Microcontroller based Environment Monitoring and Load Control System

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Declaration

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

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Certification

This is to certify that this project entitled "**Microcontroller based Environment Monitoring and Load Control System**" 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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At first, we would like to show our gratitude to the University authority to permit us to do our practicum. Specially, we would like to thank to our honorable teacher Md. Majharul Islam, Lecturer, Department of Electrical & Electronics Engineering, SU−Sonargaon University, Dhaka, for his valuable and patient advice, sympathetic assistance, co-operation, contribution of new idea. Deep theoretical and hardware knowledge & keen interest of our supervisor in this field influenced us to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.

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Abstract

Automation can be described as a process following pre-determined sequential steps with a little or without any human exertion. Automation is provided with the use of various sensors suitable to observe the production processes, actuators and different techniques and devices. In this project, the automation system developed is an automatic lamp and an automatic fan on the smart auditorium. Both of these systems will be processed using microcontroller. A microcontroller is used to obtain values of physical conditions through sensors connected to it. In the automatic lamp system required sensors to detect the light of the LDR (Light Dependent Resistor) sensor. While the automatic fan system required sensors to detect the temperature. The lamp can turn on automatically when the light begins to darken, and the lamp can also turn off automatically when the light begins to bright again. Then for the fan, it can also turn on automatically when the temperature is greater than 28°C, and the fan speed can also be adjusted. The fan may also turn off automatically when the temperature is less than equal to 28°C it also can automatically visitor counter shown in the LCD display controlling by the sensor.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In the present day, automation systems play an important role for comfort in life. This is achieved by the incorporation of various subsystems into the automation system with a single control unit such as surveillance, intruder control, access control, fire detection, etc.

A smart home is one that is equipped with lighting, heating, and electronic devices that can be controlled remotely by Smartphone via the Bluetooth. A Microcontroller based home automation system focuses on controlling home electronic devices whether you are inside or near to home. Home automation gives an individual the ability to remotely control things around the home. A home appliance is a device or instrument designed to perform a specific function, especially an electrical device, such as a refrigerator, for household use. The words appliance and devices are used interchangeably.

Automation is today's fact, where things are being controlled automatically, usually the basic tasks of turning ON/OFF certain devices and beyond, in close proximity. Automation lowers the human judgment to the lowest degree possible but does not completely eliminate it. The concept of remote management of household devices over the Smartphone from anywhere, any time today can be a reality. Assume a system where the user control the devices and decides to take control by tuning his TV set to his favorite channel, turns on the cooling system, say the air conditioner, and switches on or off some of the lights. This user could walk back home and only find a very comfortable, pleasant home.

The recent developments in technology which permit the use of Bluetooth have enabled different devices to have capabilities of connecting with each other. The microcontroller is programmed by Arduino-IDE. For the project we used ATmega328 with Arduino platform which is an open source platform and more flexible to programming the chip.

1.2 Background

Automation is a demand in this era of information and communication technology where a smart control system is used to reduce or replace human operators in the industry, offices or homes to produce some goods or services. Home automation system is the subset of automation system that allows us to control household appliances like light, door, fan, air-conditioner etc in an intelligent way. It also includes those of domestic activities such as home entertainment systems, houseplant and yard watering, pet feeding and the use of domestic robots. Home automation system also can provide home security and emergency systems to be activated while necessary. It helps handicapped and old aged people which will enable them to control home appliances and alert them in critical situations. It not only refers to reduce human efforts but also energy efficiency and time saving. There are different types of home automation systems in the market. They are generally proprietary and closed, expensive and not very customizable by the end user. To overcome this limitation, there are scopes of research in this area.

In this project work, a simple home automation device has been chosen to implement. It can operate by any android mobile when needed by using bluetooth. A program code was being downloaded into the microcontroller. When the bluetooth gives any high signal to the microcontroller, the microcontroller then gives an output signal to the output module and turn on the output connected to it. If Bluetooth give any low output signal to the input of the microcontroller then the output will turned off. This is a very simple project work which is very cost-effective and can be used in so many places where automatic power consumption control is the main concern.

1.3 Problem Statement

In today's world, many institutions are composed of plenty of commercial buildings in which room light and fan are not automatically controlled at all. In other words, manual systems are employed in many buildings where one has to switch the lights and fan on and off. A person can also forget to put off the lights and fan when leaving the room This In operation to control these, this project herein, explores an automated home light and fan controlling system to curb the stemming challenge to numerous institutions, companies, and government agencies. The ability to automatically control light and fan would allow the users to feel comfortable without physically controlling them. The use of automated control here would further aid in the use of such systems by those who are sick, handicapped or elderly

1.4 Project Objective

Our objective is to design and construct a Automatic auditorium appliances control system using LDR and thermostat with a low cost and to ensure human comfort.

1.5 Goal of the Research Work

The main purpose of this project is to design and implement a Home Automation System that can be produced at a low cost with effective and competitive usage. This system is designed to be more users friendly and easy to operate at any level. The project is also been designed to be further working vision using minimum hardware at the lower level of processing. These systems are directed at specific applications.

CHAPTER 2

HARDWARE COMPONENTS

2.1 Introduction

In this Chapter, we are going to explain about the system Design construction through Hardware and development of software. In addition, the chapter elaborates the hardware and the software stage by stage. All the operations of hardware and software are also included in this chapter. The system design of the total project is shown in below Figure3.1 with simple block diagram.

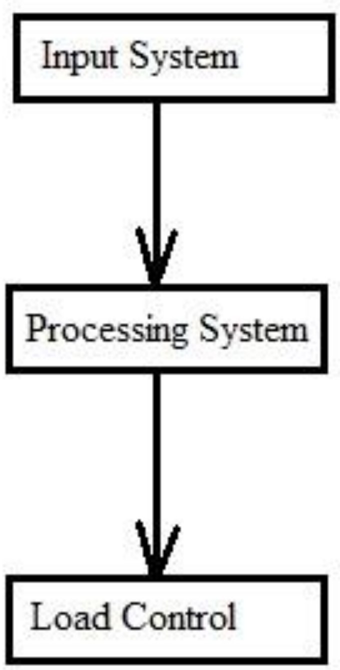

Fig 2.1: Block Diagram

2.2 System Implementation

The system architecture of the automatic output appliance can be divided into 3 main Modules. They are:

1. Input system
2. CPU
3. Output system

The goal of this project is to smart home control system. To fulfill this goal it needs ir obstacle sensor to counting, temperature sensor and ldr for controlling light and fan. Our aim is to implement a low cost project so that we create a simple system which can fulfill the project demand and objective.

2.3 Arduino Nano

Arduino is an open-source prototyping 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, publishing something online. it can tell that board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language and the Arduino Software (IDE), based on Processing.

Fig 2.1: Arduino Nano Pin Diagram

Technical specifications:

Table 2.3.1.1: Technical specifications of Arduino Nano

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	8
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P)of which 0.5 KB used by

	bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz

2.3.1 Microcontroller ATMEGA328P

The Atmel® picoPower® ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per MHz. This empowers system designer to optimize the device for power consumption versus processing speed.

The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs , 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption. In Extended Standby mode, both the main oscillator and the asynchronous timer continue to run. Atmel offers the QTouch® library for embedding capacitive touch buttons, sliders and wheels functionality into AVR microcontrollers. The patented charge-transfer signal acquisition offers robust sensing and includes fully debounced reporting of touch keys and includes Adjacent Key Suppression® (AKS™) technology for unambiguous detection of key events. The easy-to-use QTouch Suite toolchain allows you to explore, develop and debug your own touch applications. The device is manufactured using Atmel's high density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core. The Boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation.

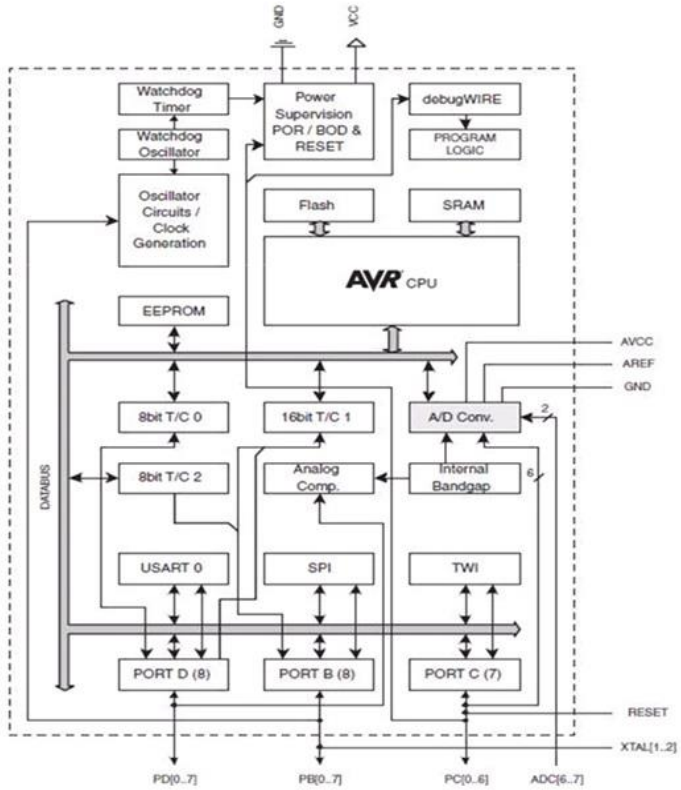

Fig 2.2: ATmega328 Microcontroller Architecture

the program memory is the single-level pipelining. The concept of pre-fetching the next instruction while executing one instruction enables the instructions to be executed in every clock cycle and the program memory is in the System Reprogrammable Flash memory.

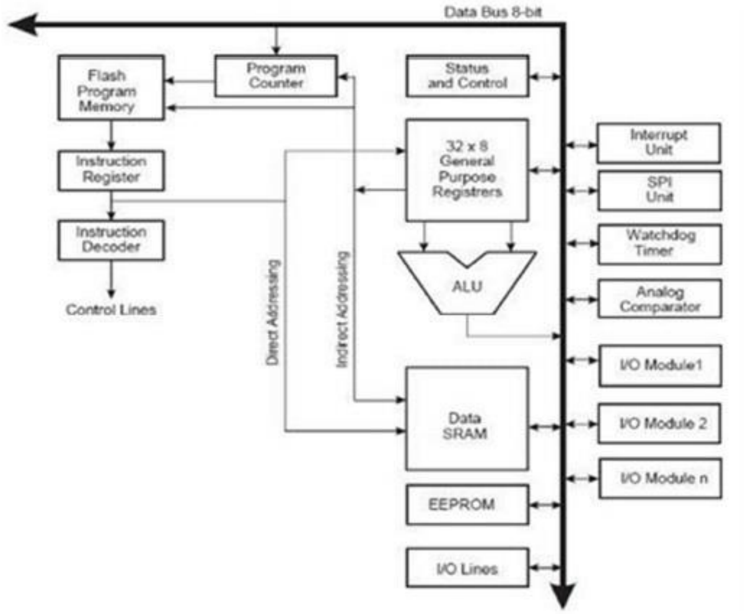

Fig 2.3: Block diagram of the AVR CPU Core architecture

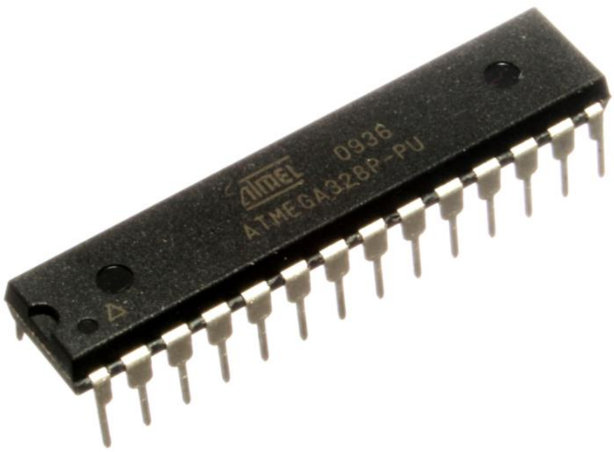

Fig 2.4: Microcontroller IC ATmega 328p.

The high-performance Microchip picoPower 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

Power supply, inputs and outputs

Either Arduino is supplied with USB connection or with an external power supply (recommended with 7-12V), outputs are going to have a continuous voltage due to voltage regulators and stabilization capacitors present on the board. These power supply pins are:

- **VIN:** it is the input power supply that will have the same voltage that we are supplying the Arduino with the external power supply
- **5V:** power supply of 5V, this voltage may come from VIN pin and a voltage regulator or from the USB connection.
- **3.3V:** power supply that will provide 3.3V generated by an internal regulator, with a maximum current of 50 mA.
- **GND:** grounding pins

Digital inputs and outputs

Each of the 14 digital pins can be used as an input or output. Besides, each pin can supply or receive a maximum of 40 mA and has a pull-p resistance from 20 to 50 kOhm. In addition, some pins have specialized functions such as:

- Pin 0 (RX) and 1 (TX). They are used to receive (RX) and transmit (TX) in TTL serial communication.
- Pin 2 and 3. External interruptions. Pins in charge of interrupting the sequential program stablished by the user.
- Pin 3, 5, 6, 9, 10 and 11. PWM (pulse width modulation). They form 8 output bits with PWM with the function analogWrite ().

- Pin 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI (Serial peripheral interface) communication.
- Pin 13. LED. There is a LED connected to the digital pin 13. When the pin value is HIGH, the LED is on, and when the value is LOW, the LED is off.

2.4 Communication system

A number of signal detecting devices are available in the market. These devices include:

- Ethernet Module
- Wi-Fi Module
- Bluetooth Module

All of the devices have their own advantages and disadvantages but we will be targeting that particular device which best suits our requirement. There are certain features that should be considered when choosing the Bluetooth module for use. The features are

- Wireless transceiver
- Function description
    - Can work at the low voltage (3.1V~4.2V).
    - The current in communication is 8mA.
    - This module can be used in the SMD.
    - It’s made through RoHS process.
    - The board PIN is half hole size.
    - Has a 2.4GHz digital wireless transceiver.
    - Small (27mm×13mm×2mm)
    - Peripherals circuit is simple.
    - It’s at the Bluetooth class 2 power level.
- Low power consumption
- Has high-performance wireless transceiver system
- Low Cost

This Bluetooth module can easily achieve serial wireless data transmission. Its operating frequency is among the 2.4GHz frequency band. In Bluetooth 2.0, signal transmit time of different devices stands at a 0.5 seconds interval so that the workload of bluetooth chip can be reduced substantially and more sleeping time can be saved for bluetooth. This module is set with serial interface, which is easy to use and simplifies the overall design.

Fig 2.7: HC-06 Bluetooth Module

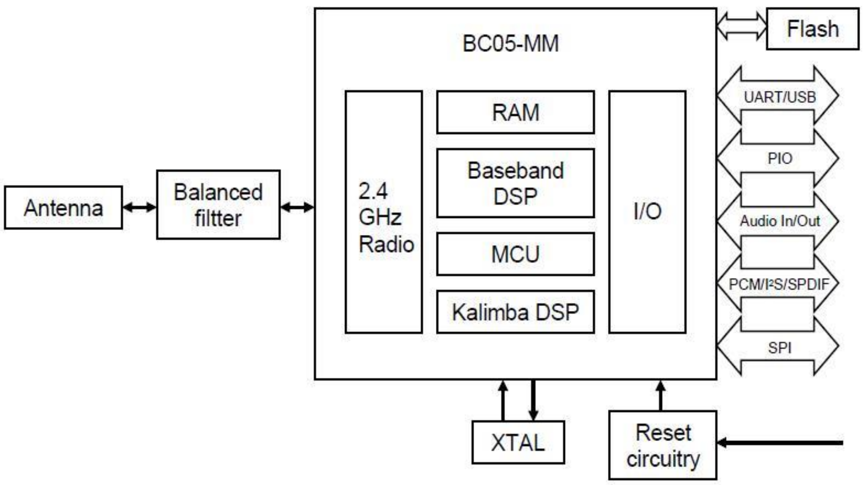

Fig: 2.8: Schematic Diagram of Bluetooth Module

It need to download a bluetooth debugging assistant from play store for mobile phone to connect phone with the Bluetooth HC-06 module, after download and install the package on mobile it needs to enable Bluetooth and open app bye click connect it appear hc-06 and click. A window will pop up asking for a PIN, the password is: 1234, click ok to connect by thus the mobile is able to send data to controller.

2.5 L298 (DC motor driver)

A Motor Driver or motor controller is a device that serves to govern in some predetermined manner the performance of an electric motor. A motor controller might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, regulating or limiting the torque, and protecting against any condition.

The 4 input pins for this l298, pin 2, 7on the left and pin 15, 10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

L298 is a bipolar motor driver IC. This is a high voltage, high current push pull four channel driver compatible to TTL logic levels and drive inductive loads. It has 600 mA output current capabilities per channel and internal clamp diodes. The L298 provide bidirectional drive currents of up to 1A at voltages from 4.5 V to 36 V.

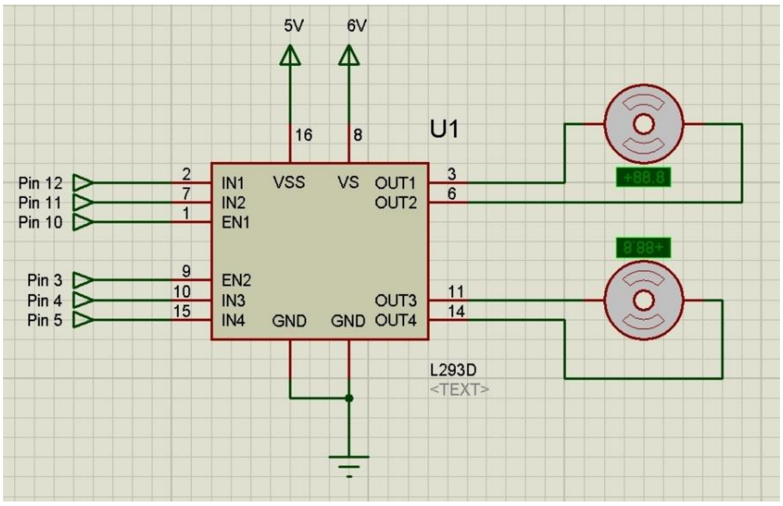

Fig 2.9: Circuit Diagram of connection between driver and motor.

All inputs are getting from microcontroller. When an enable input is high, the associated drivers are enabled, and their outputs are active and associate motor will start rotating. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for motor applications.

Table 2.1: Operation of Motor Driver

Enable	In 1	In 2	Motor status
1	1	0	Reverse Rotation
1	0	0	Stopped
1	0	1	Reverse Rotation

Controlling a DC Motor

In order to have a complete control over DC motor, we have to control its speed and rotation direction. This can be achieved by combining these two techniques.

- **PWM** – For controlling speed
- **H-Bridge** – For controlling rotation direction

PWM – For controlling speed

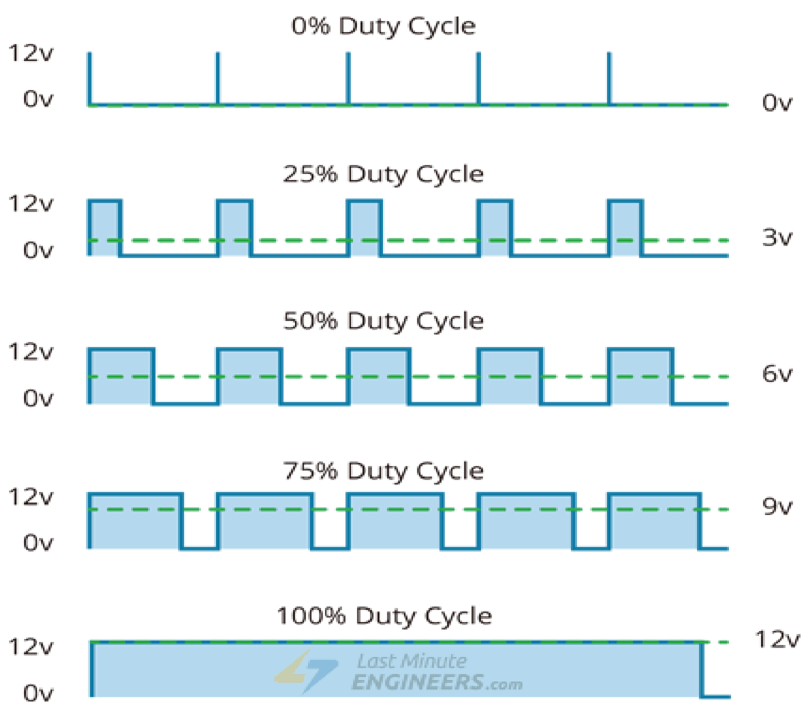

Fig 2.10: PWM for speed control

The speed of a DC motor can be controlled by varying its input voltage. A common technique for doing this is to use PWM (Pulse Width Modulation)

PWM is a technique where average value of the input voltage is adjusted by sending a series of ON-OFF pulses.

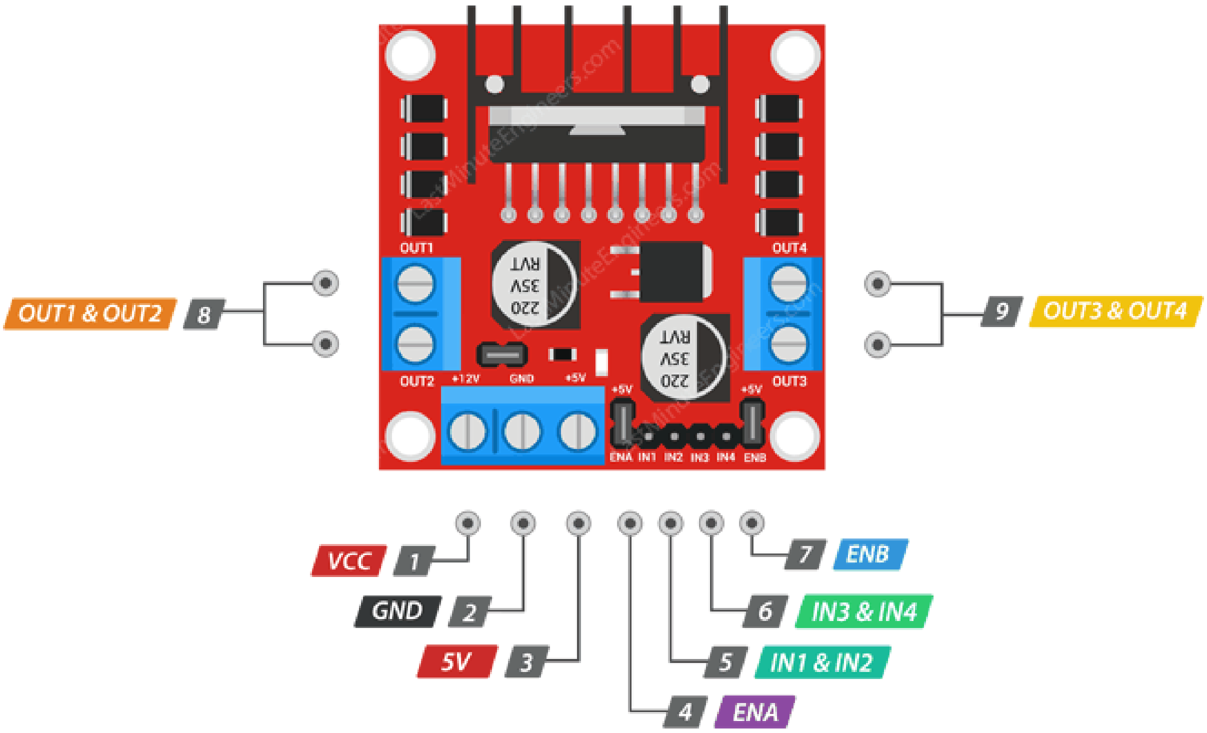

Fig 2.11: Motor Driver pin Connection

VCC pin supplies power for the motor. It can be anywhere between 5 to 35V. Remember, if the 5V-EN jumper is in place, you need to supply 2 extra volts than motor’s actual voltage requirement, in order to get maximum speed out of your motor.

GND is a common ground pin.

5V pin supplies power for the switching logic circuitry inside L298N IC. If the 5V-EN jumper is in place, this pin acts as an output and can be used to power up your Arduino. If the 5V-EN jumper is removed, you need to connect it to the 5V pin on Arduino.

ENA pins are used to control speed of Motor A. Pulling this pin HIGH(Keeping the jumper in place) will make the Motor A spin, pulling it LOW will make the motor stop. Removing the jumper and connecting this pin to PWM input will let us control the speed of Motor A.

IN1 & IN2 pins are used to control spinning direction of Motor A. When one of them is HIGH and other is LOW, the Motor A will spin. If both the inputs are either HIGH or LOW the Motor A will stop.

IN3 & IN4 pins are used to control spinning direction of Motor B. When one of them is HIGH and other is LOW, the Motor B will spin. If both the inputs are either HIGH or LOW the Motor B will stop.

ENB pins are used to control speed of Motor B. Pulling this pin HIGH(Keeping the jumper in place) will make the Motor B spin, pulling it LOW will make the motor stop. Removing the jumper and connecting this pin to PWM input will let us control the speed of Motor B.

OUT1 & OUT2 pins are connected to Motor A.

OUT3 & OUT4 pins are connected to Motor B.

2.6 LCD Display

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements.

Fig: 2.12 LCD Display

LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement. For example, a character positive LCD with a backlight will have black lettering on a background that is the color of the backlight, and a character negative LCD will have a black background with the letters being of the same color as the backlight. Optical filters are added to white on blue LCDs to give them their characteristic appearance**.**

2.7 Fan

Brushless DC motor fans are engineered to outlast popular AC motor models by as much as 70 percent, reducing the need for replacement. brushless DC motor fans are engineered to outlast popular AC motor models by as much as 70 percent, reducing the need for replacement. use up to 74% less power than popular AC motor exhaust fans.

Fig 2.13: Fan

2.8 Light Dependent Resistor

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 1000000 ohms, but when they are illuminated with light resistance drops dramatically. Electronic onto sensors are the devices that alter their electrical characteristics, in the presences of visible or invisible light. The best-known devices of this type are the light dependent resistor (LDR), the photo diode and the photo transistors. Light dependent resistors as the name suggests depend on light for the variation of resistance.

LDR are made by depositing a film of cadmium sulphide or cadmium solenide on a substrate of ceramic containing no or very few free electrons when not illuminated. The longer the strip the more the value of resistance.

When light falls on the strip, the resistance decreases. In the absence of light, the resistance can be in the order of 10K ohm to 15K ohm and is called the dark resistance. Depending on the exposure of light the resistance can fall down to value of 500 ohms. The power ratings are usually smaller and are in the range 50mW to 0.5W. Though very sensitive to light, the switching time is very high and hence cannot be used for high frequency applications. They are used in chopper amplifiers. Light dependent resistors are available as disc 0.5cm to 2.5cm. The resistance rises to several Mega ohms under dark conditions. The below figure shows that when the torch is turned on, the resistance of the LDR falls, allowing current to pass through it is shown in figure.

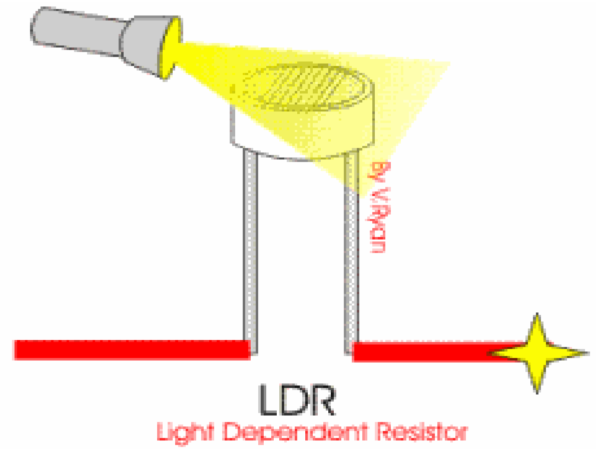

Fig 2.14: LDR

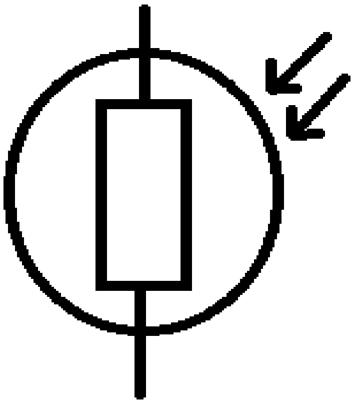

Fig 2.15: Symbol of LDR

The basic construction and symbol for LDR are shown in above figures respectively. The device consists of a pair of metal film contacts separated by a snakelike track of

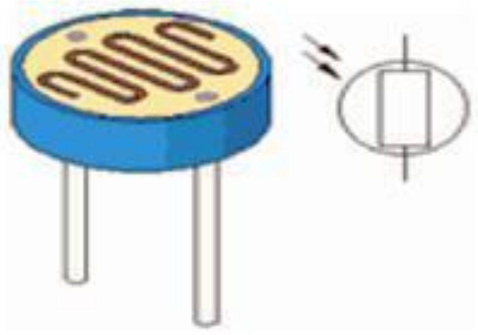

Fig 2.16: Practical LDR

cadmium sulphide film, designed to provide the maximum possible contact area with the two metal films. The structure is housed in a clear plastic or resin case.

2.9 Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

Fig 2.17: Resistors

High-power resistors that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.

2.10 Buck Converter Module

A buck converter (step-down converter) is a DC-to-DC power converter, which steps down voltage from its input to its output. The basic operation of the buck converter has the current in an inductor controlled by two switches. In the idealised converter, all the components are considered to be perfect. Specifically, the switch and the diode have zero voltage drop when on and zero current flow when off, and the inductor has zero series resistance. Further, it is assumed that the input and output voltages do not change over the course of a cycle

Fig 2.19: DC-DC Buck Converter

2.11 Temperature Sensor

Thermistors are variable resistors that change their resistance with temperature. They are classified by the way their resistance responds to temperature changes. In *Negative Temperature Coefficient (NTC)* thermistors, resistance decreases with an increase in temperature. In *Positive Temperature Coefficient (PTC)* thermistors, resistance increases with an increase in temperature.

NTC thermistors are the most common, and that’s the type we’ll be using in this project. NTC thermistors are made from a semiconducting material (such as a metal oxide or ceramic) that’s been heated and compressed to form a temperature sensitive conducting material.

The conducting material contains *charge carriers* that allow current to flow through it. High temperatures cause the semiconducting material to release more charge carriers. In NTC thermistors made from ferric oxide, electrons are the charge carriers. In nickel oxide NTC thermistors, the charge carriers are electron holes.

Fig 2.20: NTC Temperature sensor

To measure the temperature, we need to measure the resistance. However, a microcontroller does not have a resistance-meter built in. Instead, it only has a voltage reader known as a analog-digital-converter. So what we have to do is convert the resistance into a voltage, and we'll do that by adding another resistor and connecting them in series. Now you just measure the voltage in the middle, as the resistance changes, the voltage changes too, according to the simple voltage-divider equation. We just need to keep one resistor fixed

Say the fixed resistor is **10K** and the variable resistor is called **R** - the voltage output (**Vo**) is:

Vo = R / (R + 10K) * Vcc

Where **Vcc** is the power supply voltage (3.3V or 5V)

Now we want to connect it up to a microcontroller. Remember that when you measure a voltage (**Vi**) into an Arduino ADC, you'll get a number.

ADC value = Vi * 1023 / Varef

So now we combine the two (**Vo** = **Vi**) and get:

ADC value = **R / (R + 10K) * Vcc * 1023 / Varef**

What is nice is that if you notice, if Vcc (logic voltage) is the same as the ARef, analog reference voltage, the values cancel out!

ADC value = **R / (R + 10K) * 1023**

It doesn't matter what voltage you're running under. Handy!

Finally, what we really want to do is get that **R** (the unknown resistance). So we do a little math to move the **R** to one side:

R = 10K / (1023/ADC - 1)

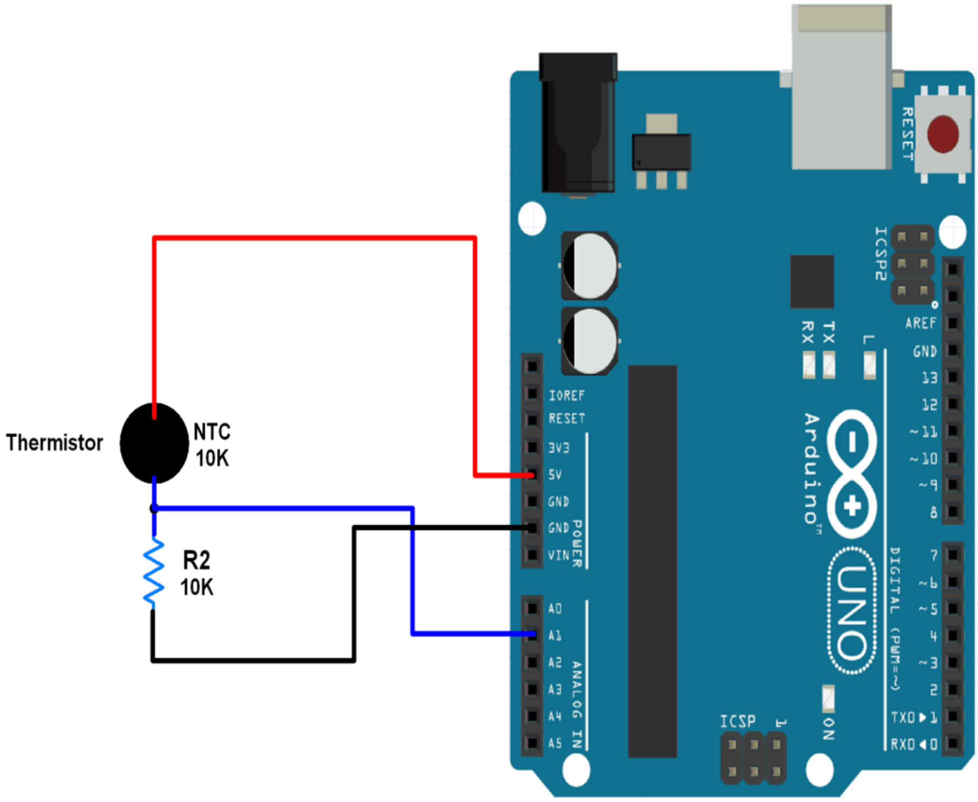

Fig 2.21: NTC and arduino connection

2.12 Vero board

Vero board is a brand of strip board, a pre-shaped circuit board material of copper strips on a protecting board. Which is the conventional name for a broadly utilized sort of hardware prototyping board described by a 0.1 inch regular network of gaps, with wide parallel strips in copper cladding running one way the distance crosswise over one side of the board? It is ordinarily additionally known by the name of the first item Vero board, which is a trademark, of British organization Vero Technologies Ltd and Canadian organization Pixel Print Ltd. In utilizing the board, breaks are made in the tracks, for the most part around gaps, to isolate the strips into different electrical hubs. With consideration, it is conceivable to break between gaps to take into consideration segments that have two stick pushes just a single position separated, for example, twin column headers for IDCs.

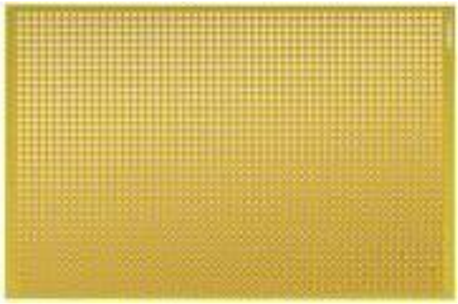

Fig 2.23: Vero Board

2.13 Soldering Wires

Weld is fundamentally a metal wire with a "low" softening point, where low for our motivations implies low enough to be dissolved with a binding iron. For gadgets, it is customarily a blend of tin and lead. At the point when the fastening wire chilled an electrical association will lead. This is getting a decent mechanical association between the wires. The fibers of each wire ought to be turned together, carry on more like a solitary element. The initial step is to set up the wires at that point tinning the wears, by join the wires and weld graft together.

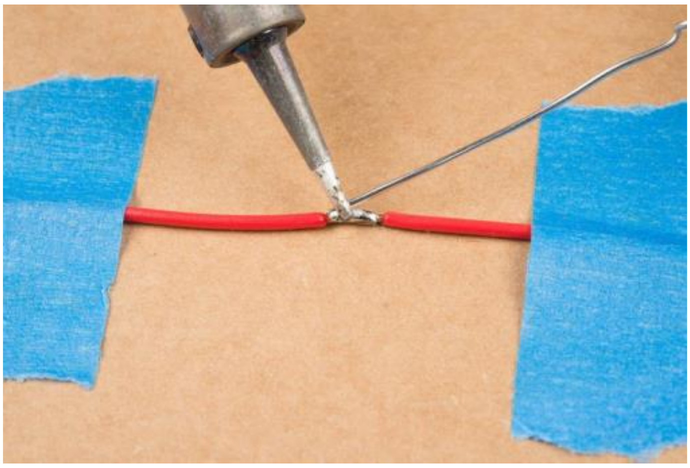

Fig 2.24: Soldering Wires

2.14 Jumper Wire

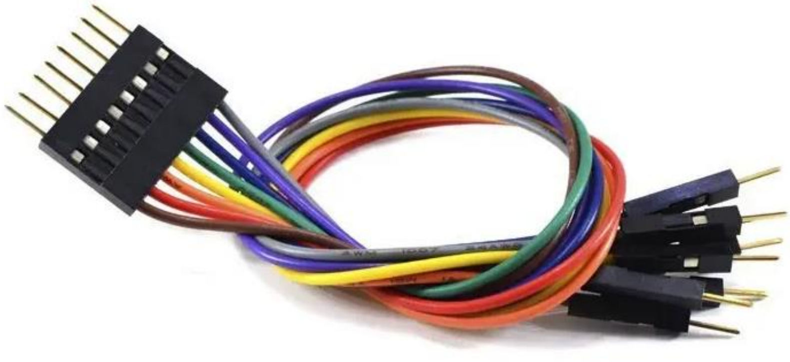

Fig 2.25: Jumper Wire

A jump wire (also known as jumper wire, or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a bread board or other prototype or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

2.15 Others devices

Fig 2.26: Two pin AC power plug

Two-pole, round-pin domestic AC power plug, rated for voltages up to 250 V and currents up to 2.5 A. It is use for supplied the power to system through plug in Socket

Fig 2.27: Blub Holder

Bulb holder is a device that holds a bulb. The bulb holder is where the bulb fits. In this project we use three blub holder.

2.16 Arduino software

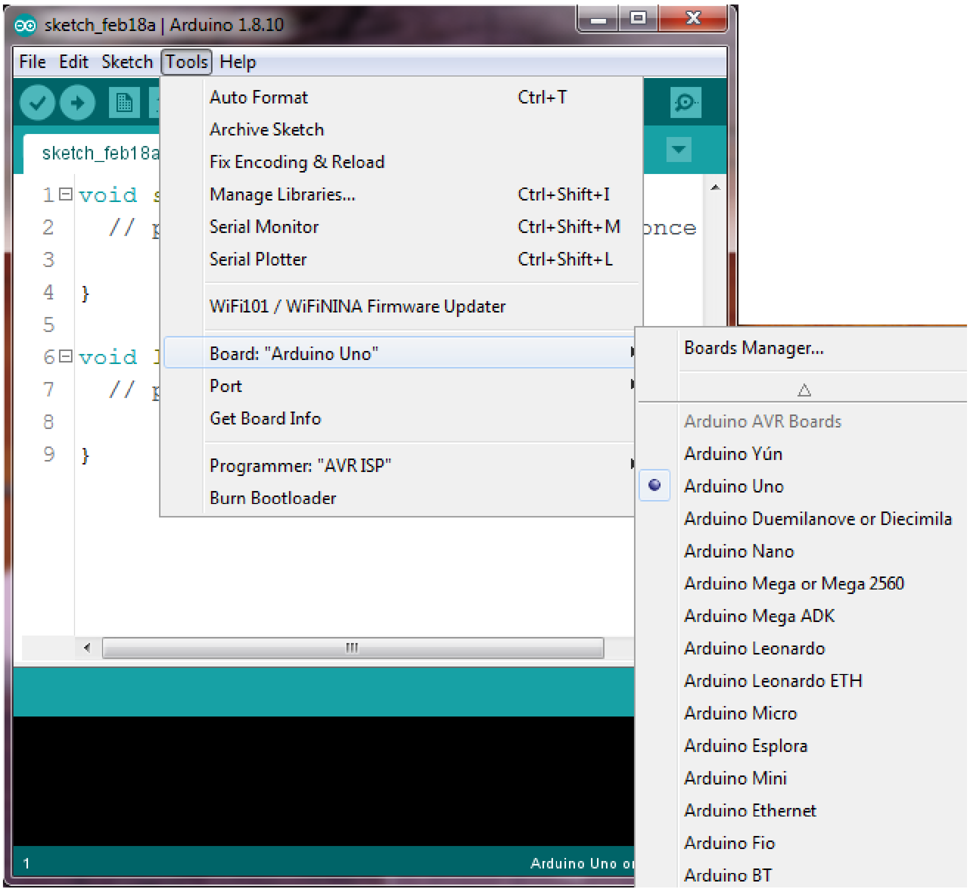

Fig 2.28: IDE configuration for ARDUINO UNO Programmer

The smart microcontroller unit named as Arduino Uno can be programmed with the Arduino software. There is no any requirement for installing other software rather than Arduino. Firstly, Select "Arduino Uno from the Tools , Board menu (according to the microcontroller on your board).The IC used named as ATmega328 on the Arduino Uno comes pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer.

Programming software of this line follower is known as ARDUINO-1.6.8. This is open source programming platform**.** The open-source ARDUINO environment makes it easy to write code and upload it to the input/output board. Here we use ARDUINO-1.6.8 platform.

To configure software, we have to use ARDUINO -1.6.8 named arduino.exe

To configure this programmer with computer we need a USB cable then check serial port and select the programmer from Aruino-1.6.8 platform such as,

Serial communication

It is used for the communication between Arduino and a computer or other devices. Every Arduino board has at least one serial port. This ports communicates thanks to the digital pins 0 (RX) and 1 (TX), and with the computer thanks to the USB connection.

Serial.begin(speed)

It establishes the speed of data in bits per second (bauds) for the transmission of data in serial communication.

Serial.read()

It reads the data from the serial port.

Serial.print(val,[format])

It prints the data to the serial port as ASCII text

Serial.println(val,[format])

It prints the data to the serial port as ASCII text but it jumps to a new line.

Serial.available()

It gives back the number of available bytes to be read by the serial port. It refers to data that has already been received and is available in the buffer of the port.

CHAPTER-3

Design &Working Methodology

3.1 Introduction

In this Chapter, we are going to Explain about the system Design construction through Hardware and development of software. In addition, the chapter elaborates the hardware and the software stage by stage. All the operations of hardware and software are also included in this chapter. The system design of the total project is shown in below Fig3.1 with block diagram.

3.2 System Overview

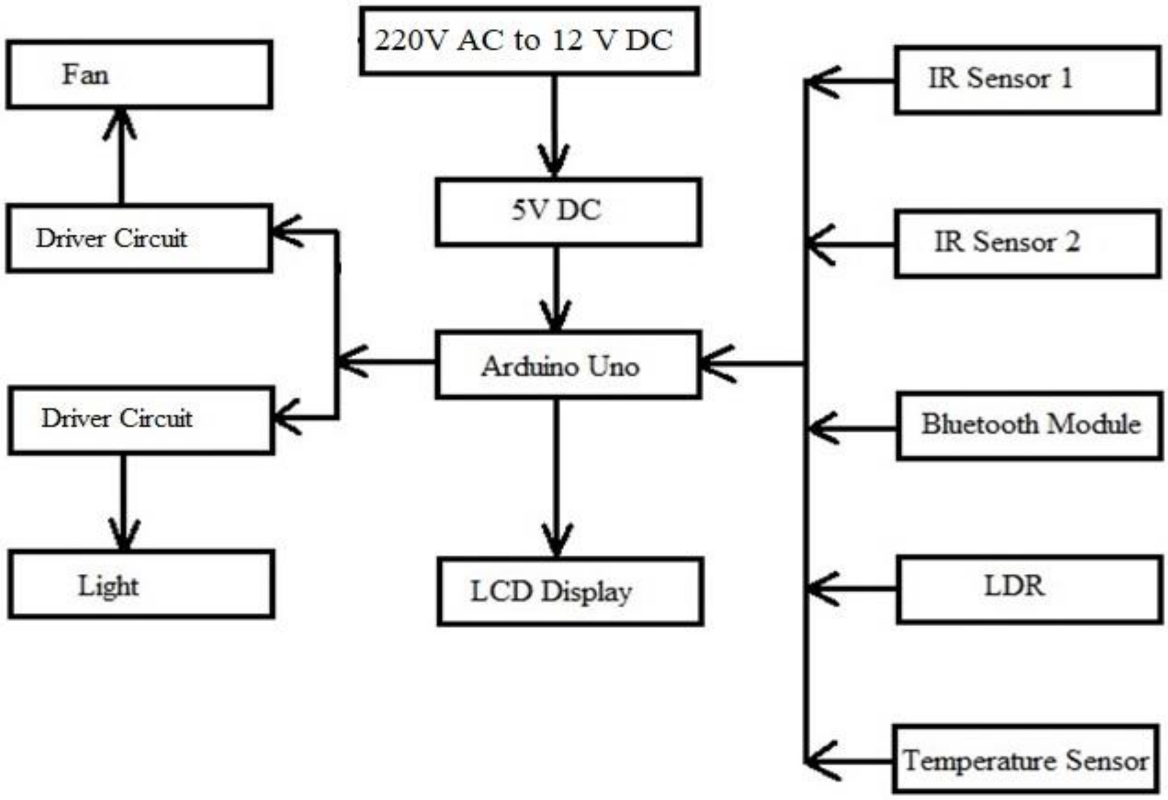

Fig: 3.1 Block diagram of the project

Fig 3.1 describes that the system consists three main parts such as controller, input and controlling. The ATmega328p microcontroller acts as a heart of the System. This ATmega controls the entire operating system. In and out counting will done by the controller and the result will shown in LCD.

3.3 Circuit Diagram

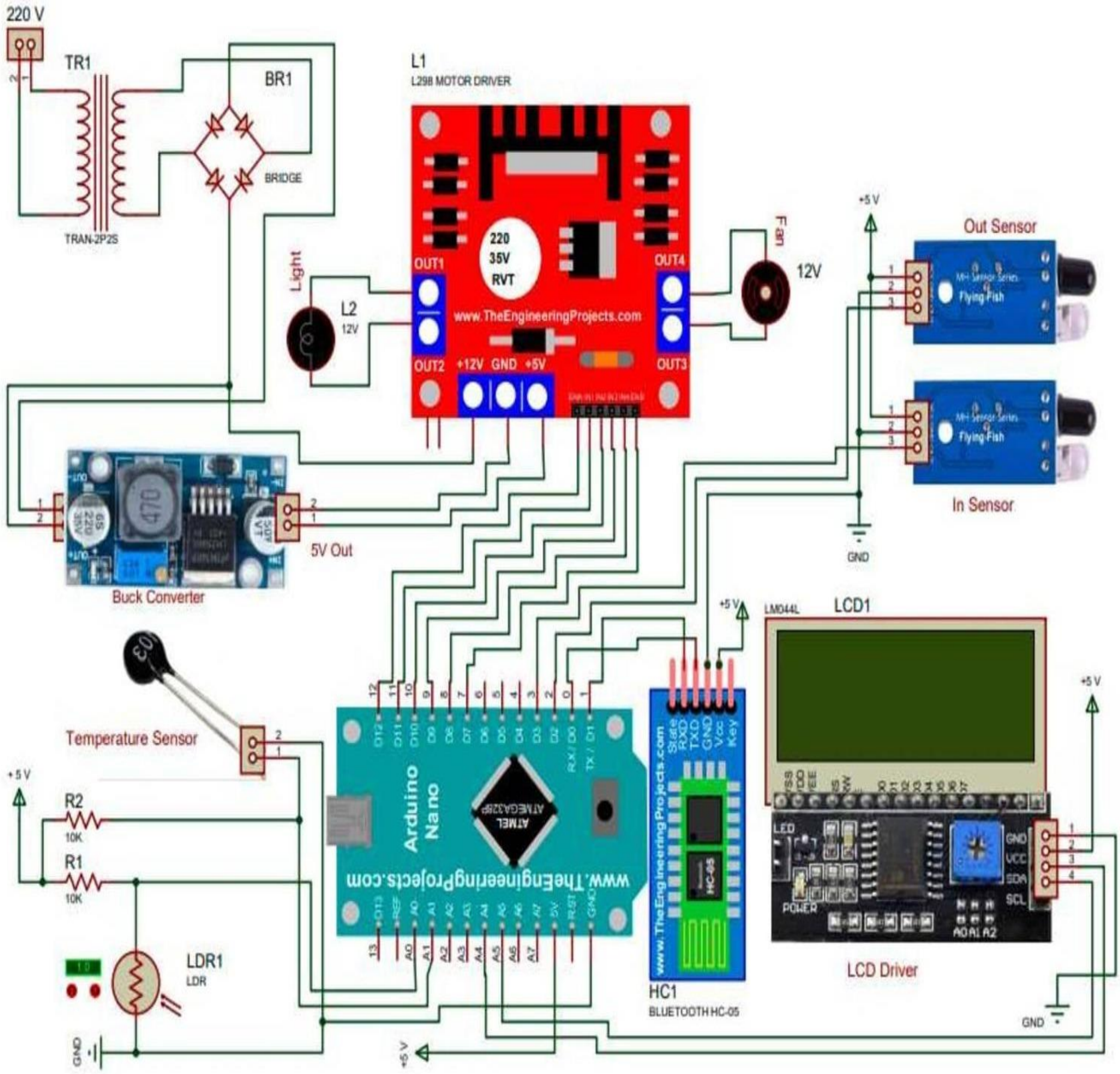

Fig 3.2: Circuit Diagram

3.4 Project Implementation

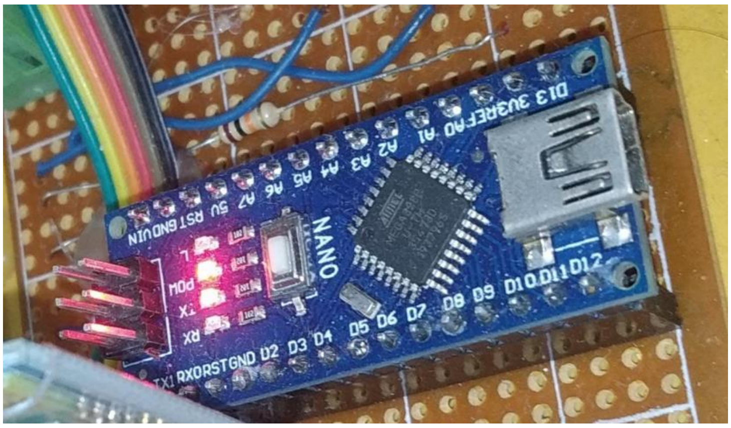

Fig 3.3: Microcontroller of the project

Fig 3.4: LCD Display

Fig 3.5: Buck Converter

Fig 3.6: Transformer

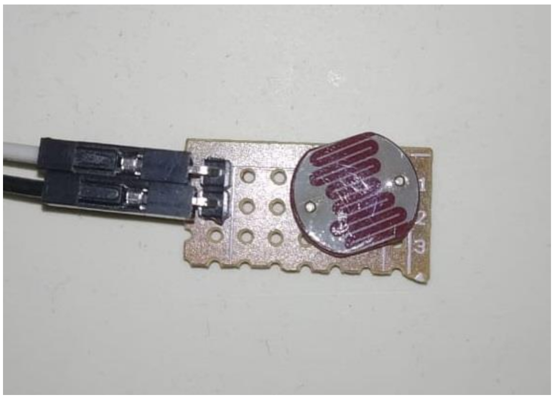

Fig 3.7: LDR

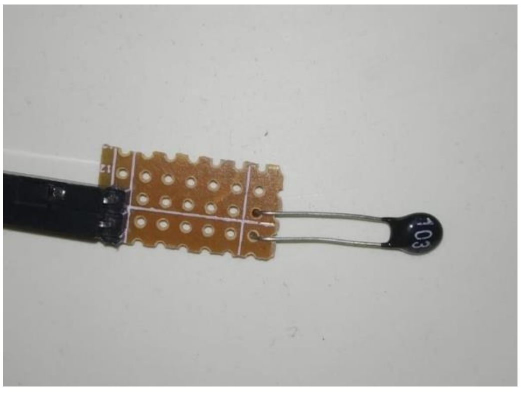

Fig 3.8: Temperature Sensor

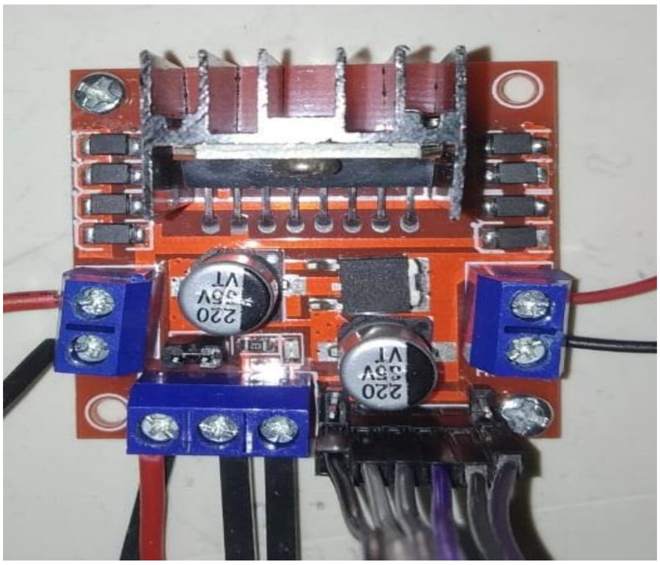

Fig 3.9: Motor Driver

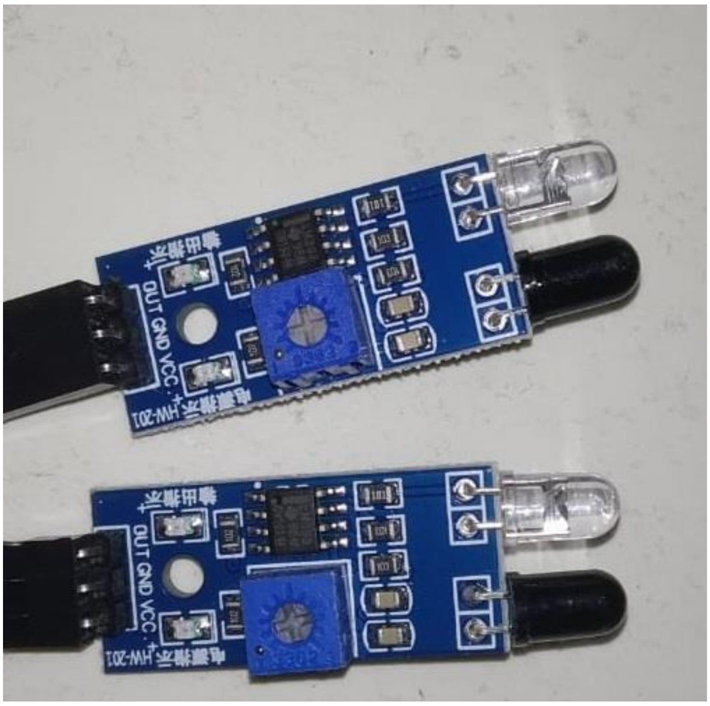

Fig 3.10: Obstacle Sensor

CHAPTER 4

Results and Cost Analysis

4.1 Introduction

Today power/current is a most valuable thing in the world. So we have to save the power to give for our next generation. Automatic controlling systems are preferred over manual controlling. The design of power controlling and saving project can handle controlling of electrical and electronic devices, appliances etc. Through this project we are tried to show a smart way to control the power consumption and power saving in Homes, Shopping malls and Theatres etc.

4.2 Result

We are properly connected all components of this project and finally we gate automatic home light intensity control, and fan control depend on temperature we can easily seen our LCD Display home in and out going.

Fig: 4.1: Project Picture

Now in all cities/areas we have shopping malls, theatres and homes. In this monitoring and controlling the appliances becomes very typical to human being. If less number of persons enters in the home then no need to switch on all the devices in that. If they on it is waste of power. If maximum persons are in that we need to ON all the devices without fail. This is too hard to maintain properly and manually. If suddenly any problem arise, it is very difficult to find out. To overcome these types of problems we are developed a system that can maintain all these ricks. This paper covers the features of capacity of monitor, hardware description, the use of different types of sensors.

4.3 Costing

Costing is always a vital issue to make any project. Price of electronics is not stable for a developing country like Bangladesh, because Bangladesh never produces electronics parts but import from other developed country and during import price depends upon the stock of foreign currency. Average price of parts used in this project is given bellow,

Table 4.1: Price list of hardware used at Automation System

Name	**Quantity**	**Unit Price**	**Total Price**
Microcontroller Arduino UNO	1	450	450
LCD Display	1	350	350
Power Supply	1	200	200
Buck Module	1	120	120
Ir sensor	2	80	160
Temperature sensor	1	20	20
Motor Driver	1	200	200
Vero Board	2	25	50
Electric Cable	1	30	30

Plug	1	25	25
Jumper wire	1 set	50	50
Light	1	100	100
Fan	1	120	120
Screw and Glue	1 set	50	50
PVC Board	1	150	150
		TOTAL COST	**2,075/- Taka**

CHAPTER 5

Discussion and Conclusion

5.1 Discussion

The number of person count and to microcontroller based. Model to count the number of person interring to the home and it lights up the home based on the light intensity and automatic light control of the home and turn on fan automatically where the persons are sitting inside the home. It is made to prevent unwanted electric power waste in schools, colleges, houses and other working places. This whole process is operated automatically.

5.2 Advantage

- Energy Saving
- Less consumption of power
- Easy to operate
- Provide safety from electric shock
- Automatic Load ON/OFF
- Low maintenance cost

5.3 Application

- Home
- Common restroom, for lights & exhaust fans
- Common staircases
- In parking area
- For garden lights

5.4 Limitation

The working procedure of this project is very easy but we are facing some limitation for doing this project. Such as coding problem, program writing, connecting to PCB board, commend following etc

5.5 Conclusion

In this experimental setup, we are able to turn automatically the appliances ON and OFF as required. By implementing this setup, we can expect more power. This concept not only ensures that our work will be useful in the future but it will also provide flexibility to adapt and extend as needs change. This device is compatible with our existing system used for providing comfort. In this paper we have developed a real time model that can control and monitor the complete status of all appliances of any place like home, shopping mall, theatre, school, college, bus stand etc automatically without having human interference. So that there is a chance to reduce the power wastage and human efforts. An automated home can be a very simple grouping of controls, or it can be heavily automated where any appliance that is plugged in to electrical power supply is remotely controlled. It monitors the entrance and exit s of the home so that we need not to check manually. This system has a lot of advantages such as simple structure, small size, low power consumption, low cost and stable

In this project, we develop a general purpose of electronic circuit design that can Show the automatic light intensity control and fan control temperature based LCD display shown the temperature and visitor counter it can be also used fire detector and alarm circuit This project is the overview of smart home system The project is successfully developed and met the
stated objectives.

5.6 Future Recommendation

It is possible to develop this project a lot of way such as IOT can be implement to observe the load and visitor form anywhere in the world. Accuracy can be increase by adding more sensor. Computer control system or data storage also can be add to save visitor count. Camera or gsm also can be add for safety purpose.

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[12] Andriod software is collected from https://play.google.com /store/apps/ details?id= dev.merahkemarun.arduinobluetoothrelay4ch

Appendix

The Arduino program is given below

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
int buttonPin1 = 2;
int buttonPin2 = 3;
int light=9;
int lightL=7;
int lightR=8;
int fan=10;
int fanL=11;
int fanR=12;
float RT, VR, ln, TX, T0, VRT;
int insensor=0;
int outsensor =0;
int person=0;
int totalin=0;
int totalout=0;
int lightsensor;
int instate=0;
int outstate=0;
int brightness;
int fanspeed;
int lowtemp=28;
int hightemp=33;
int isf=0;
int osf=0;
int rx=0;
int rxf=0;
```

```
LiquidCrystal_I2C lcd(0x27,20,4);  // set the LCD address to 0x27 for a 16 chars and
2 line display

void setup()
{
 Serial.begin(9600);
 lcd.init();                      // initialize the lcd
 lcd.init();
 T0 = 25 + 273.15;                  //Temperature T0 from datasheet, conversion from
Celsius to kelvin
 pinMode(light, OUTPUT);
 pinMode(lightL, OUTPUT);
 pinMode(lightR, OUTPUT);

 pinMode(fan, OUTPUT);
 pinMode(fanL, OUTPUT);
 pinMode(fanR, OUTPUT);
 digitalWrite(fan, LOW);
 digitalWrite(fanL, LOW);
 digitalWrite(fanR, LOW);
 digitalWrite(light, LOW);
 digitalWrite(lightL, LOW);
 digitalWrite(lightR, LOW);
 lcd.backlight();
 lcd.setCursor(0,0);
 lcd.print("Inside House: 0");
 lcd.setCursor(0,1);
 lcd.print("Total In  : 0");
 lcd.setCursor(0,2);
 lcd.print("Total Out : 0");
 lcd.setCursor(0,3);
 lcd.print("Light: OFF");
 lcd.setCursor(12,3);
 lcd.print("Fan: OFF");
```

```
  }


void loop()
{
 if(Serial.available() > 0)
  rx = Serial.read();
 digitalWrite(lightL, LOW);
 digitalWrite(lightR, HIGH);
 digitalWrite(fanL, LOW);
 digitalWrite(fanR, HIGH);

 insensor = digitalRead(buttonPin1);
  outsensor = digitalRead(buttonPin2);
  Serial.print(insensor);
  Serial.println(outsensor);

if (insensor==0 && instate==0)
  {
 delay(50);
 instate=1;
  }

if (insensor==1 && instate==1)
  {
 totalin=totalin+1;
 person=totalin-totalout;
 lcd.setCursor(0,0);
 lcd.print("Inside House: ");
 lcd.setCursor(14,0);
 lcd.print(person);
 lcd.print("   ");
 lcd.setCursor(0,1);
 lcd.print("Total In  : ");
```

```
lcd.setCursor(12,1);
lcd.print(totalin);
lcd.print("   ");
delay(5000);
instate=0;
 }

if (outsensor==0 && outstate==0)
 {
delay(50);
outstate=1;

 }
if (outsensor==1 && outstate==1)
 {
totalout=totalout+1;
person=totalin-totalout;
lcd.setCursor(0,0);
lcd.print("Inside House: ");
lcd.setCursor(14,0);
lcd.print(person);
lcd.print("   ");

lcd.setCursor(0,2);
lcd.print("Total Out : ");
lcd.setCursor(12,2);
lcd.print(totalout);
lcd.print("   ");
delay(5000);
instate=0;
outstate=0;
 }

if (person>=1 && rxf==0)
```

```
{
 lcd.setCursor(7,3);
 lcd.print("ON ");

 lightsensor= analogRead(A0);
 Serial.println(lightsensor);
 brightness= map(lightsensor, 0, 1023, 0, 255);
 analogWrite(light, brightness);
  VRT = analogRead(A1);              //Acquisition analog value of VRT
  VRT = (5.00 / 1023.00) * VRT;      //Conversion to voltage
  VR = VCC - VRT;
  RT = VRT / (VR / R);               //Resistance of RT
  ln = log(RT / RT0);
  TX = (1 / ((ln / B) + (1 / T0))); //Temperature from thermistor
  TX = TX - 273.15;                 //Conversion to Celsius
  Serial.print("Temperature:");
  Serial.print("\t");
  Serial.print(TX);



  if (TX>lowtemp)
  {
  fanspeed=map(TX,lowtemp ,hightemp,0,255);
  analogWrite(fan, fanspeed);
 lcd.setCursor(17,3);
 lcd.print("ON ");  }


  if (TX<lowtemp)
  {
 digitalWrite(fan, LOW);
 lcd.setCursor(17,3);
 lcd.print("OFF");  }
```

```
 }


if (rx== '1' )
{
rxf=0;}

if (rx== '2' && rxf==0)
{
digitalWrite(light, LOW);
 digitalWrite(fan, LOW);
 lcd.setCursor(0,3);
 lcd.print("Light: OFF");
 lcd.setCursor(12,3);
 lcd.print("Fan: OFF");
 rxf=1;}

if (rx== '3' )
{
digitalWrite(light, HIGH);
 lcd.setCursor(0,3);
 lcd.print("Light: ON ");
 rxf=1;}

if (rx== '4' )
{
digitalWrite(light, LOW);
 lcd.setCursor(0,3);
 lcd.print("Light: OFF");
 rxf=1;}



if (rx== '5' )
```

```
{
 digitalWrite(fan, HIGH);
 lcd.setCursor(12,3);
 lcd.print("Fan: ON ");
 rxf=1;}

if (rx== '6' )
{
 digitalWrite(fan, LOW);
 lcd.setCursor(12,3);
 lcd.print("Fan: OFF");
 rxf=1;}

if (person<1)
{digitalWrite(light, LOW);
 digitalWrite(fan, LOW);
 lcd.setCursor(0,3);
 lcd.print("Light: OFF");
 lcd.setCursor(12,3);
 lcd.print("Fan: OFF");
}

}
```