B. TECH. PROJECT REPORT

On

Smart Load Sensing Seat with Automated Light and Fan Control

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Smart Load Sensing Seat with Automated Light and Fan Control

A PROJECT REPORT
Submitted in partial fulfillment of the
requirements for the award of the degree of
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CANDIDATE’S DECLARATION

We hereby declare that the project entitled "Smart Sensing Seat with Automated Light and Fan Control" submitted in partial fulfillment for the award of the degree of Bachelor of Technology under the supervision of Dr. Sudipta Chakraborty, Assistant Professor in the Department of Electronics & Instrumentation Engineering, NIT Silchar is an authentic work.

Further, we declare that we have not submitted this work for the award of any other degree elsewhere.

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CERTIFICATE by BTP Guide

It is certified that the above statement made by the students is correct to the best of my knowledge.

Signature of BTP Guide with dates and their designation

Dr. Sudipta Chakraborty,
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Abstract

In current days everything is seeking towards automation which reduce the human innovation because human commit lot of mistake and errors due to imperfect senses. For example, if one take wastage of electricity in their daily life, there are many reasons for electricity wastage and no doubt manual switching is one of them. According to US department of energy research 2011, 35% of light is wasted by unshielded and/or poorly aimed outdoor lighting and indoor cooling system. There are many past works already done over this issue. To resolve this issue our team is just trying to automate the light wastage by automate the light intensity based on outdoor light intensity and automatic fan switching with speed regulation according to requirement. US department of energy research claims that if for one day if one use automation for domestic use which is able to save that much electricity which is enough to watch plasma television more than one hour. With this motive our team is trying to make a prototype for that according to outcome and target achievement we will proceed it further with more features.

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CHAPTER 1: INTRODUCTION

Light Pollution happened slowly at first which was several decades ago which was a process that was hardly noticeable. A light here, a light there, burning way into the dark nighttime realm, helping us see in the darkness when people are fast asleep. The process still continues today, with little thought ever given to what we are stealing away. Our intentions are good but our methods need adjustment, and they needs to be done immediately. In fact, our methods should have been changed years ago, but nearly everyone has resisted, perhaps due to a profound lack of awareness. The use of too many lights at night can cause environmental pollution, known as light pollution. But, since the lights are also very important for us at night when we are driving or walking alone on a street, I think there are certainly some solutions for protecting our natural environment while we can also use the lights at the same time. Light pollution is when sky glow produced by the scattering of artificial light caused by the poor quality of outdoor lighting (Nakata) causing too much wasted light dispersed upwards. Therefore recent studies show that "Nationally, more than 30% of the electricity generated for outdoor illumination is simply squandered by being misdirected into the sky. That comes to 4.5 billion dollars annually" (Lipsitz) for the electricity generated to send light into the sky and across property lines where it serves no benefit.

Another problem faced due to light pollution is excess power consumption. A lot of power used to light up these unwanted light which are in turn wasted. This wastage of energy not only cause huge economic loss but also have dreadful environmental consequences. In an average year in the U.S. alone, outdoor lighting uses about 120 terawatt-hours of energy. That's enough energy to meet New York City's total electricity needs for two years.

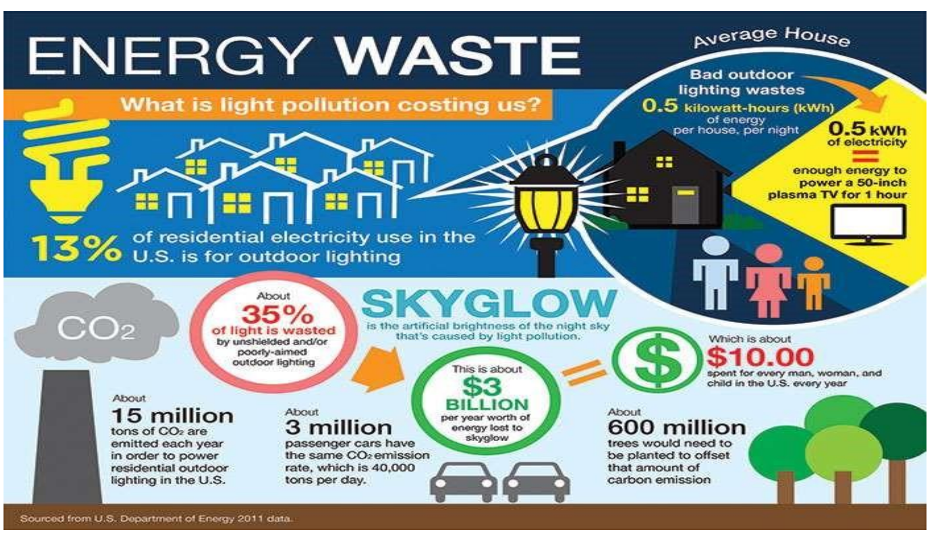

Fig1.1: A pictorial view of the energy wastage causes per year.

An immediate attention is needed to be given to this major concern in this modern world. It is rightly said that "Modern problems require modern solution". Here it is!! HOME AUTOMATION. It is a term that is used to describe the working together of all household amenities and application which in turn helps to control the power consumption. It also decrease the human efforts along with the above mentioned advantage. During the time when Greeks ruled, the idea of automation tasks were into existence. Later during the Industrial Revolution, automation was developed. The steam powered machines launched by James Watt and improved by Richard Trevithick, Thomas Salvery and Thomas Newcomen are a few examples of taking over the work from human.

A lot of research work is done in the field of power saving. Our work basically deals with the automation and control over home appliances like fan and light which is modulated by a pressure sensor and an ambient sensor and aids in decreasing the power consumption

CHAPTER 2: CONCEPT DESIGN

2.1 Proposed System

The proposed system mainly consists of the following elements:

- Microcontroller (Arduino Uno) BH1750 Light Sensing Module
- Force Sensing Resistance
- Two channel 5V 10A Relay Module
- 10MΩ Resistor
- 12V LED

2.2 Operational Framework

- When pressure is applied on the sensor and resistance changes the voltage across the 10MΩ. The rating of the output voltage lies between 0-5V. When the voltage rating goes above 4.5V the complete system turns on. The 2 channel relay module turns the fan on, which in turn shows that the fan only turns on when any person is using the seat and remain off when not in use.
- When the system is turned on, then the Light sensing module comes into action. When the intensity of the light falling on the sensor changes, the luminance of the output changes proportionally. This is manipulated according to the output using the microcontroller. A relation is established between the output voltage and lux. The output so obtained is fed into the 12V LED where the change in intensity can be observed visibly.

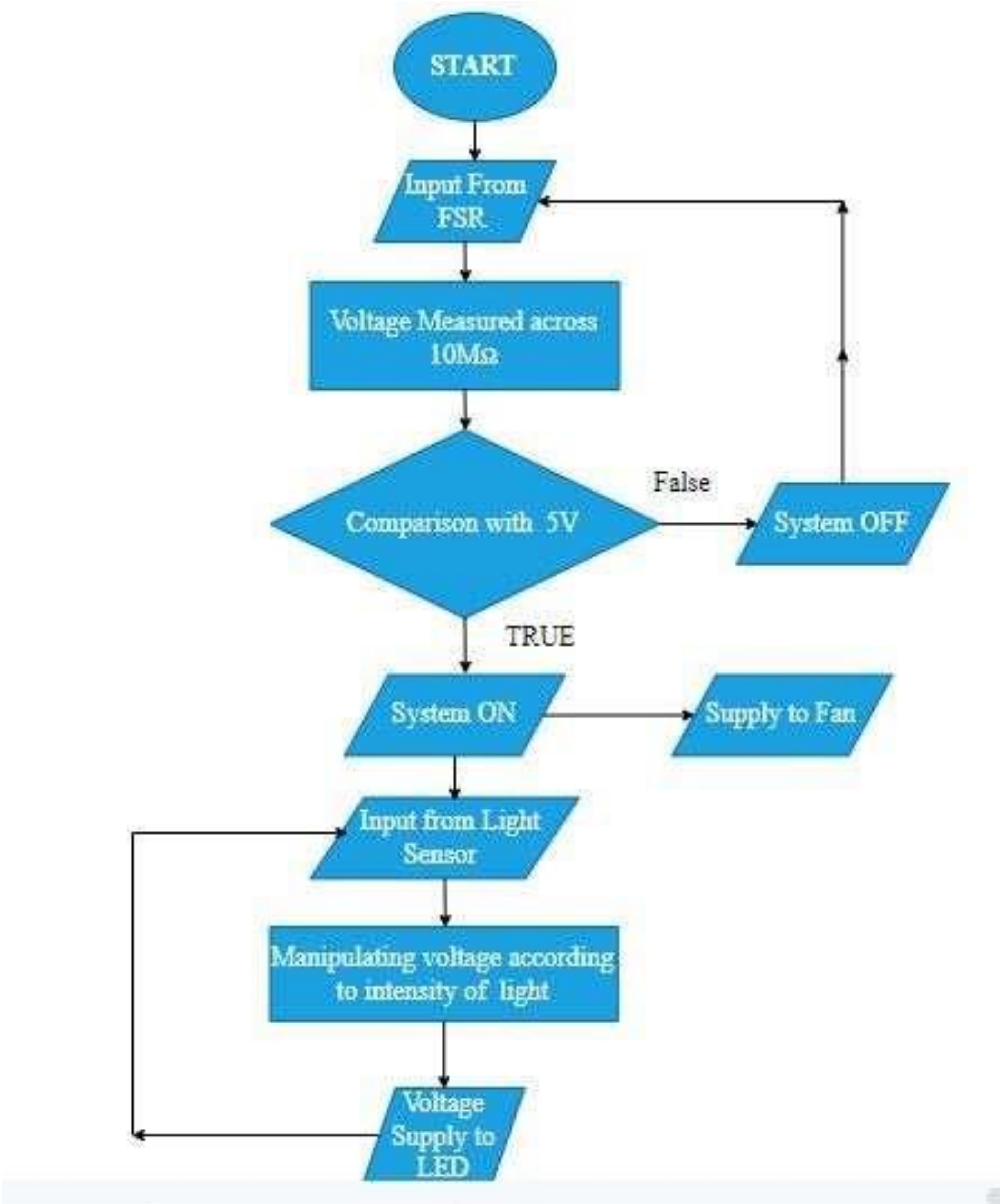

Fig 2.1: The flowchart followed in the project

CHAPTER 3: EXPERIMENT AND ANALYSIS

3.1 Hardware Description

3.1.1 Arduino

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino based started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IOT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too is open-source, and it is growing through the contributions of users worldwide.

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 tum it into an output – activating a motor, turning on an LED, publishing something online. We can tell our board what to do by sending a set of instructions to the microcontroller on the board. To do so we use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers – students, hobbyists, artists, programmers & professional – has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy to use for beginners, yet flexible enough for advanced users . It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principle, or to get started with programming and robotics .Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers,of course , use it to build many of the exhibited at Maker Faire, for example , Arduino is a key tool to learn new things . Anyone –children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of Arduino community. There are many others microcontrollers and its platforms available for physical computing. Parallax Basic Stamp, Netmedia’s BX-24, Phidgets, MIT’s Handyboard, and many others offer similar functionality. All of these tools take messy details of microcontroller programming and wrap it up in an easy to use package. Arduino also simplifies the process of working with microcontrollers, but offers some advantage for teachers, students, and interested amateurs over other systems.

- Inexpensive:- Arduino boards are relatively inexpensive compared to other microcontroller platforms . The least expensive version of the Arduino module can be assembled by hand, even the pre-assembled Arduino modules cost less than 50$.

- Cross-platform:- The Arduino Software (IDE) runs on Windows , Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

- Simple, clear programming environment:- The Arduino Software (IDE) is easy to use for beginners , yet flexible enough for advanced users to take advantages of as well, For teachers, it's conveniently based on Processing programming environment so students learning to program in that environment will be familiar with how the Arduino IDE works.

- Open source and extensible software:- The Arduino software is published as open source tools , available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into Arduino programs if you want to.

- Open source and extensible hardware:- The plans of Arduino boards are published under a Creative Common license, so experienced circuit designers can make their own version of the module , extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

Specifications

ATmega328 is commonly used in many projects and autonomous systems where a simple, low- powered, low cost microcontroller is needed. Perhaps the most common implementation on of this chip is on the popular Arduino development platform, namely the Arduino Uno The Amel 8-bit AVR RISC – based microcontroller combines 32kB ISP Flash memory with read while write capabilities , 1kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose , 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 port , 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator , and five software selected power saving modes . The device operates between 1.8 and 5.5 V. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC to DC adapter or battery to get started. UNO means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0 .The UNO board and version 1.0 of Arduino Software were the reference versions of Arduino , now evolved to newer releases.

Arduino Uno Technical Specification

Table 3.1: Arduino Uno Technical Specification

Microcontroller	ATmega328P- 8bit AVR family microcontroller
Operating Voltage	5V
Recommended Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6(A0 – A5)
Digital I/O Pins	14(Out of which 6 provide PWM output)
DC Current on I/O pins	40mA
DC Current on 3.3V Pin	50mA
Flash Memory	32KB(0.5 KB is used for Bootloader)
SRAM	2KB
EEPROM	1KB
Frequency(Clock Speed)	16MHz

Pin Description

Table 3.2: Pin Description of Arduino UNO

Pin Category	Pin Name	Details
Power	Vin, 3.3V, 5V, GND	Vin: Input Voltage when using an external power source 5V: Regulated power supply used to power microcontroller and other
Reset	Reset	Resets the microcontroller
Analog Pin	A0-A5	Used to provide analog input in the range of 0-5V
Input/ Output Pins	Digital Pins 0-13	Can be used as input or output pins
Serial	0(R_x), 1(T_x)	Used to receive and transmit TTL Serial data
External Interrupts	2,3	To trigger an input
PWM	3,5,6,9,11	Provides 8-bit PWM outputs
SPI	10(SS), 11(MOSI), 12(MISO) and 13(SCK)	Used for SPI communication
Inbuilt LED	13	To turn on the inbuilt LED
TWI	A4(SDA), A5(SCA)	Used for TWI Communication
AREF	AREF	To provide reference voltage for input voltage

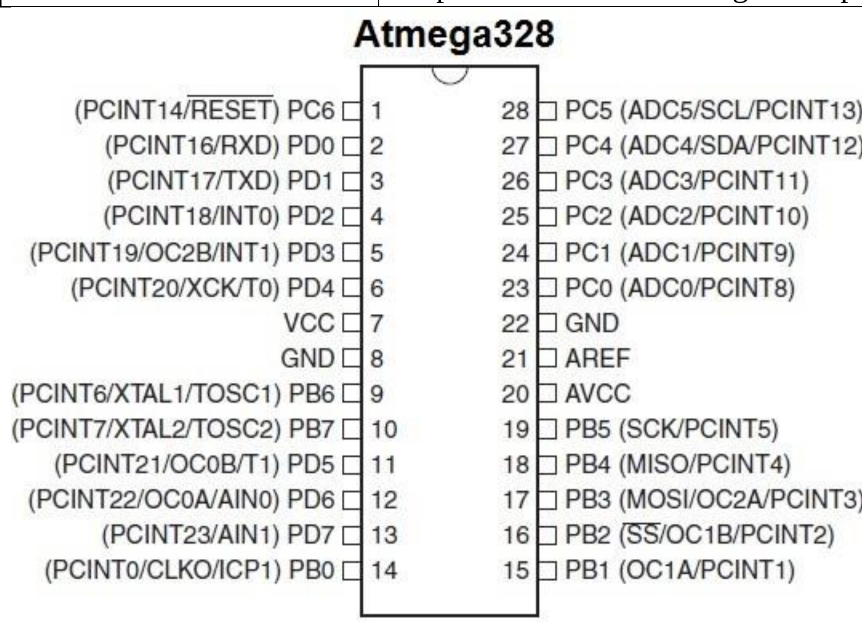

Fig 3.1: The Pin Diagram of Atmega 328

Communication

Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provide UART TTL (5V) serial communication which can be done using digital pin 0 (Receiver) and digital pin 1(Transmitter). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software of the computer. The ATmega16U2 firmware uses the standard.

USB COM drivers, and no external driver is needed. However, on Windows, a.inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and fro from the Arduino board. There are two Receiver and Transmitter LEDs on the arduino board which will flash when data is being transmitted via the USB to serial chip and USB connection to the computer (not for serial communication on any of the UNO's digital pins. The ATmega328P also support 12c (TWI) and SPI communication. The Arduino software includes a wire library to simply use of the 12C bus.

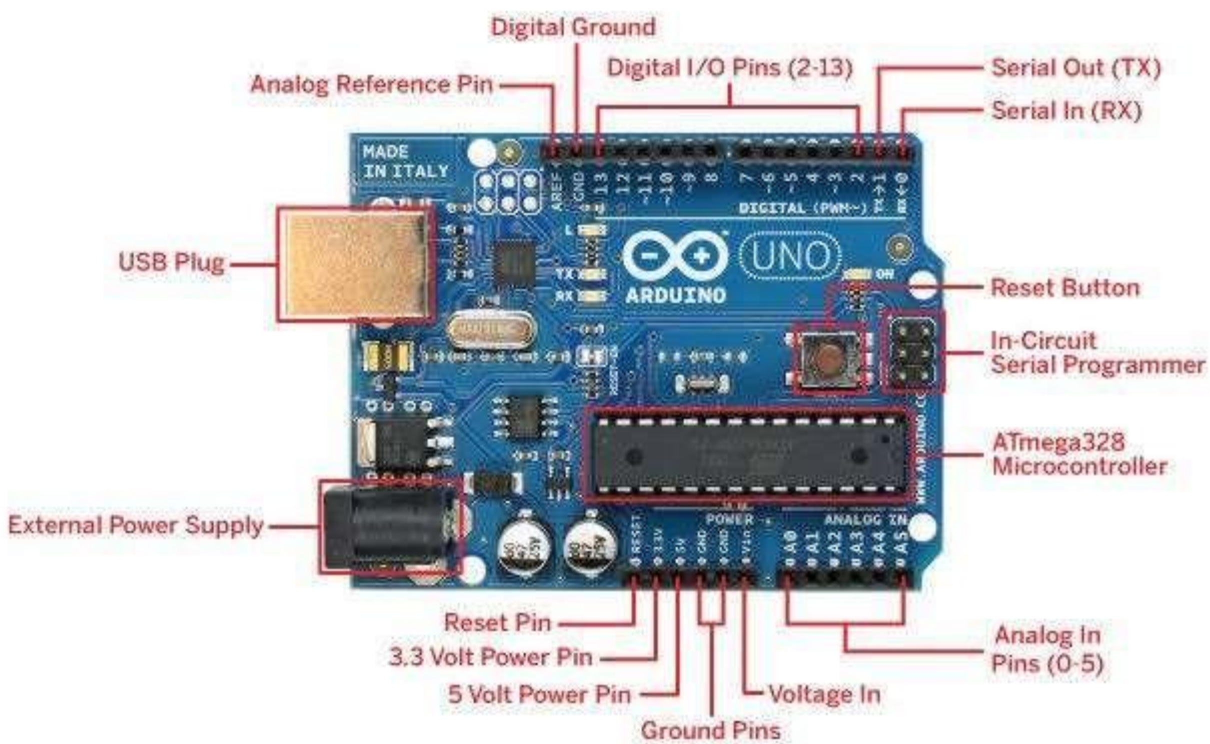

Fig 3.2: An original Arduino with labelling

3.1.2 BH1750 – Light Intensity Sensor Module

BH1750 is a Digital Ambient light sensor. Interfacing this with a microcontroller is an easy task, as it uses the 12C communication protocol. Consumption of current is very less in this case. This sensor uses a photodiode which is used to sense the light. This photodiode contains a PN junction. When light falls on the PN junction, pairs of electron-hole are created in the depletion region. Due to the internal photoelectric effect, electricity is produced in the photodiode. This produced electricity is proportional to the intensity of light. This electricity is changed into a voltage by the Operational Amplifier.

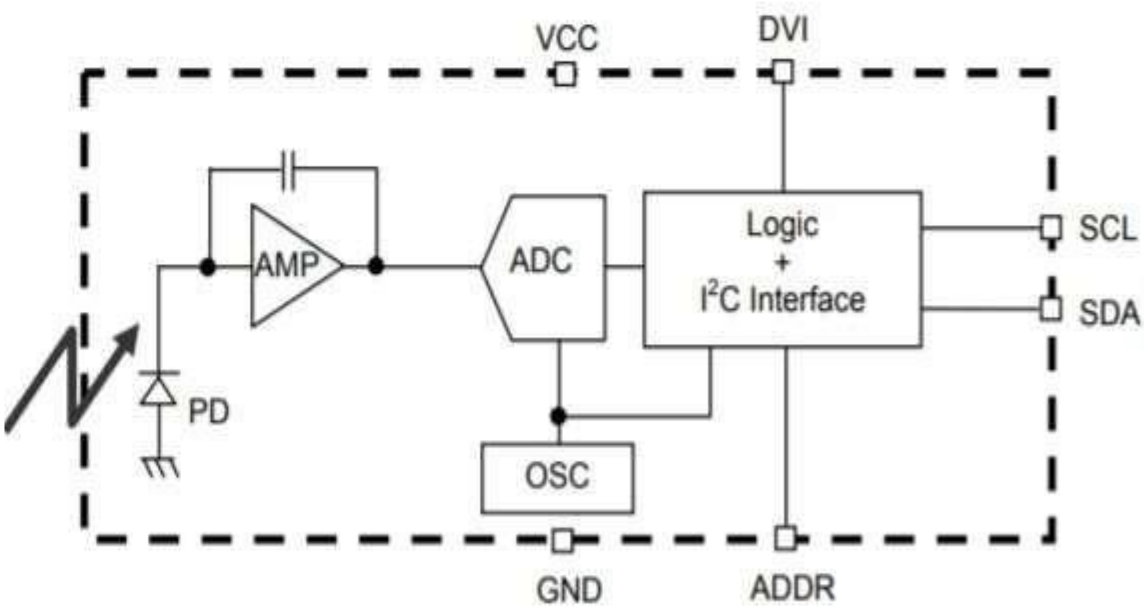

Fig 3.3: Block Diagram of BH1750

The sensors contain the photodiode that can sense light and convert it into electricity. The light that is measured is proportional to the intensity. In the above block diagram, PD is the PHOTODIODE which senses the light. The response recorded is nearly same to the human eye response.

Here the OpAmp –AMP is used as an integrator which converts the current from photodiode into the voltage. The ADC Converter used converts the analog value provided bu the AMP to digital Values. The logic and I^2C interface block shown in the block diagram is the unit where the illuminance values so obtained are converted to LUX and I^2C Communication process takes place. OSC is the internal clock oscillator of 320kHz, used as a clock for internal logic.

Circuit Diagram

BH1750 works with a supply voltage of 3V-5V. BH1750FVI is the main module of the sensor which requires 5V for working. So usually a voltage regulator is used in the circuit. SDA and SCL are the pins used for I^2C communication. 4.7kΩ pullup resistors are used with these pins.

In total, three types of measurement modes for BH1750 are used. H-resolution mode takes 120ms for measurement and has a 0.5lx of resolution. H-resolution mode also takes 120ms for measurement but its resolution is 1 lx. L-resolution takes 16ms for measurement and its resolution is 4 lx. H-resolution mode is more useful in darkness and it can also easily reject noise.

Pin Diagram

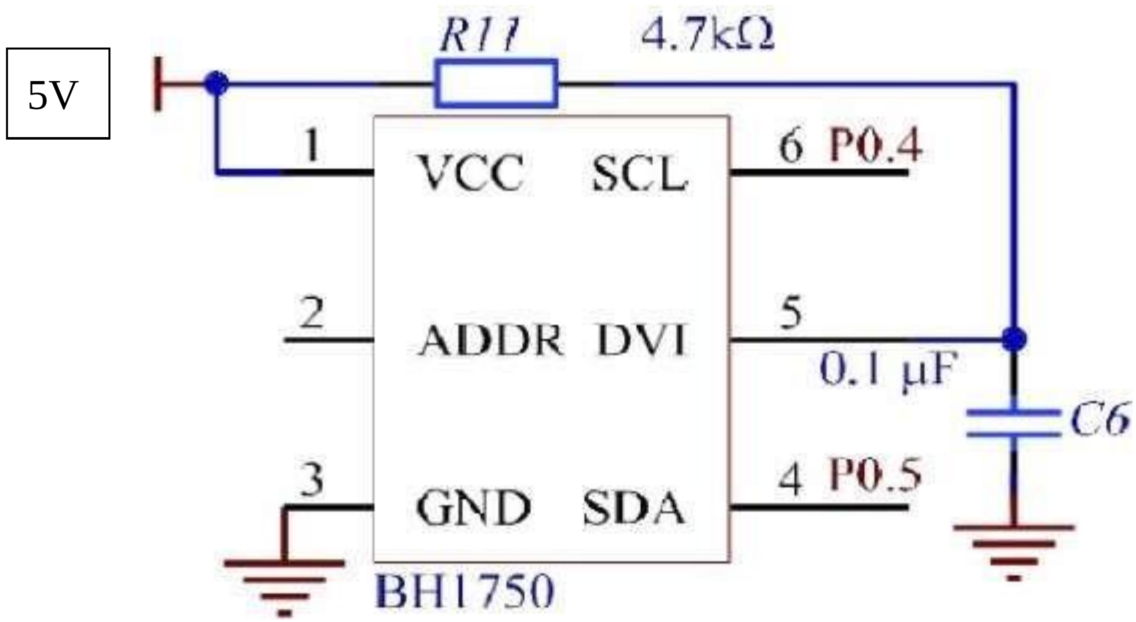

Fig 3.4: BH1750-PIN-Diagram

BH1750 is available as a 5-pin IC. Pin description of the IC is given below-

- Pin1- Vcc – is the power supply pin. The supply voltage is in the range of 2.4V to 3.6V.
- Pin-2 – GND- is the ground pin. This pin is connected to the ground of the circuit.
- Pin-3 – SCL- is the Serial Clock Line. This pin is used to provide a clock pulse for I2C communication between the sensor and the microprocessor.
- Pin-4 – SDA-is the Serial Data Address. This pin is used by I2C communication to transfer the data from the sensor to the microcontroller.

- Pin-5- ADDR- is the Device Address Pin. This pin is used when more than one modules are connected, for selecting the address.

There is another pin DVI which is the bus reference voltage terminal of the I2C module. It is also used as an Asynchronous reset terminal. After Vcc is applied DVI should be set to power-down mode. The IC may not function properly if this reset terminal is not set after applying Vcc.

Specifications

BH1750 is a 16-bit serial output type digital Ambient light sensor. Some of the specifications of this sensor are as follows-

- Power supply needed for the proper working of this sensor is 3V-5V.
- This sensor consumes very less current of 0.12mA.
- No other calculations are required to measure the intensity of light, direct digital values are given to the microprocessor.
- This sensor has an ADC to convert analog light intensity to digital LUX values.
- BH1750 can measure light intensity up to the range of 65535 lx units.
- This sensor uses the I^2C communication protocol to send data to the microprocessor.
- BH1750FVI is the main module present in the sensor. This module works on 3.3V. So, a voltage regulator is used with the IC.
- IR radiation has very less effect on the measurements of this sensor.
- BH1750 does not depend on the light source used.
- BH1750 has a 50Hz/60Hz Light noise rejection function.
- BH1750 has a very small measurement variation. It has a variation factor of about +/- 20%.
- Operating temperature range of this sensor is from -40°C to 85°C.
- The minimum I2C reference voltage is 1.65V.
- This sensor works with a 400kHz of I2C clock frequency.

Applications of BH1750

Ambient light sensors became popular from 2004 when they were used in cell phones. By 2004, 30% of the cell phones used in Europe contained an ambient light sensor, which increased to 85% by 2016. Some of the applications of ambient light sensors are listed below-

- These are used in pulse sensors to measure the light intensity of the LED.
- Cell phones contain BH1750 to adjust the brightness of the screen according to the external light conditions.
- Used in vehicles to turn ON/OFF the headlights according to the darkness.
- BH1750 is also used to control the turning ON/OFF of the automatic street lights.
- BH1750 is used to adjust the keyboard backlight in smartphones.

3.1.3 FSR Force Sensing Resistor

A force-sensing resistor is a material whose resistance changes when a force, pressure or mechanical stress is applied. They are also known as "force-sensitive resistor" and are sometimes referred to by the initialism "FSR". These are a large and growing group of embedded componets with many new sensors types having been introduced now a days.

Working

The formula for force is an object’s mass multiplied by its acceleration i.e F= M*A

Force sensing resistors are a piezoresistive sensing technology. This means they are passive elements that function as a variable resistor in an electrical circuit.

As shown in the figure below, when unloaded, the sensor has a high resistance (on the order of Megaohms (MΩ)) that drops as force is applied (usually on the order of Kilo ohms (KΩ)). When you consider the inverse of resistance (conductance), the conductance response as a function of force is linear within the sensor’s designated force range.

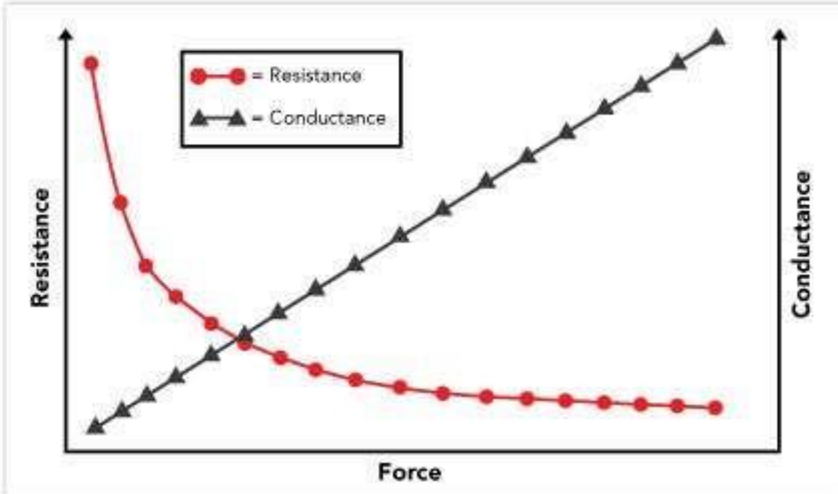

Fig 3.5: The relation between force and resistance

Force sensing resistors consist of a semi-conductive material – or, semi-conductive ink – contained between two thin substrates. As shown in the figure below, there are two different types of force sensing resistor technologies – Shunt Mode, and Thru Mode.

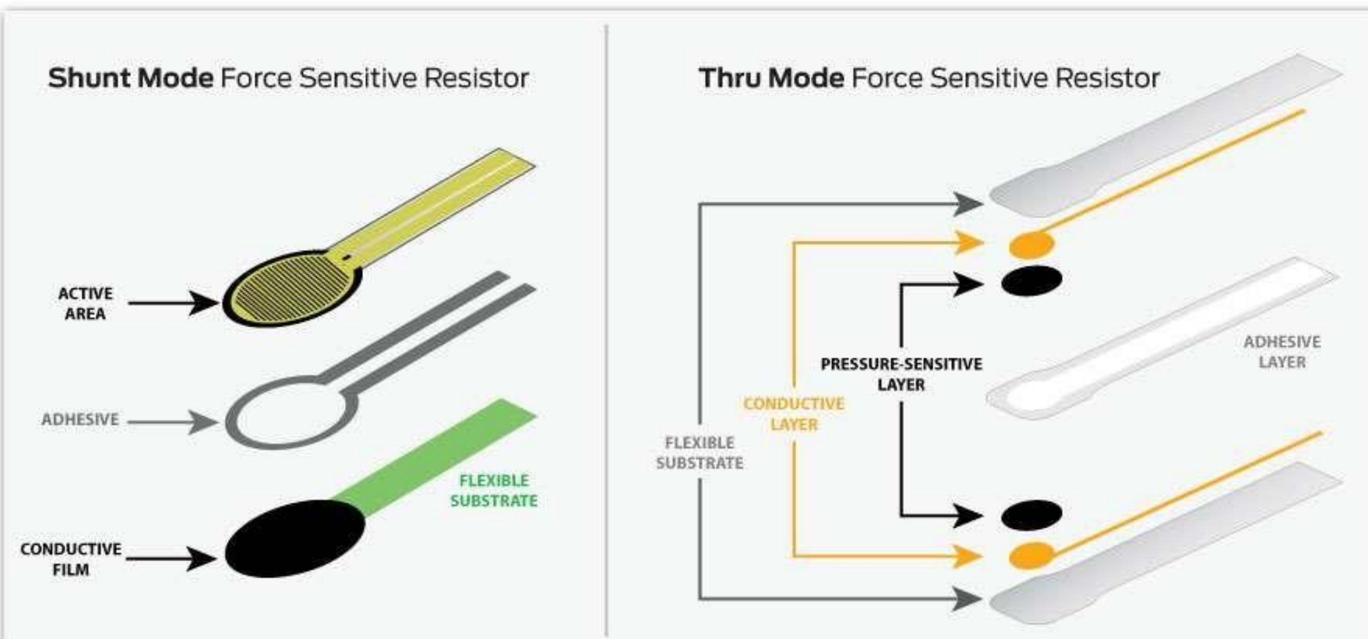

Fig 3.6: The graphical illustration showing the differences between both the types

Shunt mode force sensing resistors are polymer thick-film devices consisting of two membranes separated by a thin air gap. One membrane has two sets of interdigitated traces that are electronically isolated from one another, while the other membrane is coated with a special textured, resistive ink.

Thru mode force sensing resistors are flexible printed circuits that utilize a polyester film as its two outer substrates. Silver circles with traces are positioned above and below a pressure-sensitive layer, followed by a conductive polymer. An adhesive layer is used to laminate the two layers of the substrate together.

The sensor that we have used in our project is the shunt mode. This resistor has a force sensing area with dimensions 1.75*1.5”. This FSR will vary its resistance depending on how much pressure is being applied to the sensin area. The harder the force, the lower the resistance. When no pressure is being applied to the FSR its resistance will be larger than 1MΩ. This FSR can sense applied force anywhere in the range of 100g-10kg. Two pins extend from the bottom of the sensor with 0.1″ pitch making it bread friendly. There is a peel-andstick rubber backing on the other side of the sensing area to mount the FSR. The resistor is connected as such it forms a voltage divider and thus measures the voltage at the junction to find the amount of force applied.

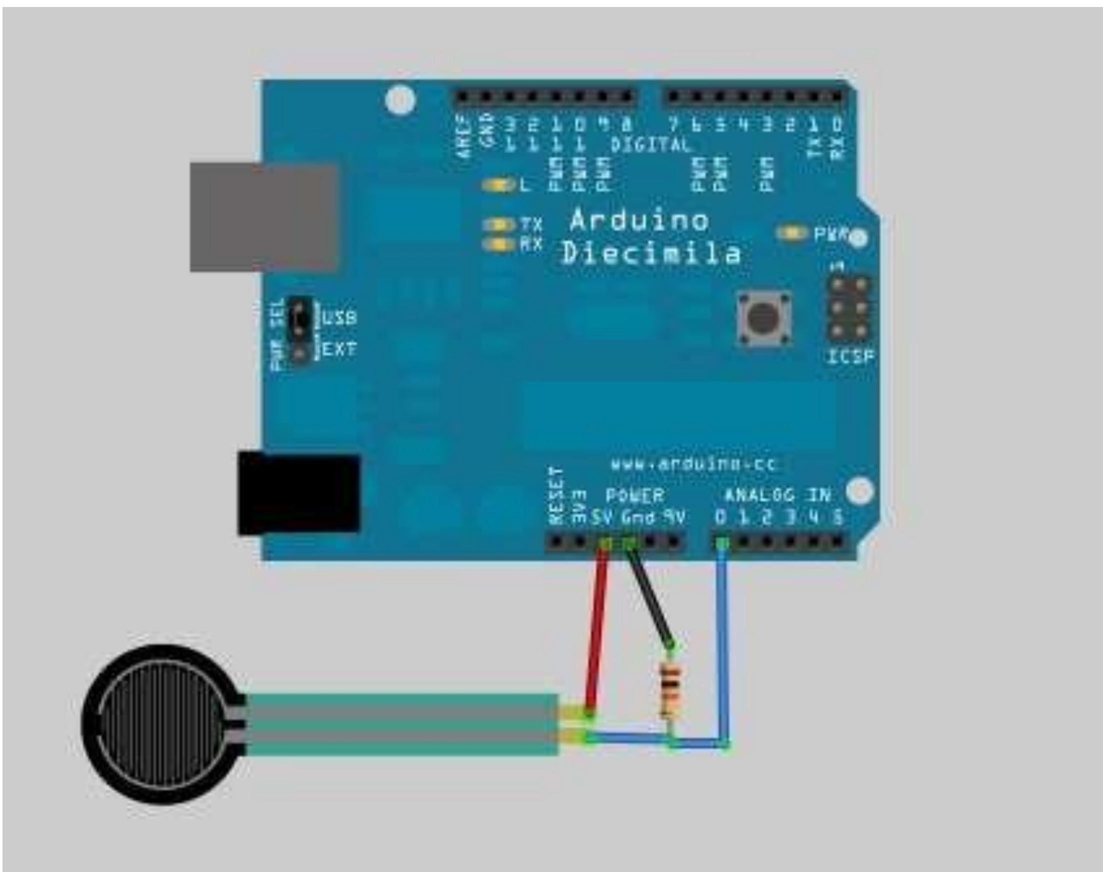

Fig 3.7: The connection of the sensor with the microcontroller (Arduino Uno)

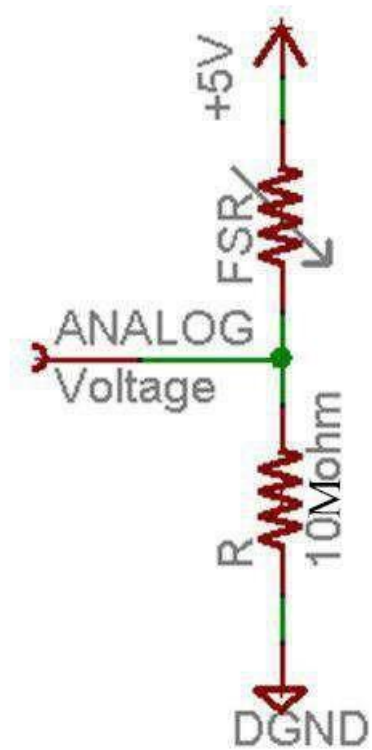

Fig 3.8: The voltage divider circuit

Specifications

Table 3.3: The specifications of the pressure sensor

Power Supply	3V- 5V
Force Ranging	0.1 – 10.02 Newton
Rise time	< 3 microseconds
Operating Temperature Range	-30°C to 70°C
Sensing Area diameter	44.5 × 44.45 mm²

3.1.4 Two Channel 5V 10A Relay Module

A relay is defined as an electrically operated switch; their main use is controlling circuits by a low-power signal or when several circuits must be controlled by one signal. The first relay was used in long distance telegraph circuits as amplifiers, basically they repeated the signal they received from one circuit, and transmitted it into a different one, they were also used in early computers to perform logical operations.

The Arduino relay module is designed for a wide range for micro controllers such as the Arduino board, AVR, PIC, ARM, with digital outputs. This module incorporates 2 relays. The following forms the relay system:

- Input: Vcc, connected to the 5V current on the Arduino Board, GND, connected to the ground and 2 digital inputs. (In1 & In2
- Output: The 2 channel relay module could be considered like a series switches: 2 normally Open (NO), 2 normally closed (NC) and 2 common Pins (COM).

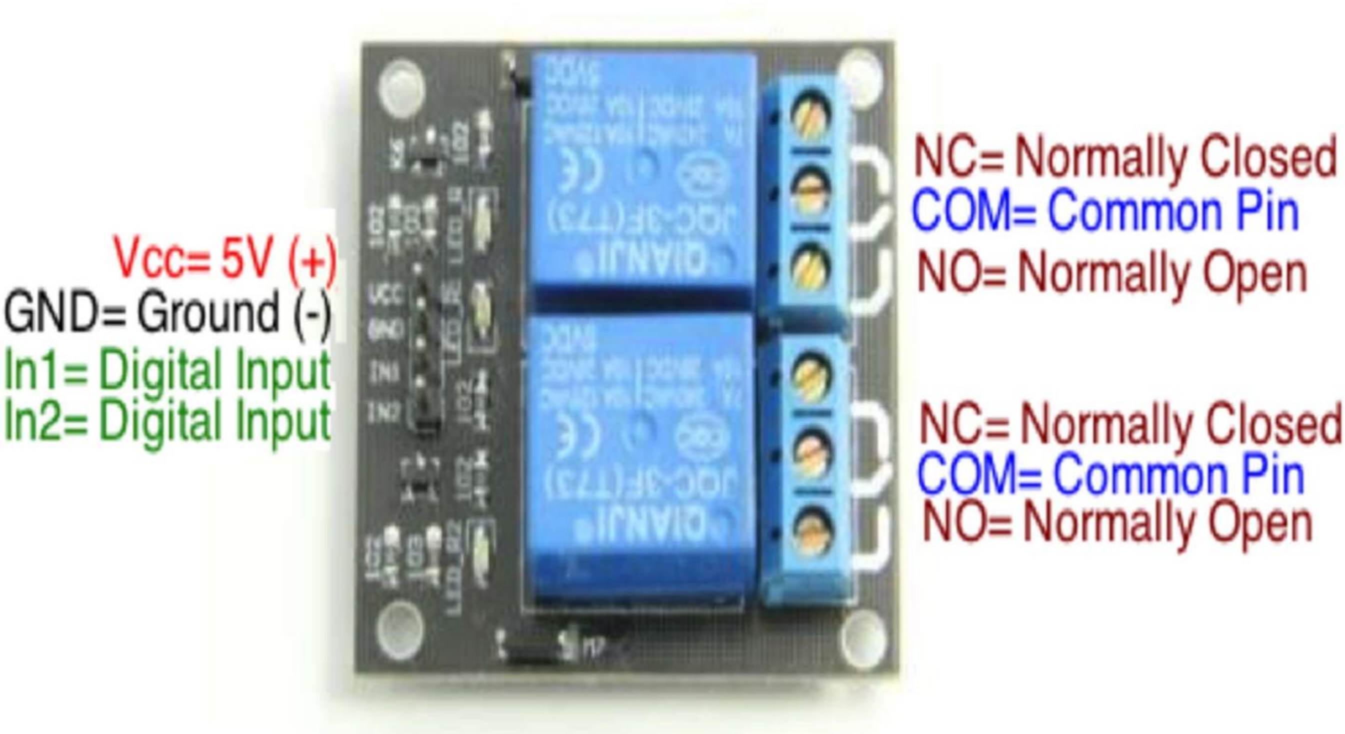

Fig 3.9: The relay structure

The relay we used is low triggered. It is formed by a series of switches, when receiving power, the NC switch would open and the NC would close. The working was checked using a bulb. The codes snippet is attached below:

```
void setup() {
  pinMode(10,OUTPUT);
}

void loop() {
  digitalWrite(10,LOW);
}
```

Fig 3.10: the code snippet of relay testing

Features

The 2-Channel Relay Module includes the following features:

Table 3.4: The Features of 2-channel Relay Module

Number of Relays	2
Control Signal	TTL
Rated Load	7A/240VAC 10A/125VAC 10A/28VDC
Contact Action Time	10ms/ 5ms
Interface Board	5V 2-Channel Relay Interface Board and each one need 15-20mA Driver Current
Equipment	· Equipped with high-current relay, AC250V 10A; DC30V 10A · Indication LED's for Relay output status.
Supported Microcontrollers	Standard interface that can be controlled directly by microcontroller(Arduino, 8051, AVR, Pic, DSP, ARM, ARM, MSP430, TTL logic

Pin Definition and Circuit Diagram:

To wire up the relay, we should take into account that it's only a switch, so if we are attaching some LEDs on the other end, they should receive power from the Arduino board.

The 2-Channel relay module has 4 input entrances:

- Two digital inputs, connected to the Arduino board.
- One V_{cc} port, attached to the Arduino's 5V.
- One GND port, connected to the ground.

It outputs consist in the following:

- Two NO switches connected to one of the LED's anode.
- Two NC switches connected to the other LED's anode.
- Two common pins attached to the 5V of the Arduino board.

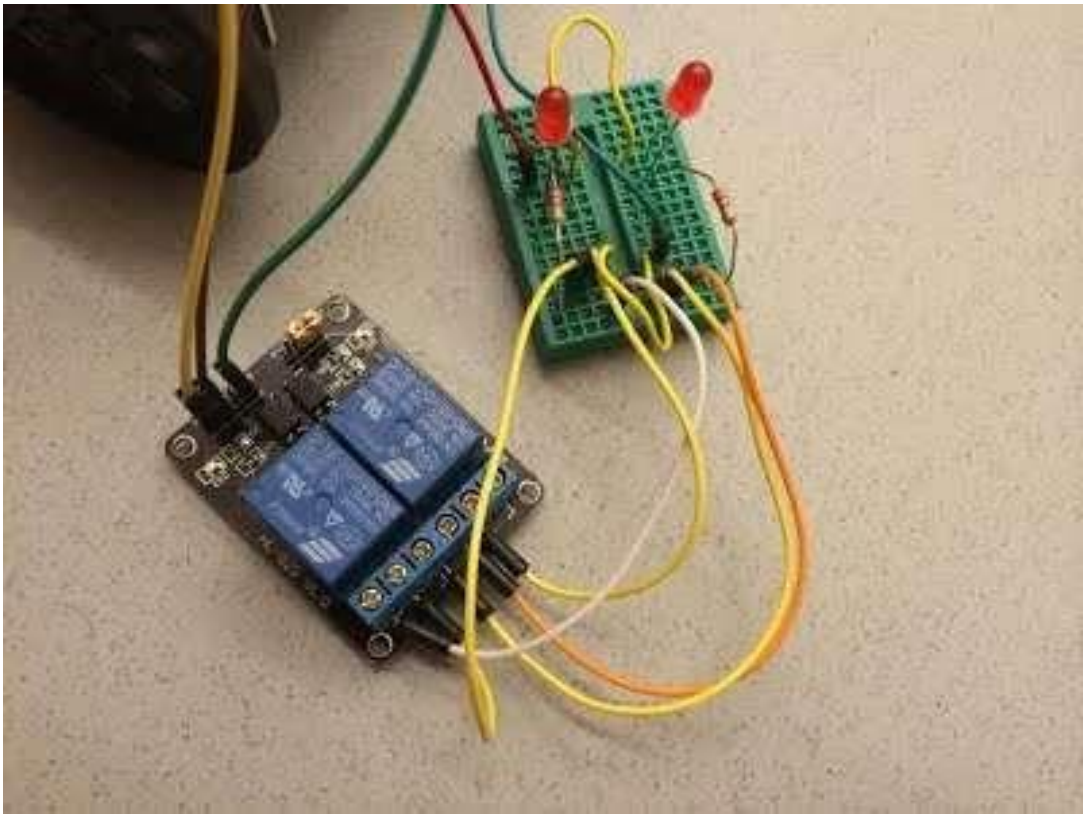

Fig 3.11: The Relay connection

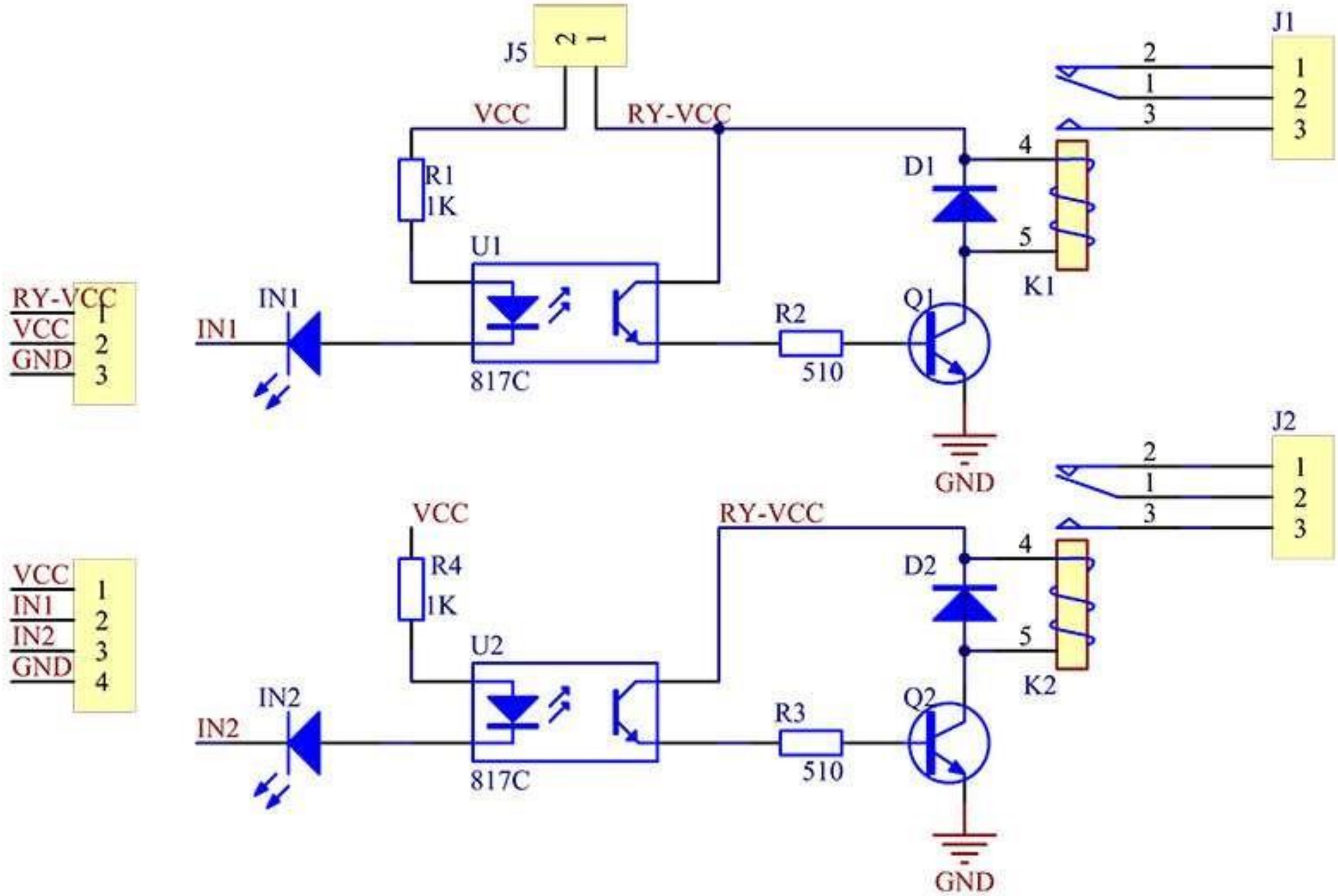

Fig 3.12: The schematic diagram of two channel relay

Principle

A is an electromagnet, B armature, C spring, D moving contact, and E fixed contacts. There are two fixed contacts, a normally closed one and a normally open one. When the coil is not energized, the normally open contact is the one that is off, while the normally closed one is the other that is on.

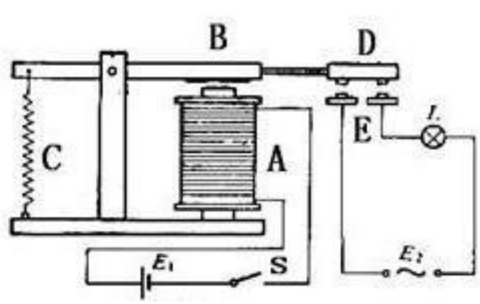

Fig 3.13: The working of relay

Certain voltage is added to the coil and some currents will pass through the coil thus generating the electromagnetic effect. So the armature overcomes the tension of the spring and is attracted to the core, thus closing the moving contact of the armature and the normally open contact (or you may say releasing the former and the normally closed contact). After the coil is de-energized, the electromagnetic force disappears and the armature moves back to the original position, releasing the moving contact and normally closed contact. The closing and releasing of the contacts results in power on and off of the circuit.

Input:

V_{cc} : Connected to positive supply voltage (supply power to according to relay voltage).
GND : Connected to negative supply voltage.
IN1 : Signal Triggering terminal 1 of relay module.
IN2 : Signal Triggering terminal 2 of relay module.

Output:

Each submodular of the relay has one NC (normally close), one NO (normally open) and one COM (Common). So there are 2 NC, 2 NO and 2 COM of the channel relay in total. NC stands for the normal close port contact and the state without power; No stands for the normal open port contact and the state with power. COM means the common port. You can choose NC port or NO port according to whether power or not.

3.2 Modular Analysis

As we all know the power consumption has become a major concern in today's world. The power consumption is increasing exponentially and all these are due to the carelessness of the human being. In this project, we have designed a seat for conserving the power and making the device cost effective.

- At first we are controlling all other system of our project by making an action based on the pressure. The component used in this section is FORCE SENSING RESISTOR(FSR).

Circuit Diagram of FSR

First of all, we made the connection of the pressure sensor with the Arduino. The two pins of the pressure sensors are connected to V_{cc} and one wend of the voltage divider. The maximum resistance that can be achieved from the sensor is 10MΩ without applying any pressure. For getting the voltage divider, a 10MΩ resistor is connected in series with the FSR. This in turn gives an optimal output of $V_{cc}/2$ at the endpoint.

Now when pressure is applied on the sensor, the resistance gets reduced proportionally and voltage across the 10MΩ resistor increases which work as the controlling factor for all other sections.

The two terminals of the FSR are connected to the 5V of Arduino and one end of the 10MΩ Resistor for getting the voltage divider.

This section when triggered controls the next section as well as switches the fan on which is powered by a <u>5V 10A Relay Module.</u> The relay module is connected to Arduino as well as the 220V source as follows:

- NO1 and COM pins of relay is directly connected to the connecting wires which are connected to the 220V AC Source.
- GND and VCC are connected to the Power Supply.
- The pin IN2 is connected to Digital Output pin 7 of Arduino

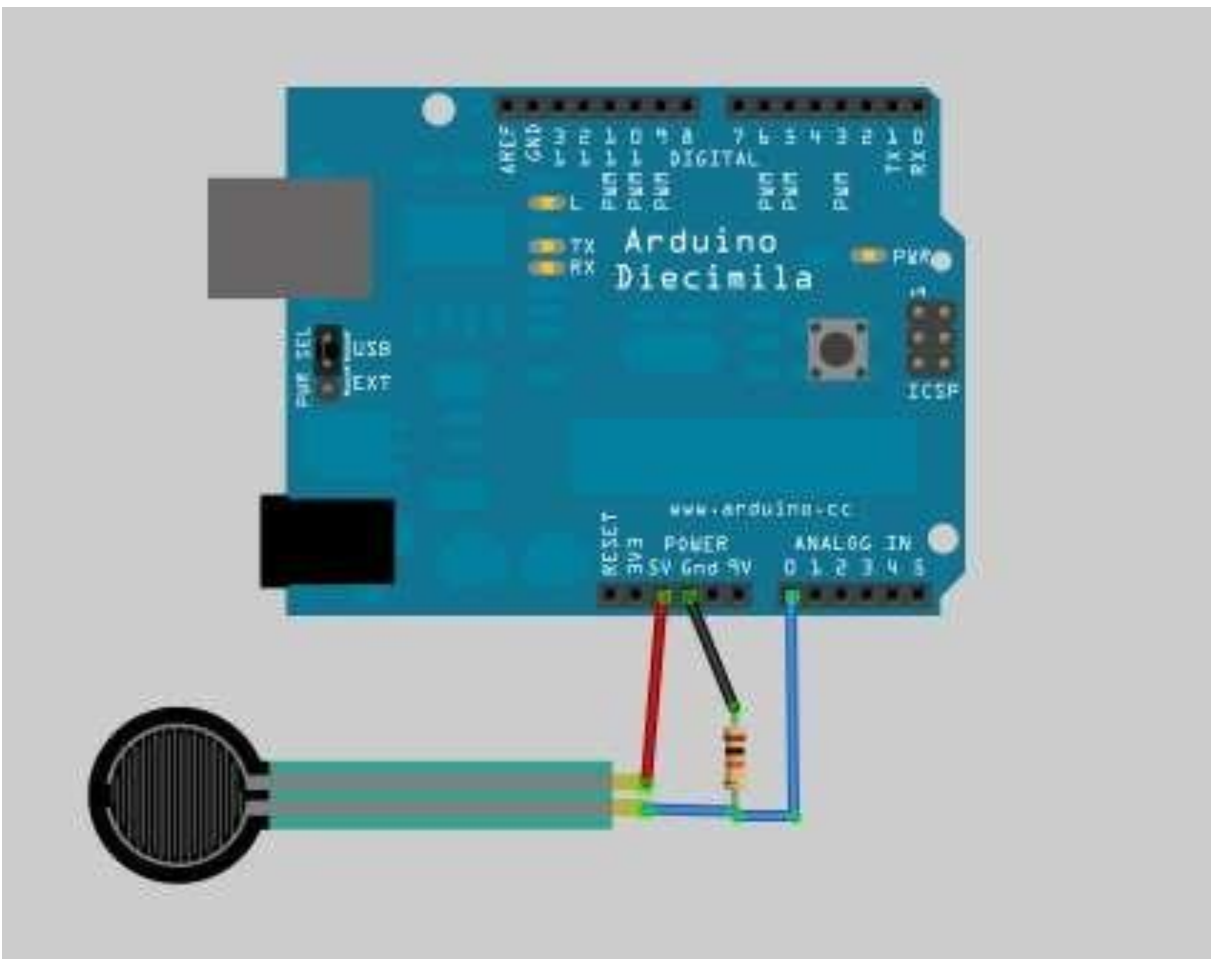

Fig 3.14: The schematic diagram of the FSR connected to Arduino.

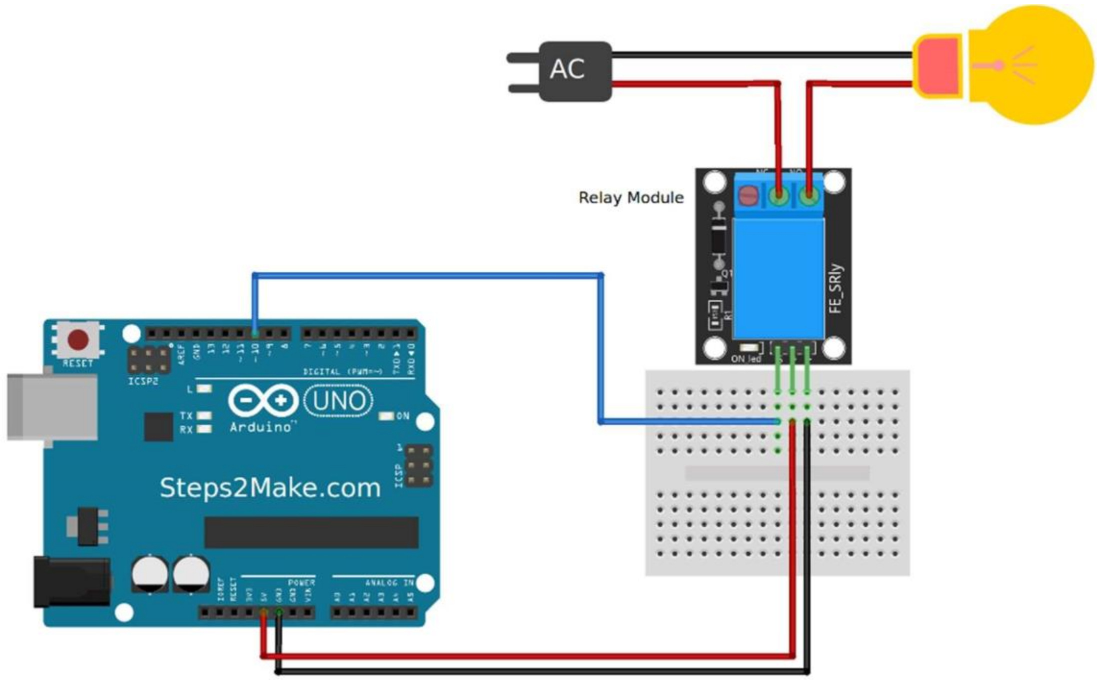

Fig 3.15: The Schematic Diagram of 5V 10A Relay Module connection

- After switching on the system by getting optimum pressure from the pressure sensor, the lights get turned on referring to the presence of people. The light intensity here is being controlled which is in proportion to the external light received which in turn helps in decreasing the power consumption as well. The component used to achieve the above mentioned target is <u>BH1750 LIGHT SENSING MODULE.</u>

Circuit Diagram of ambient sensor

First of all, we made the required circuitry in the breadboard using Arduino. The light sensing module is connected to the Arduino directly in the following order:

- V_{cc} is connected to the 5V pin of Arduino
- GND Pin is connected to the GND pin of Arduino.
- SCL (Serial Clock Line) is connected to A5
- SDA (Serial Data Address) is connected to A4

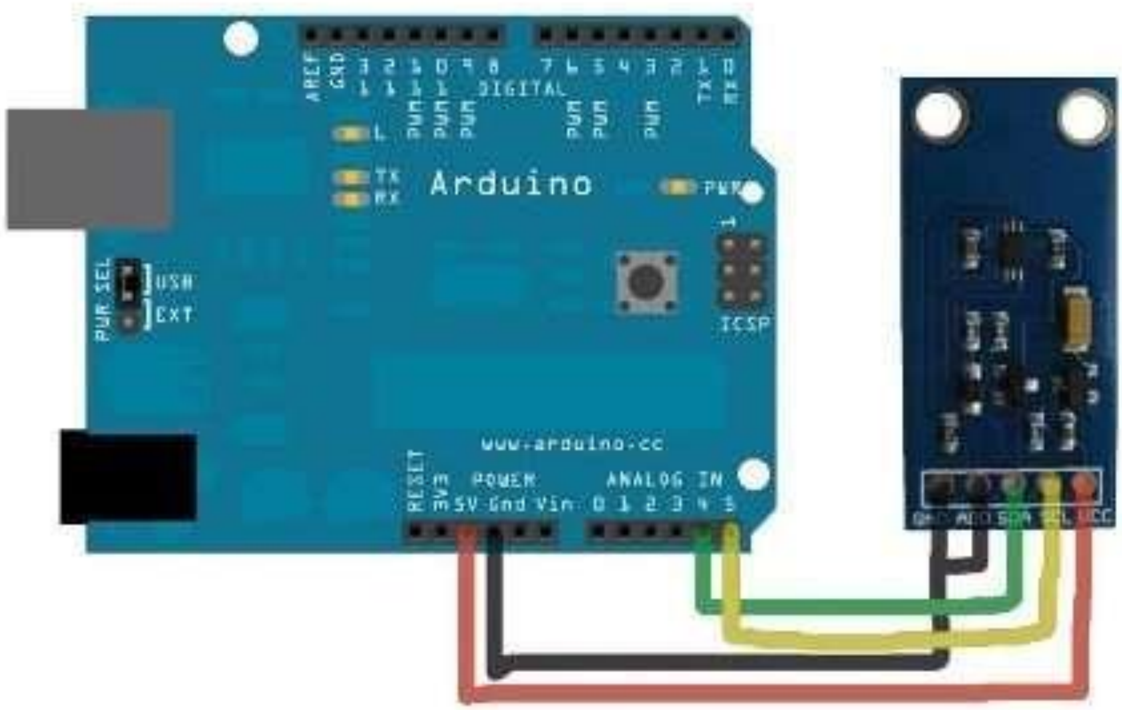

Fig 3.16: The Schematic Diagram of BH1750 light sensing module with Arduino

CHAPTER 4: RESULT AND DISCUSSION

In this work, we will be monitoring the result of the voltage across the 10MΩ resistor which is connected in series with the FSR. The result i.e. Voltage is fed into the Arduino UNO lies in the range of 1V (when no pressure applied) and 5V (when maximum pressure applied). Now when the result is more than 1V, the system is turned ON thus giving power to the BH1750 light sensing and the two channel 5V 10A relay module. The light sensing module gives the result in the range of 0.83lux to 54612.50lux. This in turn controls the output intensity of the 12V led light.

Below are attached the snapshots of the result taken at different conditions:

For visualization purpose the fan is represented using a SYSKA 0.5W, 240V, 50Hz Bulb

Sl.No	Condition of		Result
	Light Sensor	Pressure sensor	
a)	No action	No pressure applied	The system not turned on.
b)	No light	Pressure applied	The system turned on and the LED is glowing at its maximum intensity
c)	Maximum amount of light projected	Pressure applied	The system is turned on but the LED is turned off
d)	Intermediate amount of light projected	Pressure applied	The system is turned on and the intensity of the LED decreased visibly

Fig 4.1: The figure for condition (a)

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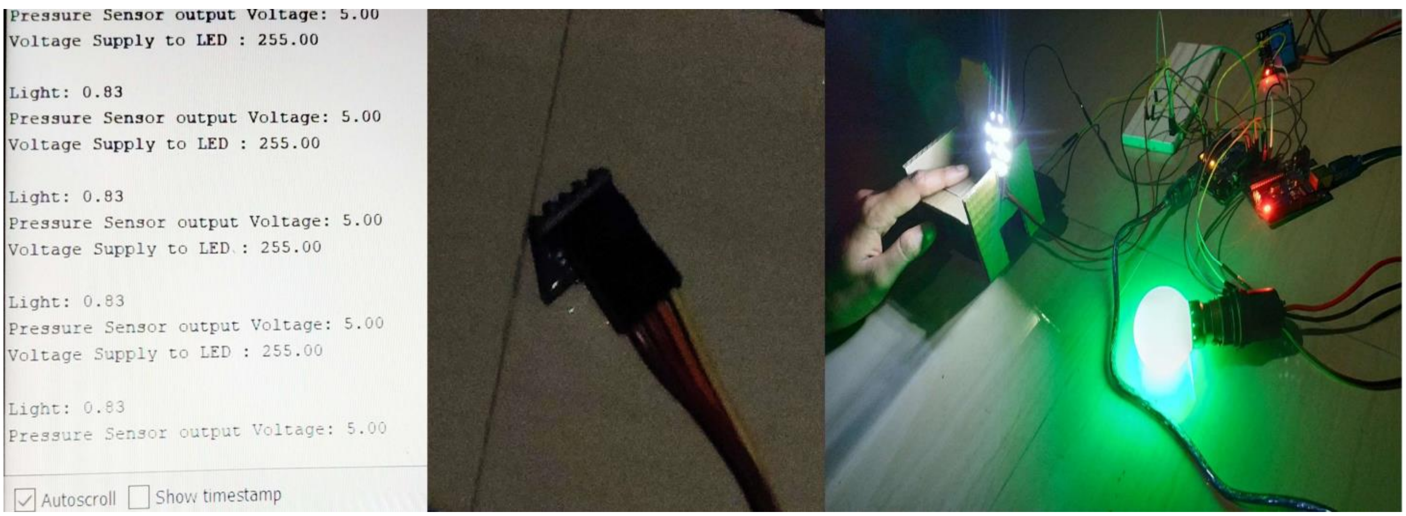

Fig 4.2: The figure for condition (b)

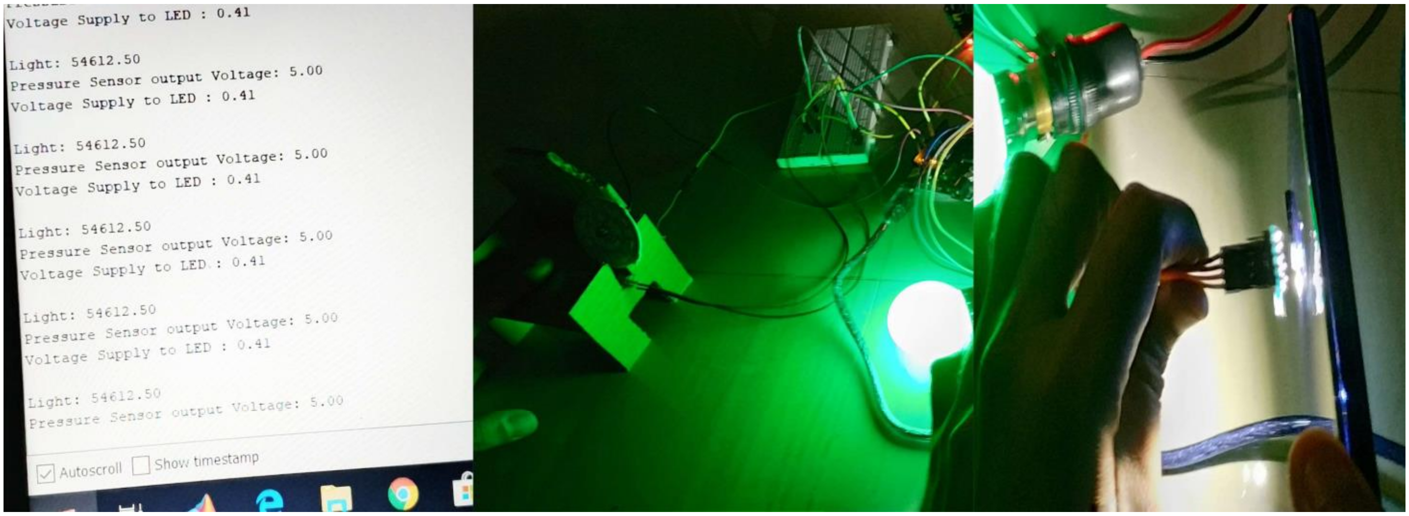

Fig 4.3: The figure for condition (c)

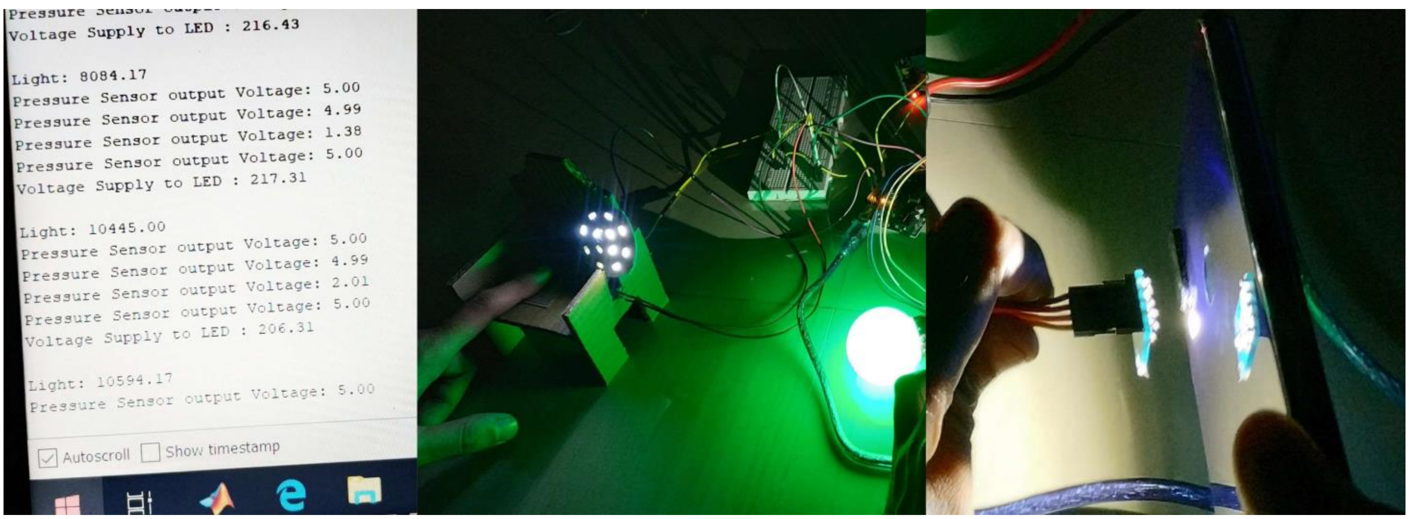

Fig 4.4: The figure for condition for (d).

CHAPTER 5: CONCLUSION AND SCOPE FOR FUTURE WORK

Conclusion

The main purpose of the project is to effectively conserve the extra amount of energy consumed when the lights keeps glowing at its full intensity all the time even when not needed and also when, at times, due to our carelessness we keep the lights and fan turned on even when not required. This project will give our daily life a new dimension and at the same time will help us to save energy. The smart load sensing seat with automated light and fan control was successfully experimented and verified using different possible conditions. We learned many skills such as soldering, wiring the circuits and other tools that we use for this project and was able to work together as a team during this project. Thus, a low-cost power conserving system was successfully designed, implemented and tested.

Future Scope

This project is intended to automate the certain functions of home appliances in order to conserve the maximum possible power. This project can further be expanded to a further level where we can control the light intensity and the room temperature using the voice command technique and wireless communication. This would, in turn, give us flexibility and would help in eradicating the environmental issue as well as decreasing the human efforts.

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