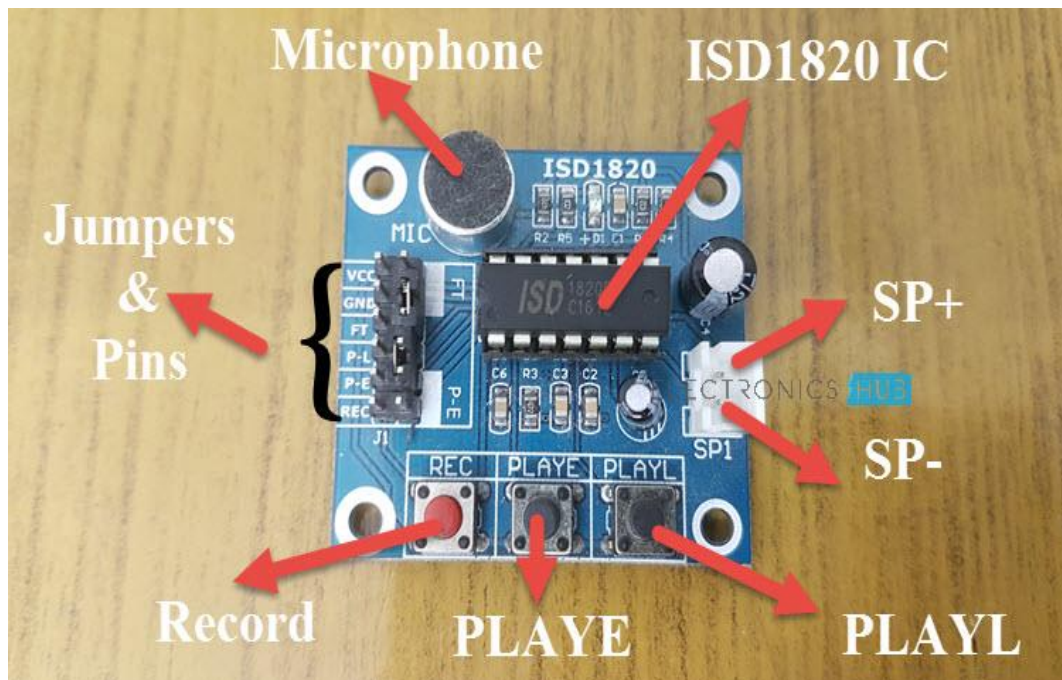
Fig.2.12. Interfacing of ISD 1820

- VCC– 3.3V power supply

- GND– Power ground

- PLAYE – Playback, Edge-activated: When a HIGH-going transition is detected on continues until an End-of-Message (EOM) marker is encountered or the end of the memory space is reached.

- PLAYL – Playback, Level-activated, when this input pin level transits for LOW to HIGH, a playback cycle is initiated.

- Speaker Outputs – The SP+ and SP- pins provide direct drive for loudspeakers with impedances as low as 8Ω.

- MIC – Microphone Input, the microphone input transfers its signals to the on-chip preamplifier.

- FT – Feed Through: This mode enable the Microphone to drive the speaker directly.

- P-E – Play the records endlessly.

2.8 Voice recorder with Speaker

- Connect small 8Ω Speaker at the output of the Module i.e. across SP+ and SP-pins.

- Push the record button (REC) on the module and the module starts recording. Continue to push the button until you record the complete message (about 10 Seconds, for example).

- In order to playback, you can use either PLAYE or PLAYL. Push the PLAYE button one time and the entire message is played back.

- You need to push and hold the PLAYL button and the message starts playing and if you want to stop the play back at any time, release the button.

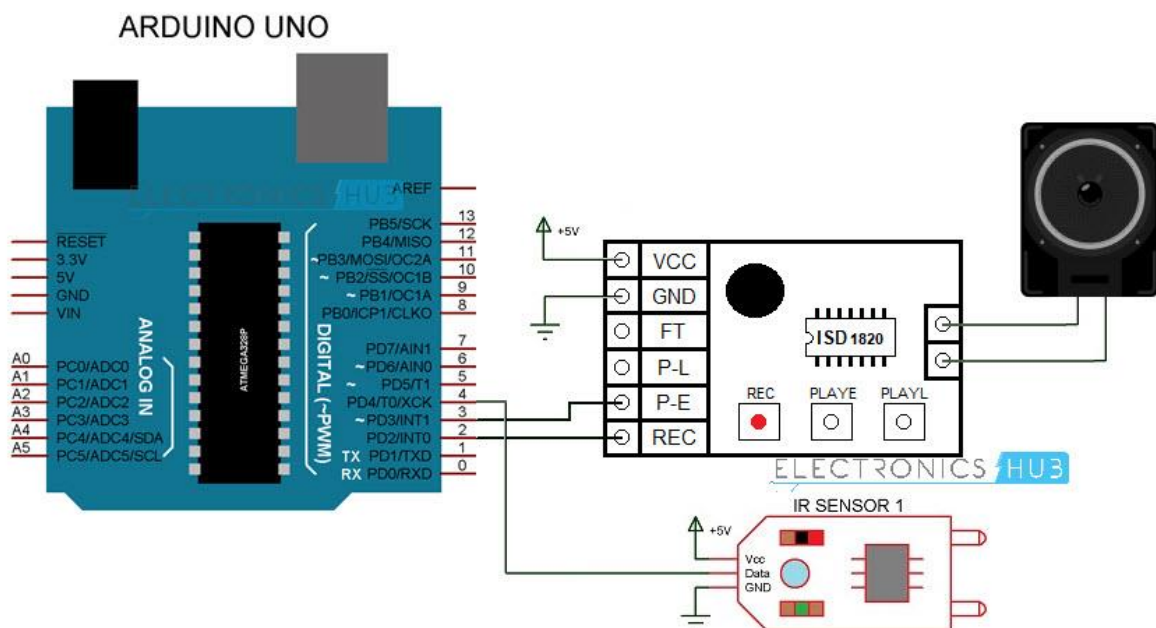- If you activate the PE Jumper, the playback is in endless loop mode.

Fig.2.13 Interfacing speaker with Arduino

2.9 Light Dependent Resistor (LDR)

- A Light Dependent Resistor (also known as a photoresistor or LDR) is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light-sensitive devices. They are also called as photoconductors, photoconductive cells or simply photocells.

- They are made up of semiconductor materials that have high resistance. There are many different symbols used to indicate a photoresistor or LDR, one of the most commonly used symbol is shown in the figure below. The arrow indicates light falling on it.
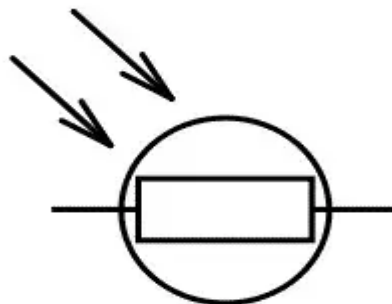

Fig.2.14 Symbol of LDR

2.9.1 Working Principle of Photoresistor (LDR)

Photoresistors work based off of the principle of photoconductivity. Photoconductivity is an optical phenomenon in which the material's conductivity is increased when light is absorbed by the material.

When light falls i.e. when the photons fall on the device, the electrons in the valence band of the semiconductor material are excited to the conduction band. These photons in the incident light should have energy greater than the bandgap of the semiconductor material to make the electrons jump from the valence band to the conduction band.

Hence when light having enough energy strikes on the device, more and more electrons are excited to the conduction band which results in a large number of charge carriers. The result of this process is more and more current starts flowing through the device when the circuit is closed and hence it is said that the resistance of the device has been decreased. This is the most common working principle of LDR. We are Placed LDR Sensor at top of the apparatus aka eye termed as night mode as in this mode specially customised for night operation. In this mode based on the incident light that falls on it or based on the movement in a proximal distance the LDR (108) activates the motor via the processor and rotates with the light illumination and therefore the display is better viewed having an aesthetic attraction.
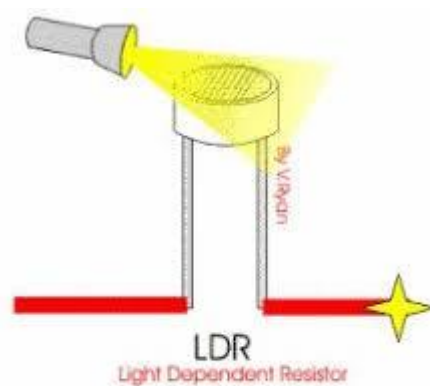

Fig.2.15 LDR Function

2.9.2 Construction of a Photocell

The structure of a light-dependent resistor consists of a light-sensitive material which is deposited on an insulating substrate such as ceramic. The material is deposited in a zigzag pattern in order to obtain the desired resistance and power rating. This zigzag area separates the metal deposited areas into two regions.
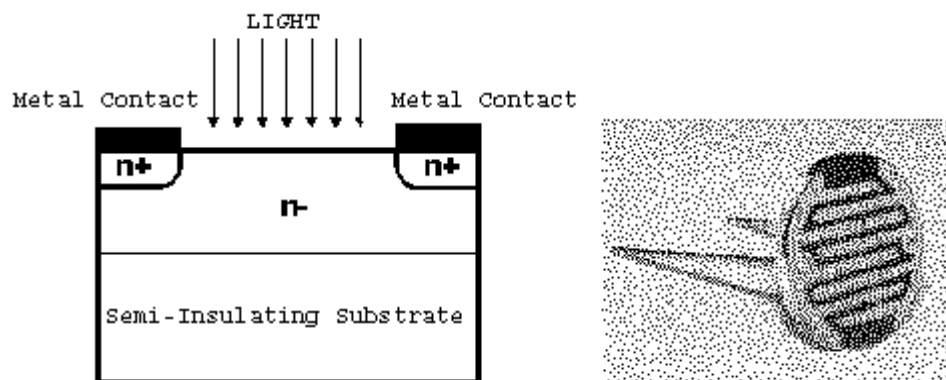

Fig.2.16 Construction Of LDR

2.9.3 Applications of LDRs

Photoresistors (LDRs) have low cost and simple structure and are often used as light sensors. Other applications include:

- Alarm clocks.
- Burglar alarm circuits.
- Light intensity meters.
- Used as part of a SCADA system to perform functions such as counting the number of packages on a moving conveyor belt.

2.10 Light-Emitting Diode (LED)

We placed LED light at centre of two sides of Rotating frames that way we create a element of surprise termed as night mode as in this mode specially customised for night operation. In this mode based on the incident light that falls on it or based on the movement in a proximal distance the LDR (108) activates the motor via the processor and rotates with the light illumination and therefore the display is better viewed having an aesthetic attraction.

Connection

- Connect +5V of the Arduino to one pin of the LDR.
- Connect the other pin of the LDR to A0 (analog pin of the Arduino) and one pin of the 100KΩ resistor.
- Connect the other pin of the 100KΩ resistor to GND of the Arduino.
- Connect the 220ohm resistor to the long leg (+ve) of the LED on the breadboard.
- connect the other leg of the resistor to pin number 11 (digital pin) of the Arduino.
- And connect shorter leg of the LED to the ground.

LED to be controlled using sensor when the light turns ON automatically when it is dark outside and turns off when it gets bright. For this, we need a light sensor to detect the light condition and some circuitry to control the Light sensor. LDR (Light Dependent Resistor, or Photo resistor) is basically a resistor that change resistance depending on light.

2.11 Passive IR Sensors

A passive infrared (PIR) sensor recognizes infrared light emitted from nearby objects. You may assume that "passive" IR sensors mean these devices are less complicated than their active counterparts, realize that everything — humans, animals, even inanimate objects — emit a certain amount of IR radiation. How much IR radiation they emit relates to the body or object's warmth and material makeup. Humans can't see IR, but we've designed electronic detection devices to pick up these signals. PIR sensors are used in thermal sensing applications, such as security and motion detection. They are commonly used in security alarms, motion detection alarms, and automatic lighting applications.
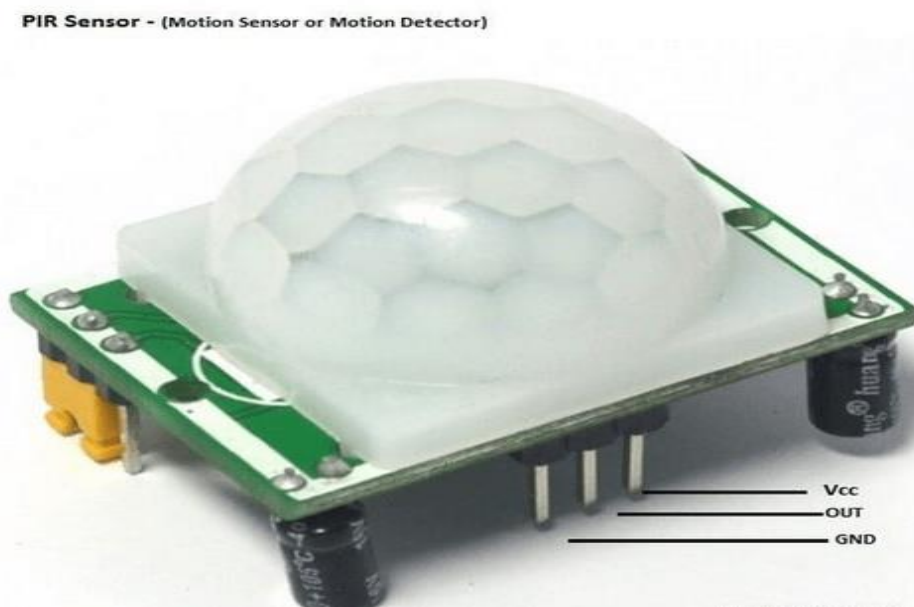
Fig.2.17 Motion Detector

2.11.1 PIR Sensor Functions

Passive infrared (PIR) sensors use a pair of pyroelectric sensors to detect heat energy in the surrounding environment. These two sensors sit beside each other, and when the signal differential between the two sensors changes (if a person enters the room, for example), the sensor will engage. That may mean it triggers an alarm, notifies authorities, or maybe turns on a floodlight. IR radiation focuses on each of the two pyroelectric sensors using a series of lenses constructed as the sensor's housing. These lenses widen the device's sensing area.

Fig.2.18 Function of PIR Sensor

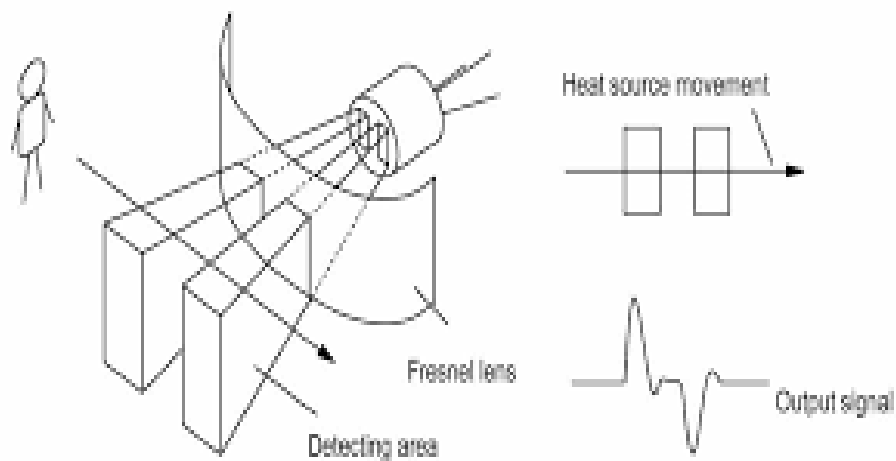While the lens setup and sensor electronics are sophisticated technology, these units are easy to use in a practical application. You only need power and ground for the sensor to produce a discreet output that's strong enough for a microcontroller to use. Typical adjustments include adding potentiometers for sensitivity and tweaking how long a PIR stays engaged once it's triggered. You can also toggle the sensor between:

- Staying on for a set amount of time after detecting movement.
- Pulsing on and off in a "non-retriggering" mode.

You'll commonly see PIR sensors in security alarms and automatic lighting setups. These applications don't require that the sensor detect an object's specific location, just that objects or people in a particular area are moving around.

2.11.2 Range of PIR Sensor?

- Indoor passive infrared: Detection distances range from 25 cm to 20 m.
- Indoor curtain type: The detection distance ranges from 25 cm to 20 m.
- Outdoor passive infrared: The detection distance ranges from 10 meters to 150 meters.
- Outdoor passive infrared curtain detector: distance from 10 meters to 150 meters

We used Indoor Passive infrared Sensor The PIR Sensor Placed at top of the Apparatus aka Eye to senses the object(Humans) will function as a normally rotating unit and will rotate at a constant speed displaying the content that is mounted over the frame of the user's choice.

2.12 Single-Channel Relay Module

The electromagnetic relay consists of a multi-turn coil, wound on an iron core, to form an electromagnet. When the coil is energized, by passing current through it, the core becomes temporarily magnetized. The magnetized core attracts the iron armature. The armature is pivoted which causes it to operate one or more sets of contacts. When the coil is de-energized the armature and contacts are released.

The coil can be energized from a low power source such as a transistor while the contacts can switch high powers such as the mains supply. The relay can also be situated remotely from the control source. Relays can generate a very high voltage across the coil when switched off.
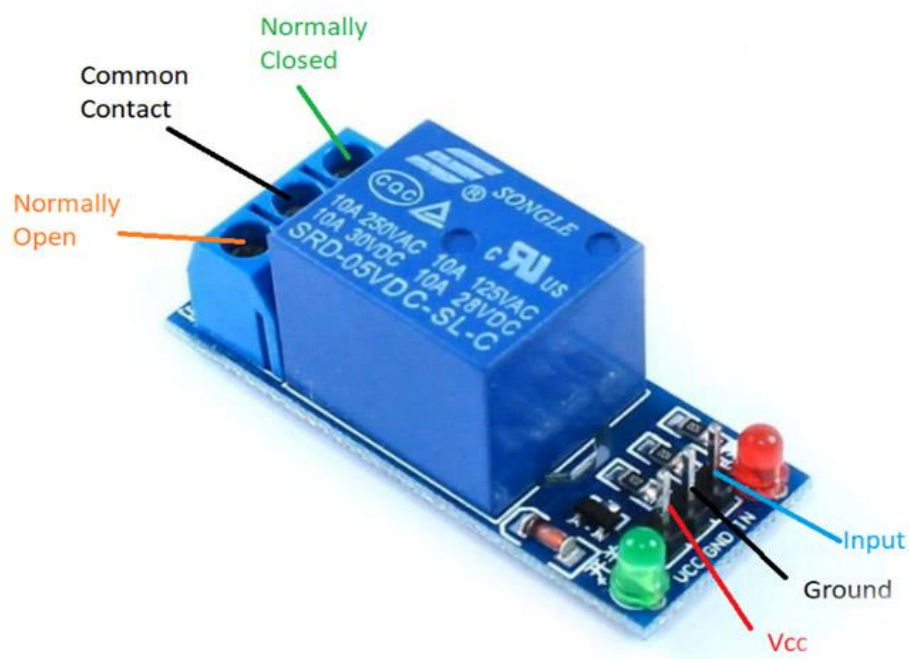

Fig.2.19 Single-Channel Relay Module

2.12.1 Internal Operation of Mechanical Relays

- Flexure Type: The armature actuates the contact spring directly, and the contact is driven into a stationary contact, closing the circuit

- Lift-off Type: The moveable piece is energized by the armature, and the contact closes

- Plunger Type: The lever action caused by the energization of the armature produces a long stroke action

2.12.2 Types of Relays:

There are two basic classifications of relays:

- Electromechanical
- Solid State

Electromechanical relays have moving parts, whereas solid-state relays have no moving parts. Advantages of Electromechanical relays include lower cost, no heat sink is required, multiple poles are available, and they can switch AC or DC with equal ease. The general-purpose relay is rated by the amount of current its switch contacts can handle.

solid-state relays are used where the circuit under control must be protected from the introduction of electrical noises. Advantages of Solid State Relays include low EMI/RFI, long life, no moving parts, no contact bounce, and fast response. The drawback to using a solid-state relay is that it can only accomplish single pole switching.

2.12.3 Single-Channel Relay Module Specifications

- Supply voltage – 3.75V to 6V

- Quiescent current: 2mA

- Current when the relay is active: ~70mA

- Relay maximum contact voltage – 250VAC or 30VDC

- Relay maximum current – 10A
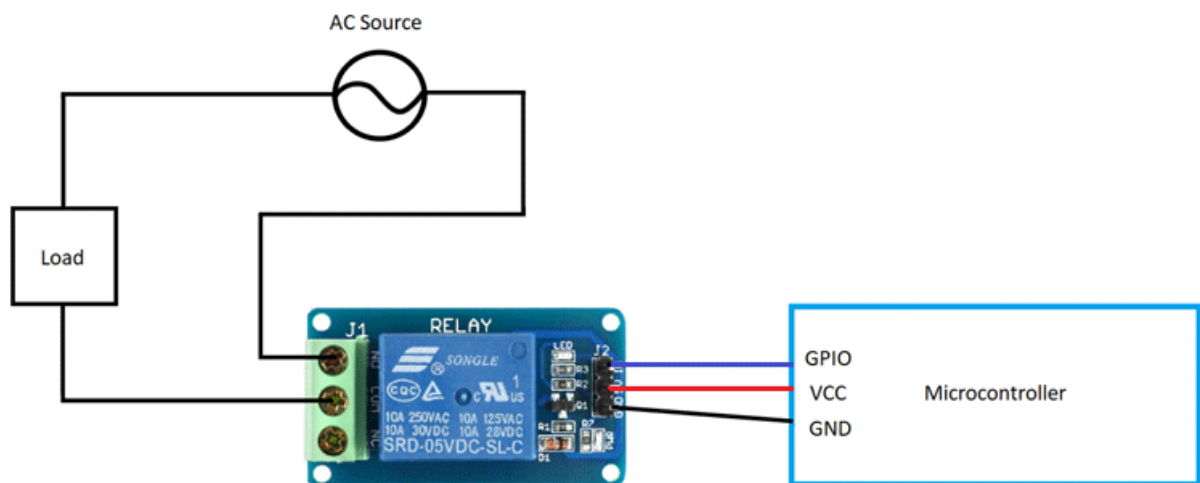
Fig.2.20 Relay Module Schematic

CHAPTER 3
EXPERIMENTAL SETUP

3.1 OUTLINE DIAGRAM

The present invention is a base (100) which is primarily of a shape of a truncated cone or may be of similar shape that houses the solar panel (101) of the apparatus and is covered on the top (102) and basically has a space beneath (103) it to protect the motor, battery, processor and the controller, gear reduction unit that is placed inside it.
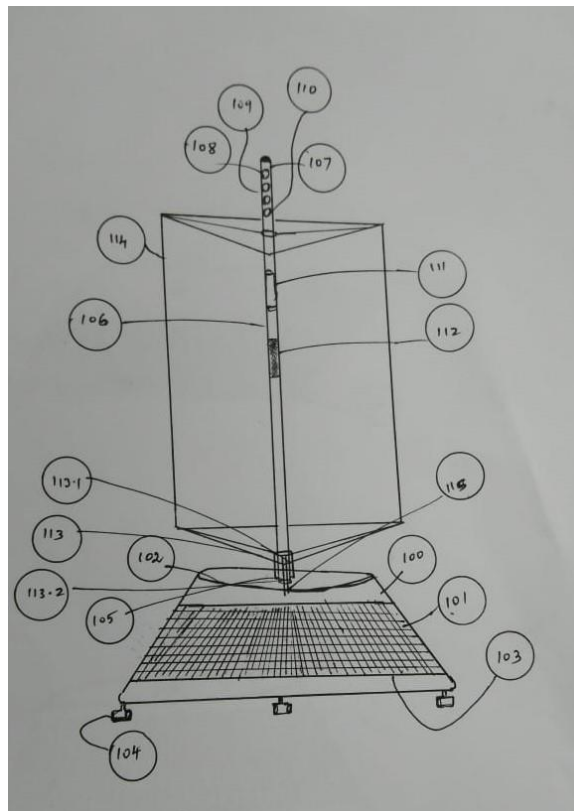

Fig.3.1 Schematic Diagram

So the base of the device is made all weather proof and bears the solar panel on its outer periphery and protects all the other elements of the apparatus on the inner periphery. The base as mentioned above has a fixed or movable bush (104) in the bottom and is covered on the top (102) completely except a small space on the top (105) to let the shaft(115) of the motor to peep outside the base. The base also has a protective covering and the shaft that is extended outside the base has threading to mount the stem (106) which houses the sensors also known as the eyes(107) of the apparatus and bears an LDR(108) light dependent resistor, a motion sensor(109), proximity sensor(110) a illuminating light(111) and a speaker(112).

The apparatus above the base comes with a double threaded adapter (113), on which, one of the threads (113.1) will bear the frame (114) or support and the other threading (113.2) will bear the stem (106) of the apparatus. The frame could be of any shape as represented, may be of triangular(114.1) structure or may be cylindrical(114.2) or may be a multi legged base holding a circular flat base ,(114.3)or a multi legged base holding a grooved plate(114.4) as a serving tray to place eatables over a dining table.

3.2 FRAME WORK

3.2.1 Shaping

It is used to break are cut the plates. In this project it is used to cut the raw materials such as plates. This done by gas cutting. Shaping operation is used to reduce the dimensions of the plates. In this project the plates are in need of shaping process. It is done by shaping machine.

3.2.2 Drilling

Drilling is used to produce holes in objects. In this project the jig plates requires the holes for making bolted assembly. Also to fitting the bushes holes are required. These holes are done by conventional vertical type drilling machine.

3.2.3 Tapping

Internal threading operation is used to produce threads inside the hole. It is also called as tapping process. In this project the holes except the holes for bushes are required tapping process. This is done for the purpose of holding the supporting block and making the jig box by bolt assembly.

Fig.3.2 Frame Structure

3.2.4 Fine grinding

It is nothing but the grinding process, which is done as smooth with fine grains. This is done as the each plate and flanges for good surface finish. It is done by conventional grinding machine.

3.2.5 Welding

It is the process, which is used to join two, is more similar materials as well as dissimilar materials. In this project it is used to join the round flanges with the bow pipe to make the work piece. This is done by arc welding machine.

3.2.6 Milling

Milling is used to machine curved surfaces. In this project the flanges for elbow pipe and supporting blocks need curved surfaces. This is done by using conventional milling machine.

3.2.7 Grooving

It is used in this project to make the groove on the both sides of top cover plate. This is done by conventional lathe.

3.3 FURTHER OPERATIONS

3.3.1 Assembling

It is the operation, which deals with the assembling of various parts produced by above operations.

3.3.2 Cleaning

It is the operation to clean the all machined parts without burrs, dust and chip formals. By meaning the parts they are brightened and good-looking.

3.4 ROTATIONAL MOVEMENT

3.4.1 Gear Mechanism

A gear is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part in order to transmit torque. Two or more gears working in tandem are called a transmission and can produce a mechanical advantage through a gear ratio and thus may be considered a simple machine. Geared devices can change the speed, magnitude, and direction of a power source. The most common situation is for a gear to mesh with another gear, however a gear can also mesh a non-rotating toothed part, called a rack, thereby producing translation instead of rotation.

The Apparatus mounted frame be rotating by gear mechanism gear placed at between the frame and circuit connection. When two gears of unequal number of teeth are combined a mechanical advantage is produced, with both the rotational speeds and the torques of the two gears differing in a simple relationship.

3.4.2 Worm Gear

The arrangement of gears seen above is called a worm and worm wheel. The worm, which is only has one tooth but it is like a screw thread. The worm wheel, is like a normal gear wheel or spur gear. The worm always drives the worm wheel round, it is never the opposite way round as the system tends to lock and jam.
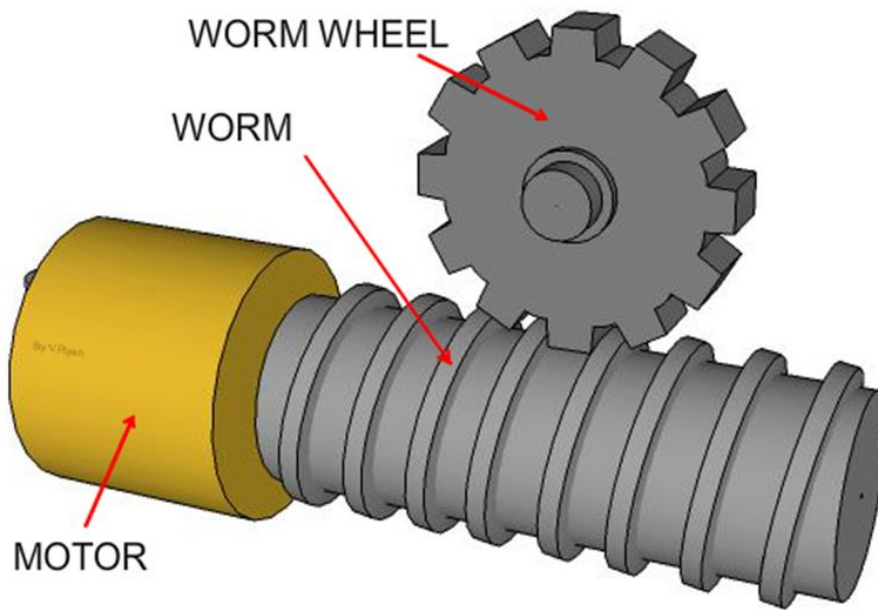
Fig.3.3 Worm Gear

A worm gear reduces the speed of the spur gear by sixty times. If you need a gear system whereby the speed is reduced by a considerable amount - a worm and worm wheel are worth considering.

Gear 'A' is called the 'driver' because this is turned by a motor. As gear 'A' turns it meshes with gear 'B' and it begins to turn as well. Gear 'B' is called the 'driven' gear. You should have also found the gear 'B' revolves the fastest. A basic rule of gears is - if a large gear (gear 'A') turns a small gear (gear 'B') the speed increases. On the other hand, if a small gear turns a large gear the opposite happens and the speed decreases.

Gear 'A' has 30 teeth and gear 'B' has 20 teeth. If gear 'A' turns one revolution, 'B' turn one and half revolution.
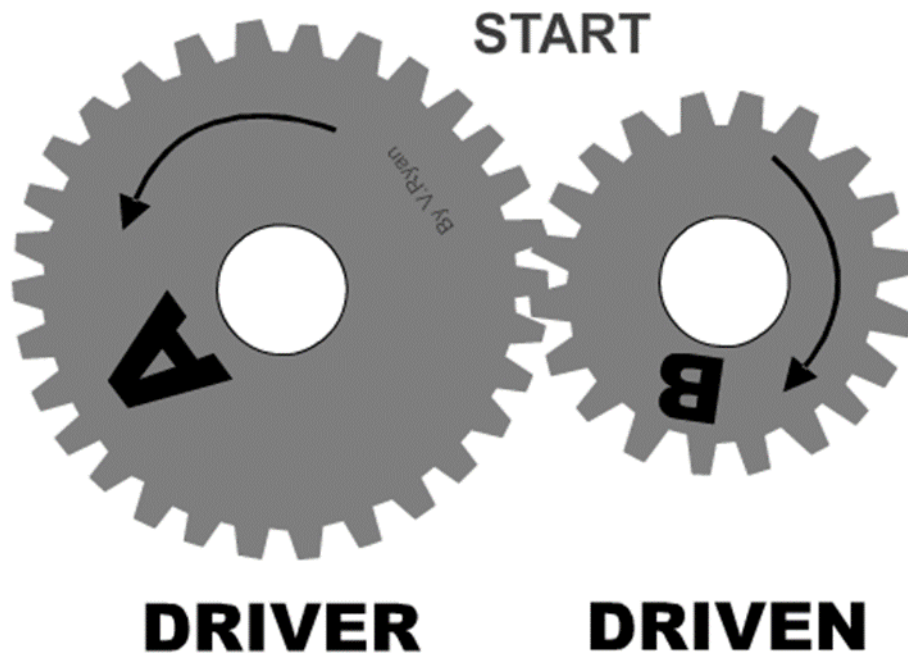

Fig.3.4 Gear Rotating

3.4.3 Bearings

A bearing is a machine element that constrains relative motion and reduces friction between moving parts to only the desired motion. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Many bearings also facilitate the desired motion as much as possible, such as by minimizing friction.
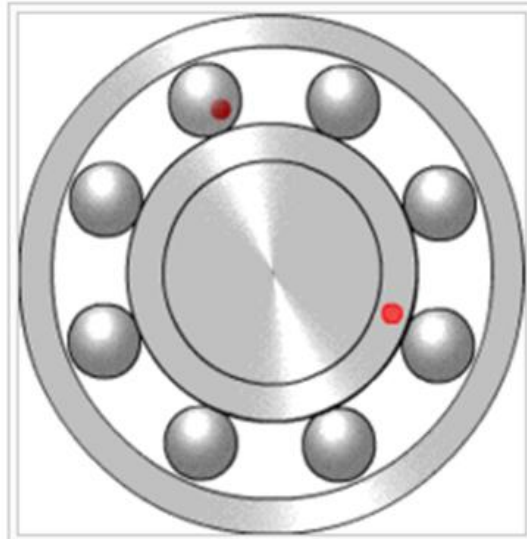
Fig.3.5 Bearings

3.4.4 Principles of operation:

There are at least 6 common principles of operation:

- Plain bearing, also known by the specific styles: bushing, journal bearing, sleeve bearing, rifle bearing.
- Rolling-element bearing such as ball bearings and roller bearings.
- Jewel bearing, in which the load is carried by rolling the axle slightly off-center.
- Fluid bearing, in which the load is carried by a gas or liquid.
- Magnetic bearing, in which the load is carried by a magnetic field.
- Flexure bearing, in which the motion is supported by a load element which bends.

3.5 EXPLANATION

The apparatus is designed to operate in 5 modes as In mode 0 the apparatus will be a simple display unit which will be a stand still mode. In mode 1 the apparatus will function as a normally rotating unit and will rotate at a constant speed displaying the content that is mounted over the frame of the user's choice.
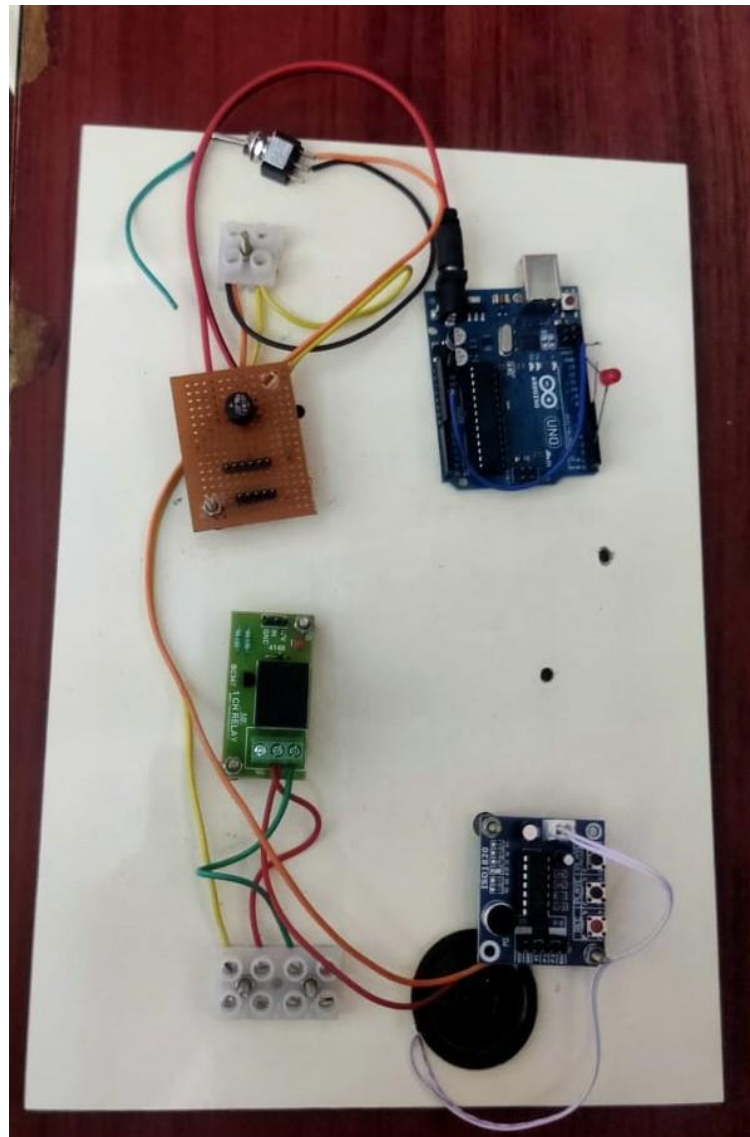

Fig.3.6 Circuit Connections

The mode 2 and mode 3 are special modes creating an element of surprise which are normally rotating and stop-on sensor activation and normally still and starts-on sensor activation respectively. In this mode the viewer is given a simple element of surprise as in these modes the sensors (aka) eyes of the apparatus senses the motion at a proximal distance and responds either by stopping or revolving with a voice message and light activation. Such kind of operation attracts the user and gives an instant impression for the observer to stare and watch the display and hence the objective of the apparatus is better resolved in these modes.

Mode 4 is termed as night mode as in this mode specially customised for night operation. In this mode based on the incident light that falls on it or based on the movement in a proximal distance the LDR(108) activates the motor via the processor and rotates with the light illumination and therefore the display is better viewed having an aesthetic attraction.

Mode 5 is the last mode which is called as the highway mode where based on the sensor activation the board takes a quarter turn instantly to attract the vehicles crossing the highway and simultaneously, the sensors activates the light and pre-saved voice either or both to create a surprise for the passer-by and to give a better view of the display and later on turns back to its original position.

The apparatus can be placed either indoor or outdoor and is a stand-alone device. The PV panel on the base harness power and puts is on the battery pack via charge regulator. The apparatus also has a plug in socket which is optional to plug in a power chord in case if it can be made.

CHAPTER 4

AUTOMATION

- Automation is the use of control systems (such as numerical control, programmable logic control, and other industrial control systems), in concert with other applications of information technology to control industrial machinery and processes, reducing the need for human intervention. Automation plays an increasingly important role in the world economy and in daily experience.

- Human-machine interfaces (HMI) or computer human interfaces (CHI), formerly known as man-machine interfaces, are usually employed to communicate with PLCs and other computers, such as entering and monitoring temperatures or pressures for further automated control or emergency response.

- Many roles for humans in industrial processes presently lie beyond the scope of automation. Human-level pattern recognition, language recognition, and language production ability are well beyond the capabilities of modern mechanical and computer systems. Tasks requiring subjective assessment or synthesis of complex sensory data, such as scents and sounds, as well as high-level tasks such as strategic planning, currently require human expertise.

4.1 Automation Tools

Different types of automation tools exist:

- ANN - Artificial neural network.
- DCS - Distributed Control System.
- HMI - Human Machine Interface.
- SCADA - Supervisory Control and Data Acquisition.
- PLC - Programmable Logic Controller.
- PAC - Programmable Automation Controller.
- Instrumentation.
- Motion control.
- Robotics.

4.2 Advantages and disadvantages

The main advantage of automation are:

- Replacing human operators in tedious tasks.
- Replacing humans in tasks that should be done in dangerous environments (i.e fire, space, volcanoes, nuclear facilities, underwater, etc)
- Economy improvement. Sometimes and some kinds of automation implies improves in economy of enterprises, society or most of humankind.

The main disadvantages of automation are:

- Technology limits. Current technology is unable to automate all the desired tasks.
- Initial costs are relatively high. The automation of a new product required a huge initial investment in comparison with the unit cost of the product, although the cost of automation is spread in many product batches. The automation of a plant required a great initial investment too, although this cost is spread in the products to be produced.

CHAPTER 5

CONCLUSIONS

The prototype of the proposed notice board was successfully designed. It can be easily integrated with all general-purpose display board thus proving its mobility Through Bluetooth receiver. The system accepts and show the message to be displayed on the frame board. This system supports only one message at a time. The proposed system can be efficiently used for transfer of message instantly on campus. The paper explains how a smart notice board can be developed using the least number of components in a short span of time. This prototype developed can be used to eliminate the need of huge billboards. Thus it is also a better method of going green. The only change with respect to different applications will be that the code of the program will change to configure only appropriate and desired words/ sentences. This simple application of the smart notice board can be easily implemented and developed further to display any message, not only the pre-decided ones. The message size can also be increased and special characters can be included. Also the Arduino can be programmed to send an acknowledgement message back to the sender after displaying the message. In Industry, Offices, colleges, Hotel This proposed system has many upcoming applications in educational institutions and organizations, crime prevention, traffic management, railways, advertisements etc.

APPENDIX

```
int motor=2;

int light=3;

int speaker=4;

int pir=7;

int ldr=8;



void setup() {

  // put your setup code here, to run once:

Serial.begin(9600);

pinMode(motor,OUTPUT);

pinMode(light,OUTPUT);

pinMode(speaker,OUTPUT);

pinMode(pir,INPUT);

pinMode(ldr ,INPUT);

}



void loop() {

  // put your main code here, to run repeatedly:

char inchar=(char)Serial.read();

if(inchar=='L')
```

```
{
  digitalWrite(light,HIGH);

  digitalWrite(motor,LOW);

  digitalWrite(speaker,LOW);

  Serial.println(inchar);

}
else if(inchar=='R')

{

  digitalWrite(motor,HIGH);

  digitalWrite(light,HIGH);

  digitalWrite(speaker,LOW);

  Serial.println(inchar);

}
else if(inchar=='U')

{

while((char)Serial.read()!='F'){

   int read1=digitalRead(pir);

  if(read1==1){

  digitalWrite(motor,HIGH);

  digitalWrite(light,HIGH);

  digitalWrite(speaker,HIGH);

  Serial.println(inchar);
```

```
    delay(5000);

    }

    else

    {

    digitalWrite(motor,LOW);

    digitalWrite(light,LOW);

    digitalWrite(speaker,LOW);

    }


}

}

else if(inchar=='D')

{

  while(1){

  int read2=digitalRead(pir);

  if(read2==1){

  digitalWrite(motor,LOW);

  digitalWrite(light,LOW);

  digitalWrite(speaker,LOW);

  Serial.println(inchar);

  delay(5000);

  }
```

```
    else

    {

    digitalWrite(motor,HIGH);

    digitalWrite(light,HIGH);

    digitalWrite(speaker,HIGH);

    }


    }

}

else if(inchar=='O')

{

  while(1)

   {

  int read3=digitalRead(ldr);

  if(read3==1){

  digitalWrite(motor,HIGH);

  digitalWrite(light,HIGH);

  digitalWrite(speaker,HIGH);

  Serial.println(inchar);

  delay(5000);

  }

  else
```

```
      {

      digitalWrite(motor,LOW);

      digitalWrite(light,LOW);

      digitalWrite(speaker,LOW);

      }

       }


}


}
```

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