SMART STREET LIGHT & CAR REVERSE PARKING ASSISTANT

by

V.Kaarthik Shrinivas (19BCE1461)
Suraj P (19BCE1044)
Vinod B (19BCE1574)

A project report submitted to

Dr. RAVI PRAKASH DWIVEDI

SCHOOL OF ELECTRONICS ENGINEERING

in partial fulfilment of the requirements for the course of

CSE2006 – MICROPROCESSOR AND INTERFACING

in

B. Tech. COMPUTER SCIENCE AND ENGINEERING

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
VELLORE INSTITUTE OF TECHNOLOGY
CHENNAI - 600127

June 2021

BONAFIDE CERTIFICATE

This is to certify that this project report entitled " SMART STREET LIGHT & REVERSING SYSTEM" is a bonafide work of by ***V.Kaarthik Shrinivas* (19BCE1461),** ***Suraj P*** **(19BCE1044)** and ***Vinod B*** **(19BCE1574)** who carried out the Project work under my supervision and guidance for the course **CSE2006-MICROPROCESSOR AND INTERFACING**.

Dr. RAVI PRAKASH DWIVEDI

Associate Professor

School of Electronics Engineering (SENSE),

VIT University, Chennai

Chennai – 600 127.

ABSTRACT

We did two projects namely Smart Street Lights and a Car Reverse Assistance using an Arduino UNO board.

Our first system aims at energy conservation. The wastage of unused electricity can be reduced as the lights switch ON only when there is low visibility and a vehicle moves by thus also increasing safety. Our second system aims to help a vehicle driver to reverse efficiently. It does so by estimating the distance between the object that is at the back of the vehicle. And based on the distance it signals the status to the driver using LEDs and the driver can act accordingly.

The proposed work is accomplished by using an Arduino microcontroller and sensors through a TinkerCad Simulator.We learnt how to apply theory concepts to projects that help solve real world problems and concluded that it will be beneficial in the future to find more innovative results.

Table of Contents

List of Figures

CHAPTER 1

Introduction

1.1 Purpose

A) SMART STREET LIGHT

Among all exciting applications, street lights play a vital role in our environment and also play a critical role in providing light for safety during night-time travel. In this scenario, when the street lights are in working functionality over the whole night that consumes a lot of energy and reduces the lifetime of the electrical equipment such as electric bulbs etc. Especially in cities' streetlights, it is a severe power consuming factor and also the most significant energy expenses for a city. In this regard, an intelligent lighting control system can decrease street lighting costs up to 70% and increase the durability of the equipment. Hence, wastage of power from street lights is one of the noticeable power losses, but with the use of automation, it leads to many new methods of energy and money saving.

B) CAR REVERSE ASSISTANCE

For the second Car Parking Assistant,the purpose is hence stated. Nowadays, parking a vehicle is one of the most important skills for any driver or car owner as it is very difficult to measure the space around the vehicle and to know the bumpers. Parking sensors are proximity sensors that the driver can use to identify nearby obstacles when parking. As a rule, the car manufacturer places these sensors on the rear bumper of the vehicle, which is why this system is also known as a driver assistance system.

Currently, the popularity of these sensors has increased due to the increase in vehicle size and decrease in parking spaces. So, for this purpose we have made use of an ultrasonic sensor along with an Arduino in order to detect and park the car carefully without any damage. The ultrasonic sensor plays a key role in detecting objects using high frequency sound waves. It generates sound pulses that ricochet off nearby objects. The receiver catches the reproduced waves and estimates the distance between the car and the object.

1.2 Scope

Our project mainly revolves around the idea to implement and try solving real world problems through simple yet efficient projects. And by the end we were successfully able to do so.

The first model, a smart street light, is unique as it is able to detect motion of a moving vehicle and detect the light intensity outside. This product can further be implemented using the physical Arduino board and other necessary hardware. And it can also be used in our own localities on a larger scale.

The second model, a car parking assistant, is also very useful. It can detect an obstacle whether it be another vehicle or a pedestrian or even a cement slab which can in turn protect the car as well as the second party from any further damage. It can also be replicated to other vehicles such as lorries, trucks which would require assistance due to their large size as well in smaller ones like bicycles and motorcycles as they can be damaged much more easily due to their fragile nature and less protection for the driver. Hence the scope is immense and can help reduce accidents to a large extent.

CHAPTER 2

Design/Implementation

2.1 Introduction

Microcontrollers have revolutionized the way people look to tackle the real-world problems as it provides us an important platform for us to convert our theoretical solution into practical one. In our projects, Our main aim is to provide a technical and feasible solution to the problem of wastage of electricity and energy due to the inefficient system of traditional street lights and to provide a comfort to the driver to analyse the distance of the objects behind the vehicle.

The first step in finding a solution to our first problem is to know the necessary conditions when the street lights should be switched on. Studies show that municipalities waste about 40% of the electricity on the streets due to traditional street lights and we need street lights only when the surroundings are dark and the vehicles are in motion in the streets. This system can be designed and implemented using the microcontrollers and other available sensors and by coding our logic into the microcontrollers. Therefore, the system would be designed in such a way that not only new modules can be added to it but also it could also be implemented in a large scale and it' s technically and economically feasible.

The first step in finding a solution to our second problem is to know how we can make drivers of the vehicles aware of the things that are behind the vehicle at their comfort so that they can focus on driving and reduce the number of accidents that occur. This system can be designed and implemented using the microcontrollers and other available sensors and by coding our logic into the microcontrollers. Therefore, the system would be designed in such a way that not only new modules can be added to it but also it could also be implemented in a large scale and it' s technically and economically feasible.

2.2 Design Approach

First let us see how we approached the first problem solution, Smart Street. As we have decided to try to reduce the consumption of electricity and save energy that is wasted unnecessarily due to traditional street lights. We have thought of a solution that only switches on the street light based on vehicle movement detection. Then we thought of a street light that switches on only when there is vehicle movement and surroundings are dark so that it can reduce consumption of energy even more. Hence, to achieve this goal, we have searched for relevant sensors that will help us in implementing this project. After some research and brainstorming sessions we found out that photoresistor is used to find the intensity of light in the surroundings, Hence we used it to detect the light intensity in the surroundings, so it will be used to detect day and night, dark surroundings so that the street light can switch on accordingly. A PIR sensor is used to detect the motion of an object, so that when a movement of a vehicle is detected then the street light can be switched on. To integrate this we thought of using AND gate so that only when both the conditions are satisfied the bulb is switched on. NPN Transistor is used as a switch in our project which we learnt from lower classes. This was our approach to the problem Smart Street Light.

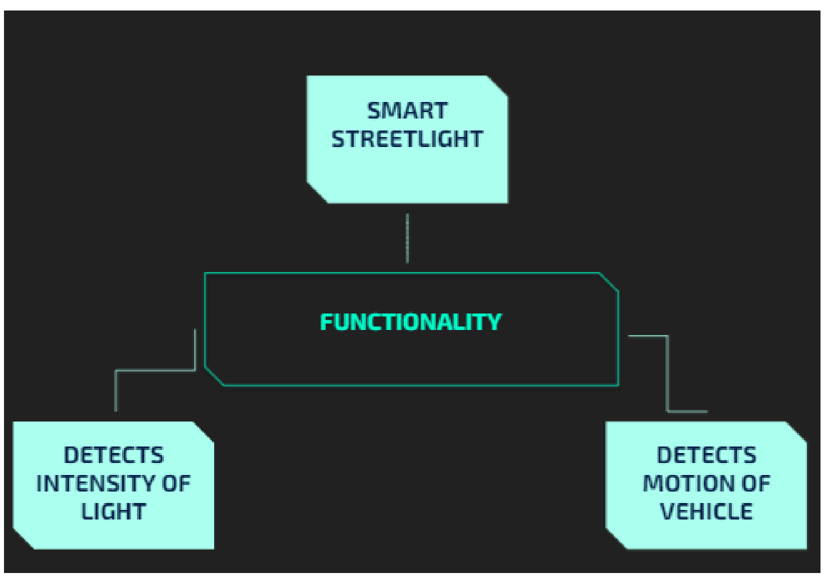


Figure 2.1 Basic Functionality

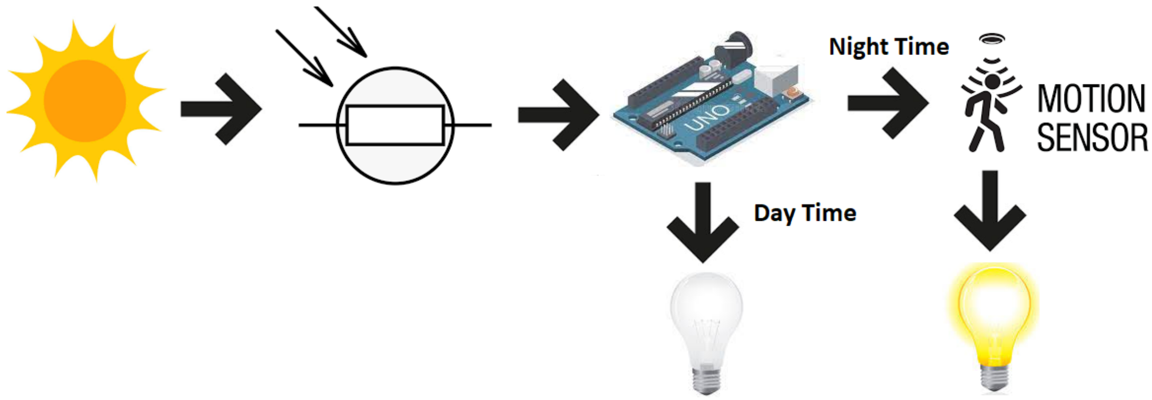


Figure 2.2 General Working of the Smart Street Light

Now let us see how we approached our second problem, Car reverse Assistant. As we have decided to let the driver comfortably focus on driving instead of seeing rear mirrors and turning back and seeing whether any object is there behind the vehicle or not for taking reverse as well as while driving. We thought of showing the driver some sort of signals that will indicate the object behind the vehicle to make him feel comfortable and reduce the damage cost that happens due to accidents that happen while reversing. After some research and brainstorming sessions we found out that an ultrasonic distance sensor which uses the principle of SONAR technology is used to find the distance between objects. Hence we thought of using an ultrasonic distance sensor which helps our program to find the distance between the object behind the vehicle and to notify the distance we have kept 3 LEDs namely Red, Yellow, Green LEDs. The Red LED signals that the object is behind the vehicle and is very close to the vehicle. The yellow LED signals that some object is behind the vehicle but not soo close enough that it may cause some damage to the vehicle. The Green LED signals that no object is detected behind the vehicle at an unsafe distance range to the vehicle. By this method we thought that we could signal the driver about the surroundings behind the vehicle. This was our approach to the problem of the Car Reverse Assistant.

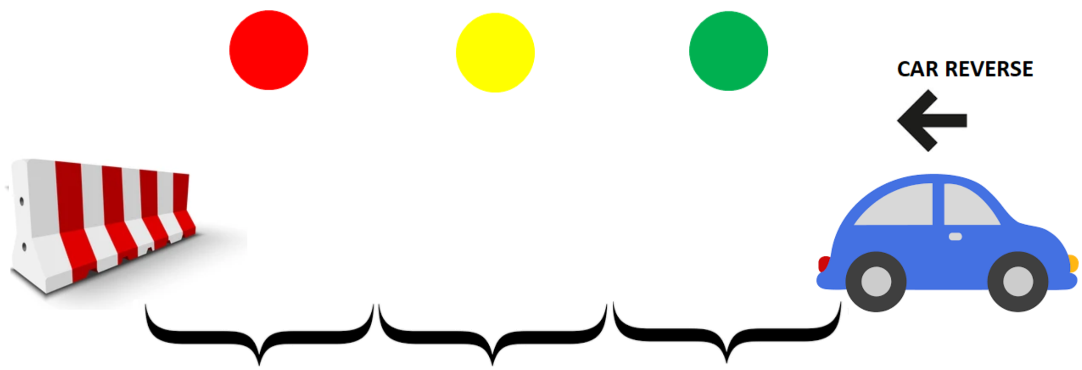


Figure 2.3 General Working of the Car Parking Assistant

2.3 Proposed System

The primary component in our both projects is Arduino UNO R3 boards which are connected to the rest of the components in order to execute the function successfully.

In our first project “Smart Street Light” we are detecting both the intensity of light in the surroundings and vehicle movement in the street to determine when the street light should be switched on. We are using a Photoresistor that detects the intensity of light of the surrounding environment using the following method. ‘If incident light on a photoresistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance and allowing the current to flow.’ Hence this helps the arduino to detect the intensity of light. Then we use a passive infrared sensor (PIR sensor) to detect motion of vehicles. PIR Sensor is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors.Then we are using AND gate to connect both the outputs of PIR Sensor and Photoresistor so that only when the surroundings are dark and there is motion of vehicles in the street the bulb is switched on. Then an NPN transistor which acts as a switch is connected to the output of the AND Gate and the bulb such that only when the output of the AND Gate is high the Bulb is switched on.

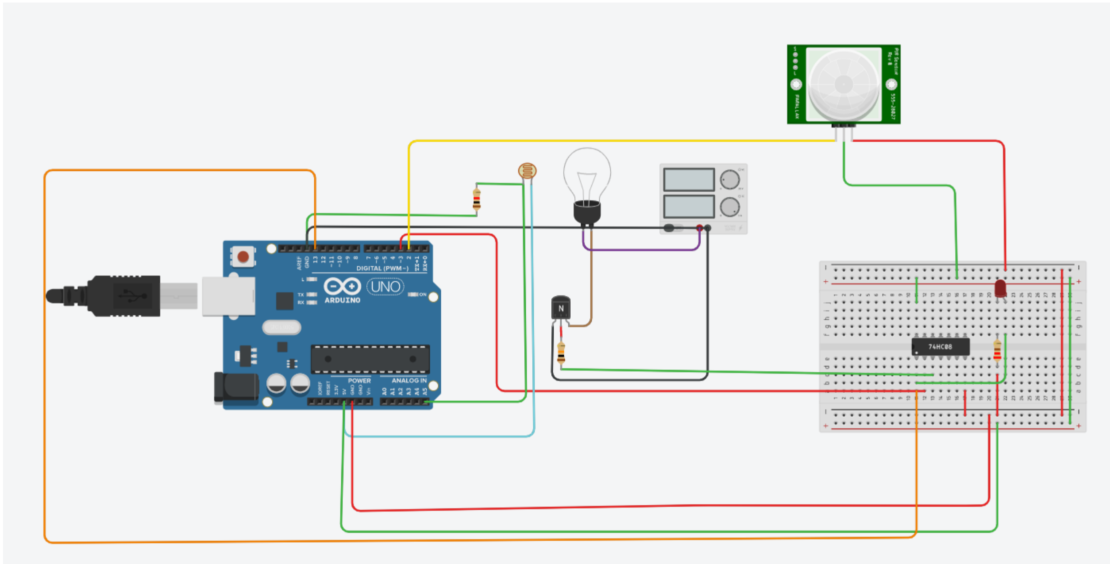


Figure 2.4 SMART STREET LIGHT CIRCUIT

In our second project "Smart Street Light" we are using an ultrasonic distance sensor which has a timer and returns the time taken for the ultrasonic wave to travel from sensor to the object that is in the path of the wave and to travel back. Using this value, in the coding part we find the distance from the sensor to the object behind the vehicle and based on the distances, the respective LEDs will glow.

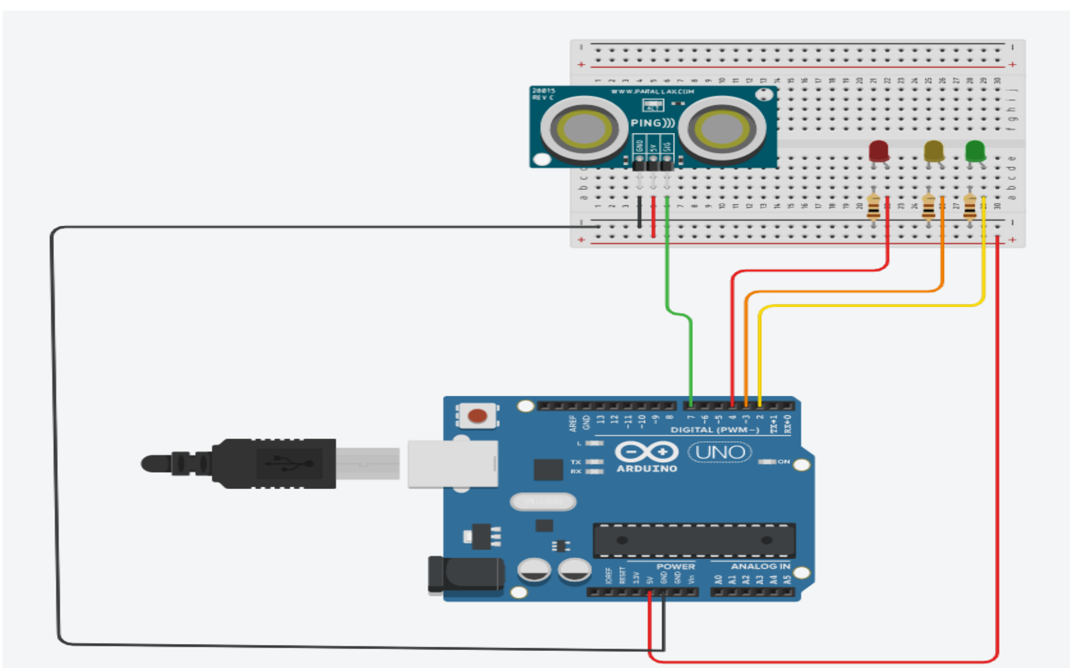


Figure 2.5 CAR REVERSE ASSISTANT CIRCUIT

```
// measure the ping time in cm
cm = 0.01723 * readUltrasonicDistance(7, 7);
// convert to inches by dividing by 2.54
inches = (cm / 2.54);
```

Figure 2.6 CODE TO CONVERT THE TIME TAKEN INTO DISTANCE

2.3.1 Economic Feasibility

Since we did the project using a simulation tool, the cost of carrying out the project was very minimal. We have given a rough estimate of the cost that it will take to develop a prototype of the project and large scale implementation of our projects.

<u>Smart street Light:</u>

- Arduino Uno R3 - ₹1000
- 1kΩ Resistor - ₹2
- 10kΩ Resistor - ₹2
- 220Ω Resistor - ₹2
- Light Bulb - ₹100
- NPN Transistor (BJT) - ₹10
- Photoresistor - ₹1
- PIR Sensor - ₹160
- Red LED - ₹2
- Quad AND gate - ₹15
- Jumper Wires - ₹40

Total cost: ₹1334

<u>Car reverse assistance:</u>

- Arduino Uno R3 - ₹1000
- Ultrasonic Distance Sensor - ₹185
- 100Ω Resistor x 3 - ₹6
- Red LED - ₹2
- Yellow LED - ₹2
- Green LED - ₹2
- Jumper Wires - ₹40

Total Cost: ₹1237

Final Total Cost: ₹2571

The prototype of the above-mentioned 2 models cost about ₹2571. It can be scaled up into working models and integrated with all the street lights and vehicles.

When scaled up to a real time scenario, the project cost will be around ₹2000 for Smart street light and ₹1800 for car reverse assistant. Comparing the production cost, the energy saving cost is more for the Smart Street Light project. Hence, there is a net profit in making and implementing the smart street light project. Car reverse assistant project also helps in reducing the number of accidents which not only saves lives but also reduces damage & repair costs that occur during vehicle reverse movement .Hence, both our projects are not only Economically feasible, but are also Economically Profitable.

2.3.2 Technical feasibility:

All the technical resources are available easily in Hardware shops. All the used sensors and microcontrollers are easily available in the market. To make sure that this project can be implemented, we can simulate these projects on Tinkercad Simulation Software. Hence, our projects are Technically Feasible.
Our project, Smart street light simulates movement of vehicles using PIR Sensor and Surrounding lighting conditions using photoresistor and as it works perfectly fine in simulation, It can be extended in real life application, Hence it is Technically Feasible.
Our project, Car Reverse Assistant simulates the distance calculation of the object behind the car using Ultrasonic Distance Sensor. And it indicates the glow of the LEDs according to the distance between the object and Ultrasonic Distance Sensor. Hence as it is simulated successfully, It can be extended in real life application, Hence it is Technically Feasible.

2.3.3 Operational feasibility

i) The Arduino supports only 32 bit operations and special data types need to be used for 64-bit, in this project we deal only with 32 bit operations.
ii) There also exists some precision error with respect to floating point numbers for example 2/3+1/3 would result in 0.999999999; this can cause minor arithmetic errors.
iii) The project is built on TinkerCad, and hence any issue with its servers can affect our operations

2.4 Overview of software

TinkerCad is an Online tool that is a free and easy-to-use app for 3D Design, electronics, and coding. We used Tinkercad to Simulate our projects online and obtain the desired results.
For coding , we have used Arduino Programming embedded in Tinkercad.
Almost all the system can use and design their circuits in tinkercad website as it requires very less system specifications and the only thing that one needs is a good internet connection to simulate the circuit online in tinkercad.

2.5 Hardware Specification

- **Smart Street Light:**

Name	Quantity	Component
U1	1	Arduino Uno R3
R1	1	1 kΩ Resistor
R2	1	10 kΩ Resistor
L1	1	Light bulb
T1	1	NPN Transistor (BJT)
P1	1	null , 5 Power Supply
R3	1	Photoresistor
PIR1	1	407.68570470303314 , -165.11805936029663 , -148.42023333805986 PIR Sensor
D1	1	Red LED
R5	1	220 Ω Resistor
U2	1	Quad AND gate

- **Car Reverse Assistant:**

Name	Quantity	Component
U1	1	Arduino Uno R3
PING1	1	Ultrasonic Distance Sensor
R1 R2 R3	3	100 Ω Resistor
D1	1	Red LED
D2	1	Yellow LED
D3	1	Green LED

2.6 Software Requirements

We are using Tinkercad software for implementing our circuit.
Tinkercad is a free, easy-to-use app for 3D design, electronics, and coding. It's used by teachers, kids, hobbyists, and designers to imagine, design, and make anything!
Tinkercad is a free-of-charge, online 3D modeling program that runs in a web browser, known for its simplicity and ease of use. Since it became available in 2011 it has become a well known platform used to construct and simulate electrical circuits using various microcontrollers and microprocessors.
For coding , we have used Arduino Programming embedded in Tinkercad.

2.7 Summary

Since the arrival of microcontrollers every technology in our world has become better and better. Now microcontrollers are used everywhere from home appliances to rocket science, from agriculture to health care systems. Even Tesla's new self-driving cars use Microcontrollers to analyse the surroundings and drive automatically according to it.
The main aspects of our design are ease of use, energy efficiency, and safety of people.
The project "Smart Street light" in a short is used for reducing the consumption of energy and analyse the 2 needs when a street light should be switched ON that is surrounding light intensity and motion of vehicles in the street.
The Project "Car Reverse Assistant" in short uses the principle of SONAR to measure the distance between the vehicle and object behind the vehicle and alerts drivers accordingly which improves passengers safety and reduces the damage costs of the vehicle.

CHAPTER 3

Result and Analysis / Testing

3.1 Screenshots of Smart Street Light

.

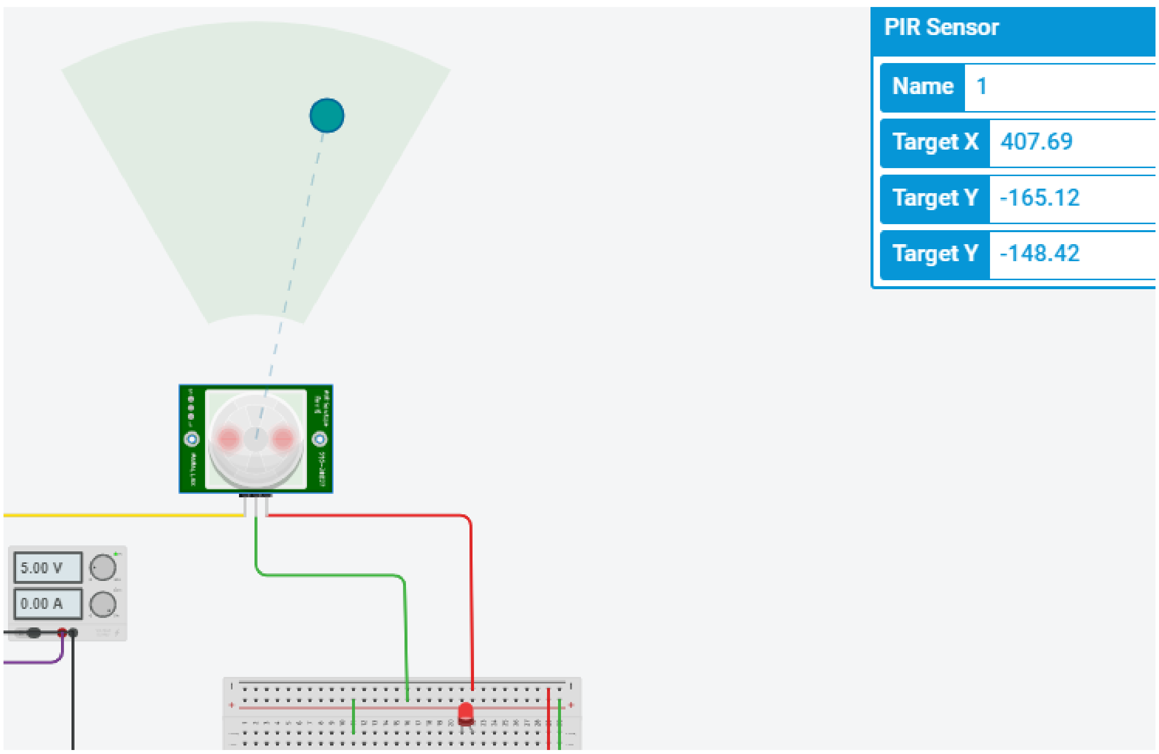


Figure 3.1 Detecting Motion Test

When the we cause motion we can see that the LED turns on indicating that vehicle moves pass

Case - 1 : When there is Light detected and no Vehicle motion

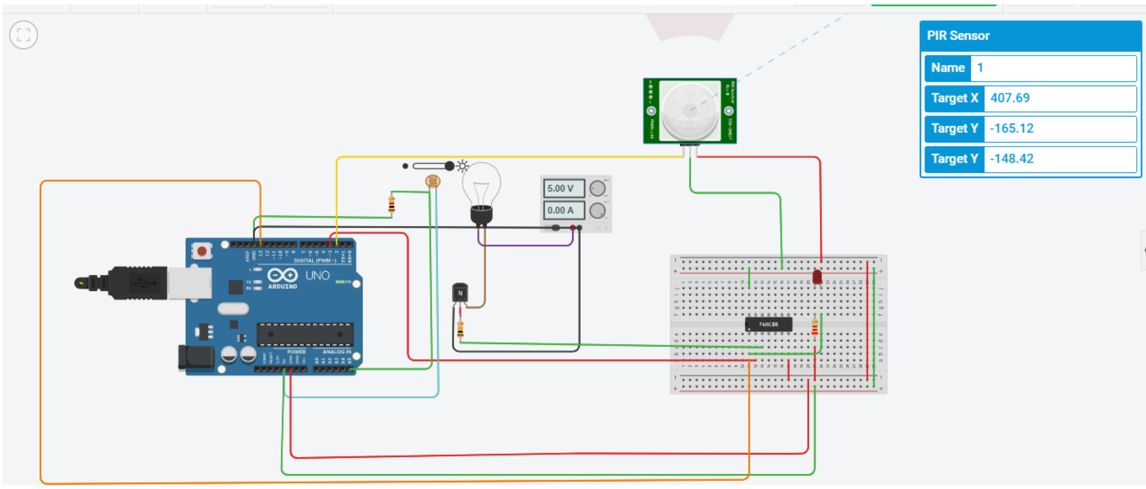


Figure 3.2 Case -1

The Bulb which simulates the Streetlight is off when high intensity light detected and no motion is detected(LED is off)

Case - 2 : When there is Light detected and there is Vehicle motion

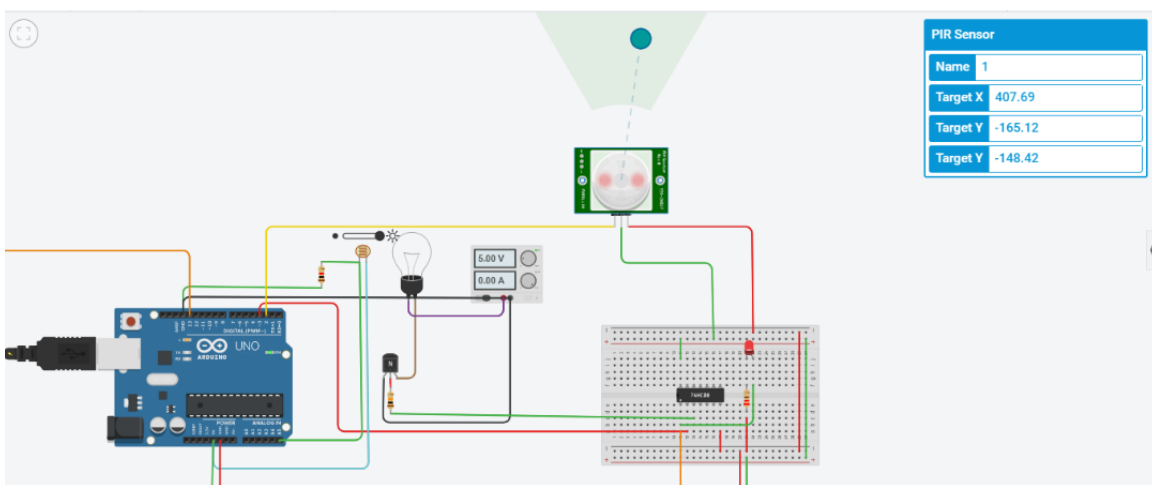


Figure 3.3 Case -2

The Bulb which simulates the Streetlight is off when high intensity light detected and even when motion is detected(LED is on) as streetlight not required

Case - 3 : When there is no/dim Light detected and there is no Vehicle motion

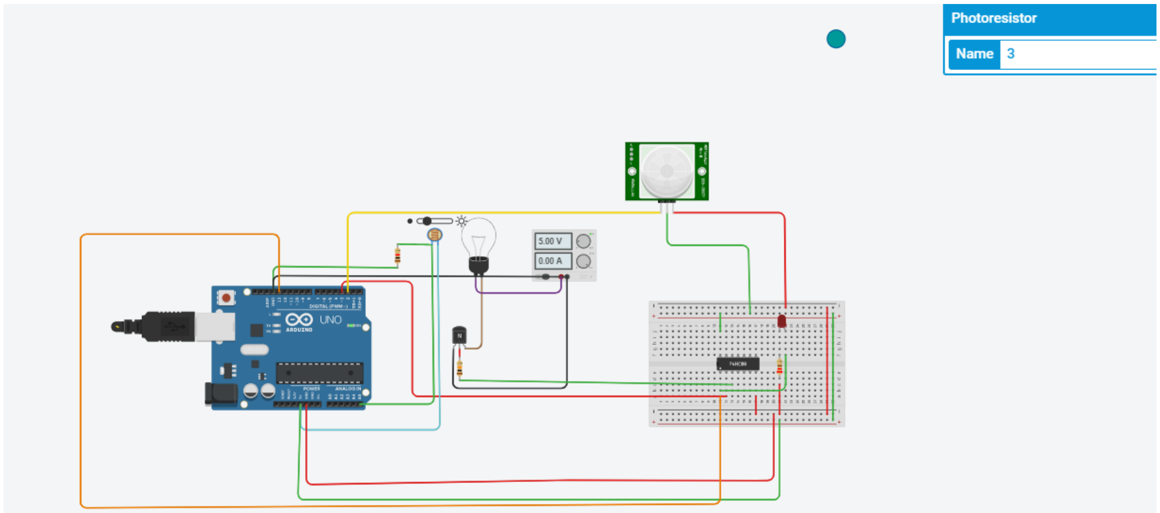


Figure 3.4 Case -3

The Bulb which simulates the Streetlight is off when dim/low light detected and when motion is not detected(LED is off) as streetlight not required

Case - 4 : When there is no/dim Light detected and there is Vehicle motion

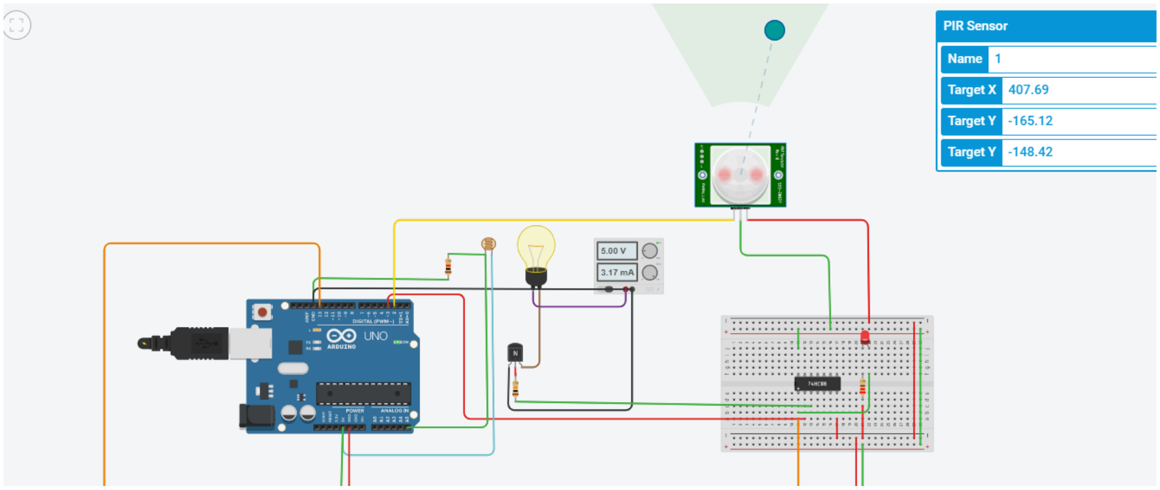


Figure 3.5 Case -4

The Bulb which simulates the Streetlight is on when dim/low light is detected and when motion is detected (LED is on) as this is the ideal case.

People require streetlight for visibility and safety

3.2 Screenshots of Car Reverse Assistance

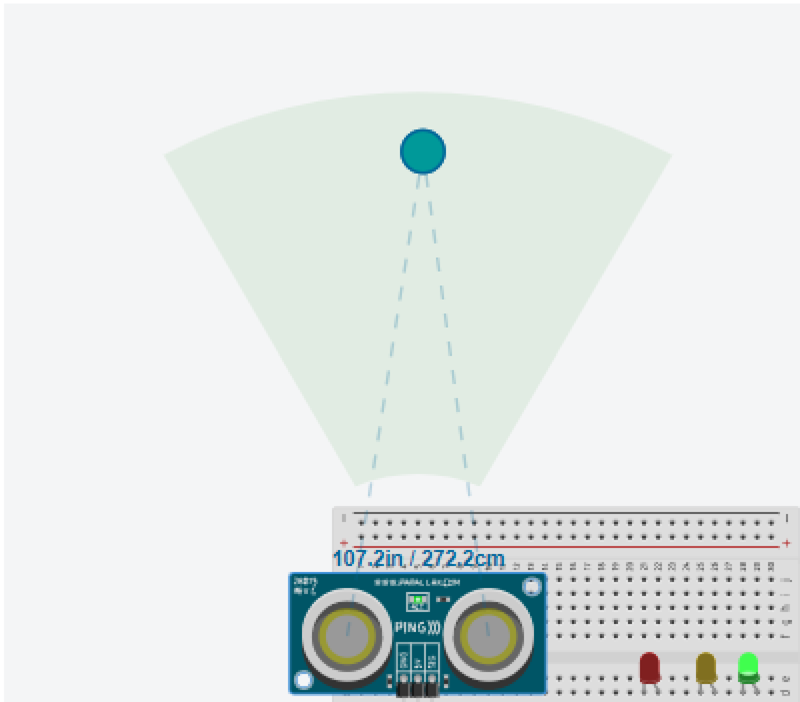


Figure 3.6 Calculating the distance of object behind the vehicle

When there is an object detected in the range of the ultrasonic distance sensor then the ultrasonic wave hits the object and comes back to the source, and by this we can calculate the distance and the distance is displayed.

Case - 1 : When there is an object outside the range of the Ultrasonic distance sensor simulation

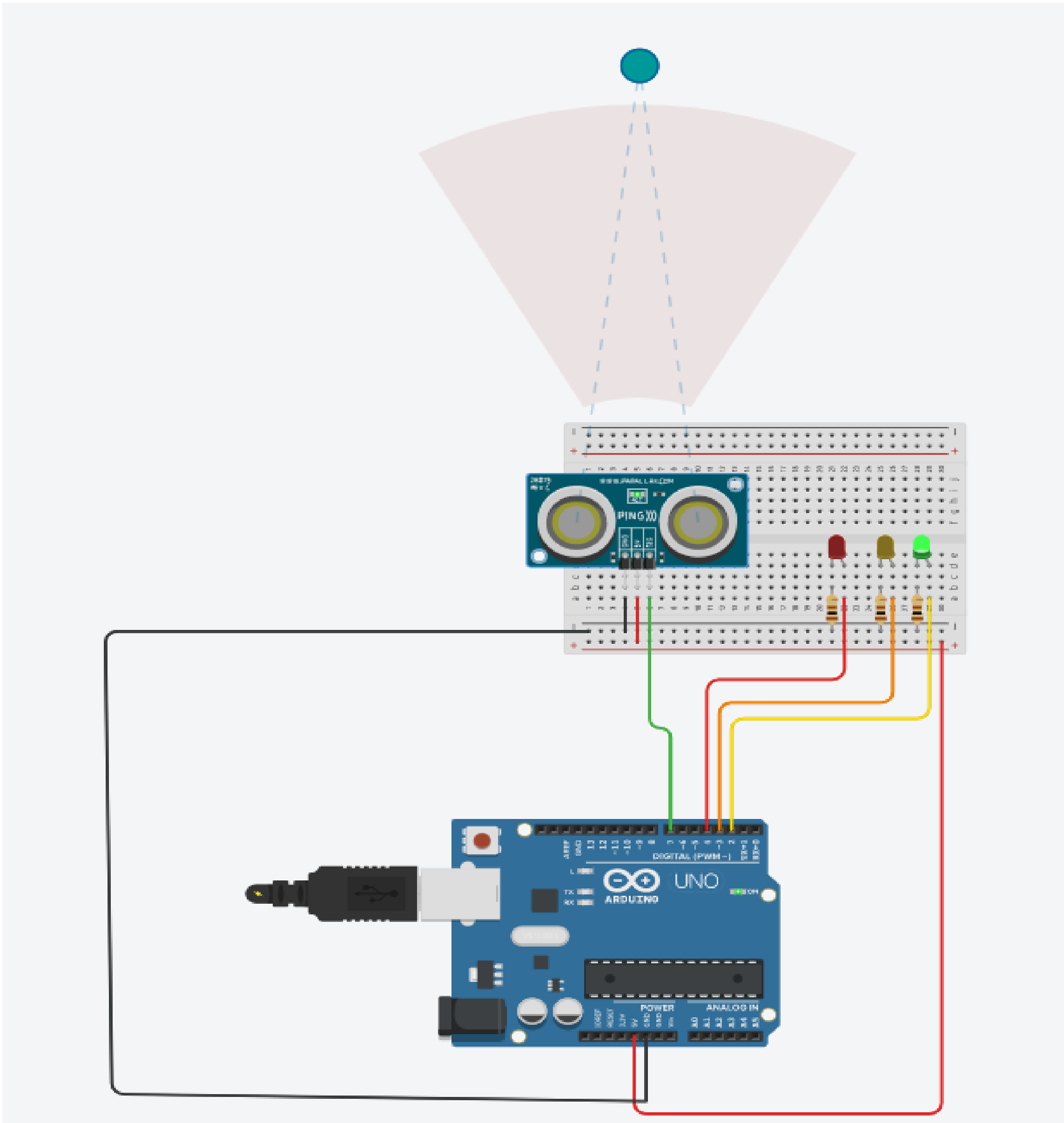


Figure 3.7 Case-1 When the object is out of range of the Ultrasonic distance sensor

When the object is within the range of the ultrasonic distance sensor then it means that there is no object near the vehicle and hence the vehicle can take reverse safely, Hence the green light is glowing indicating that it is safe to take reverse.

Case - 2 : When there is an object inside the range of the Ultrasonic distance sensor simulation but inside the safe zone

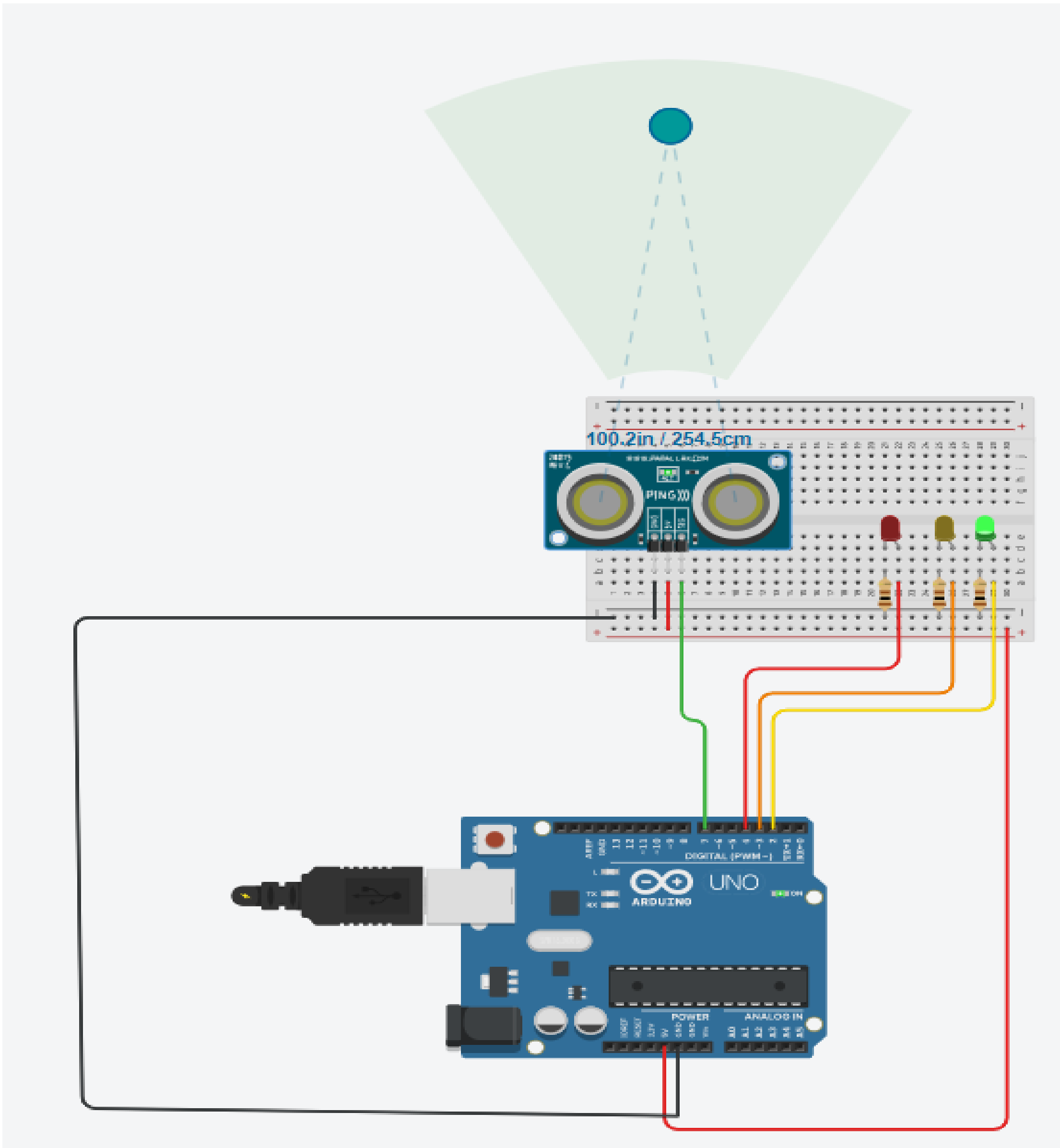


Figure 3.8 Case 2- When there is an object inside the range of the Ultrasonic distance sensor simulation but inside the safe zone

When there is an object inside the range of the ultrasonic distance sensor but is at a safe distance, then the green LED is glown indicating that it is safe to reverse.

Case - 3 : When there is an object inside the range of the Ultrasonic distance sensor simulation but inside the careful zone

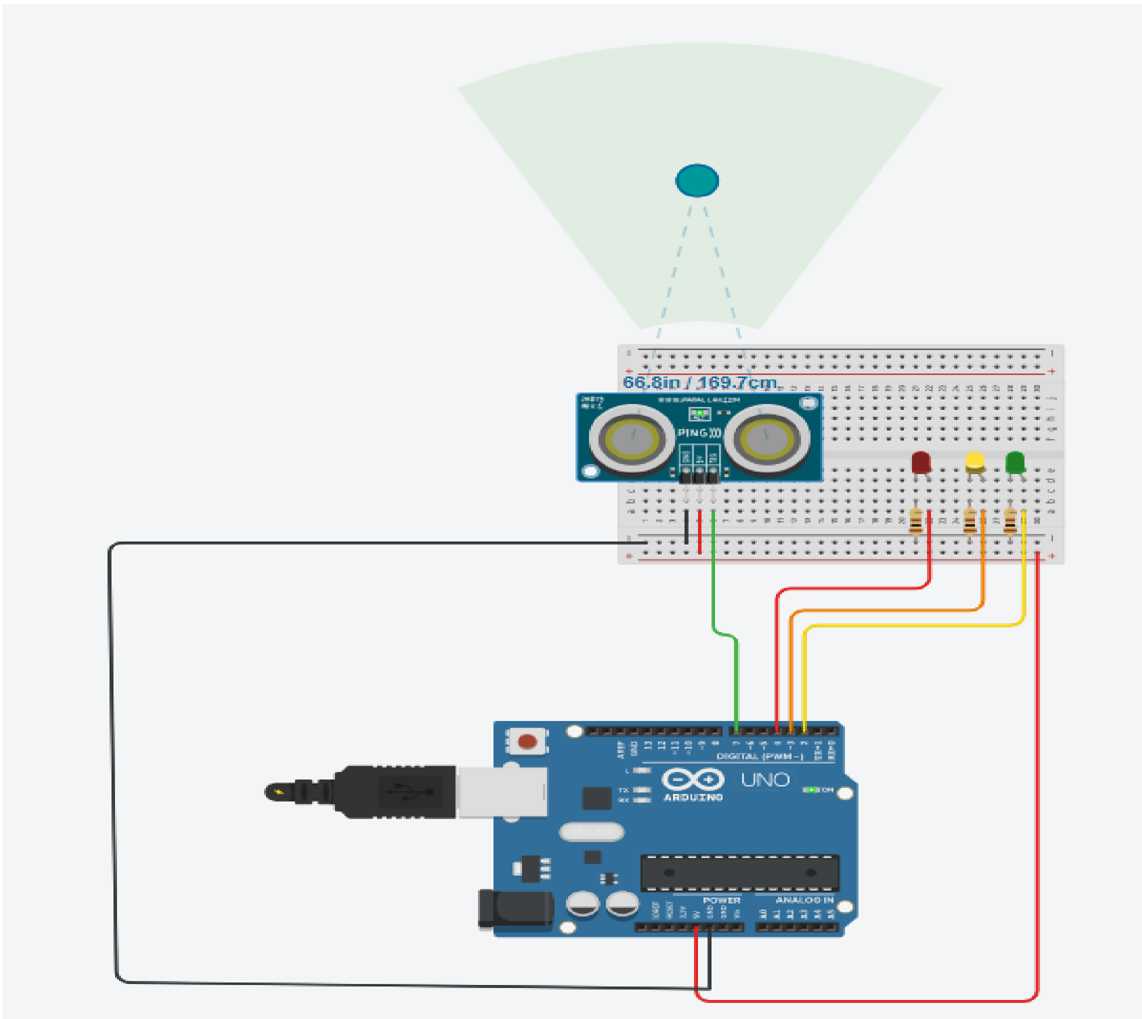


Figure 3.9 Case 3 - When there is an object inside the range of the Ultrasonic distance sensor simulation but inside the careful zone

When there is an object inside the range of the ultrasonic distance sensor but is at a careful distance, then the yellow LED is glown indicating that it is proceeding with care to reverse.

Case - 4 : When there is an object inside the range of the Ultrasonic distance sensor simulation but inside the danger zone

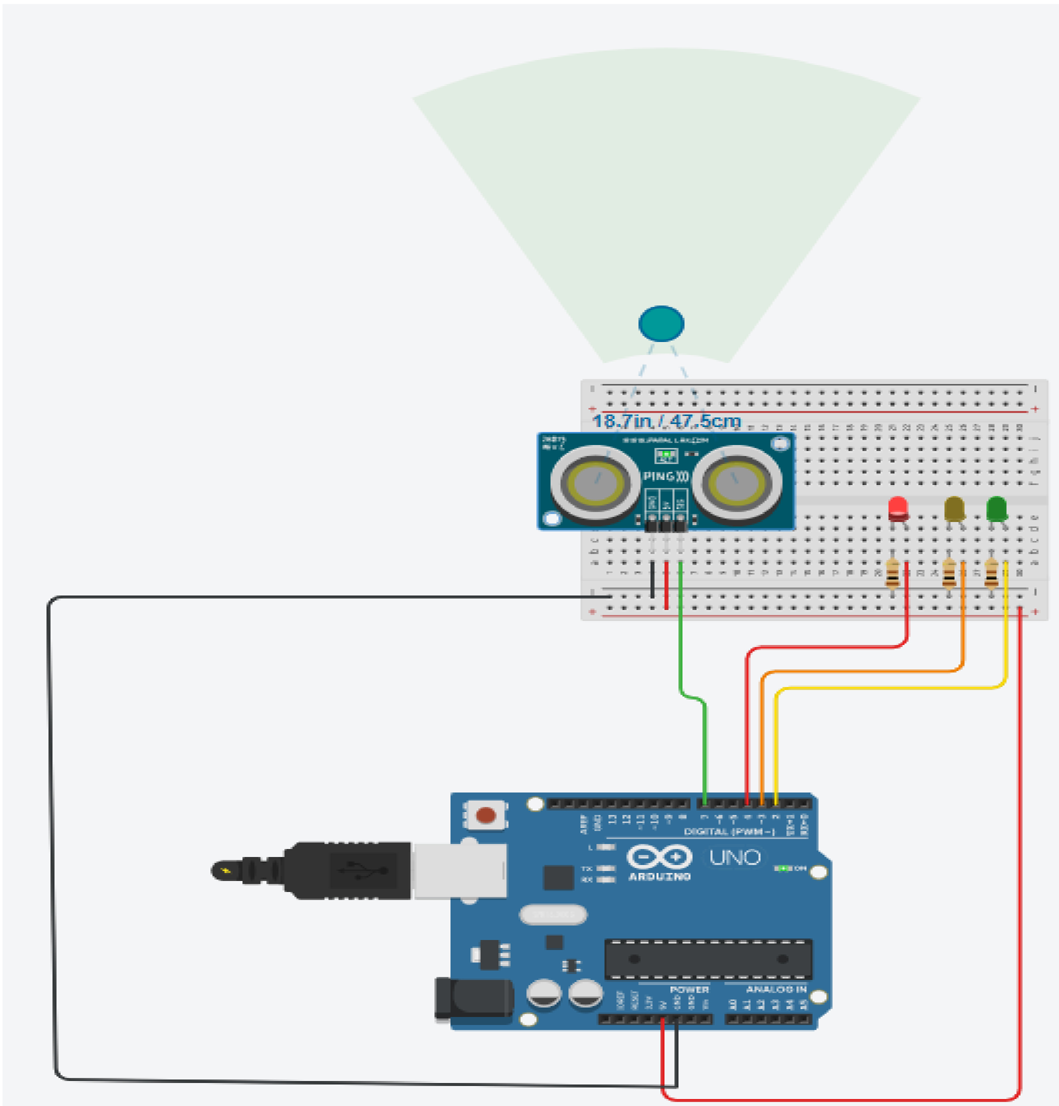


Figure 3.10 Case 4 - When there is an object inside the range of the Ultrasonic distance sensor simulation but inside the danger zone

When there is an object inside the range of the ultrasonic distance sensor but is at a careful distance, then the red LED is glown indicating that it is not safe to reverse.

3.3 Summary

From the results and testing done we have been able to identify all the test cases for our project. In the smart street light system we have checked all the cases and have shown that only when the LDR detects very low dim light or no light at all and the PIR sensor detects motion of vehicle or even a pedestrian walking by then the street light simulated through a light bulb will switch on. This is due to the fact that at night, the streetlights are of more importance and can protect from any damage due to poor visibility.

In the car reverse assistance, we have been able to identify all the test cases for our project. In the Car reverse Assistant we have checked all the four possible cases and have shown that the red LED glows when the object is very near to the ultrasonic distance sensor which is embedded at the back of the vehicle.And Yellow LED glows when the object is near to vehicle but at a cautious distance from the vehicle. And the Green LED glows when the vehicle is far enough from the object. This system thus can help drivers analyse their surroundings behind the vehicle and hence can reduce the damage caused by accidents while taking reverse.

After the project testing we discussed it among our classmates and acquaintances and many of them were of the view that such a system would indeed benefit society and should be implemented on a larger scale.

CHAPTER 4

CONCLUSION AND FUTURE ENHANCEMENT

We did two projects namely Smart Street Lights and a Car Reverse Assistance using an Arduino UNO board.

The project we did helped in deeper understanding of connecting and handling electrical related components as well as stimulating it through tinkercad.From this project we learned how to use an Arduino board and programming with it. We learned how to use a breadboard and connect different components. We learned the functionality of ultrasonic sensors and photoelectric sensors. We also learned about soft skills such as teamwork, team coordination and presentation making.

The Smart Street light is a much needed project for the development of our country as it saves a lot of electrical energy which helps in the sustainable development of the country. The Smart Street since it has a lot of demand so it can be a good business idea too.

The car reverse Assistance project is also a very useful project since a lot of accidental costs can be reduced if we install this device in a parking space. Major car companies can incorporate this device in their vehicle to completely eradicate accidents while reversing the car. cost of the components, quality and size of the components can be reduced as well. This can also be extrapolated to other vehicles such as trucks which have a larger size as a future enhancement.

APPENDIX

SMART STREET LIGHT CODE:

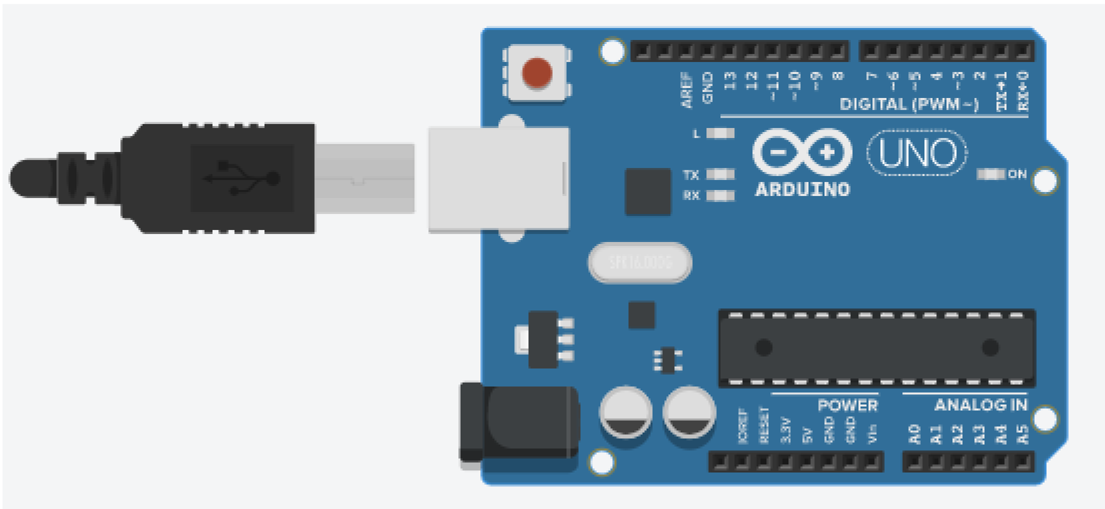
```
int ldr_pin = A5;
int ldr_value;
//2nd one
int pirsensor = LOW;
//2nd end
int light = 3;

void setup()
{
 pinMode(light, OUTPUT);
 pinMode(ldr_pin, INPUT);
        pinMode(13, OUTPUT);
 pinMode(2,INPUT);
 Serial.begin(9600);
}
void loop()
{
 ldr_value = analogRead(ldr_pin);
 Serial.println(ldr_value);
 if (ldr_value > 450)
  digitalWrite(light, 0);
 else
  digitalWrite(light, 1);
        //2nd
 pirsensor = digitalRead(2);
 if(pirsensor == HIGH)
 {
        digitalWrite(13, HIGH);
 }
 else
 {
        digitalWrite(13, LOW);
 }
 delay(10);
}
```

CAR REVERSE PARKING ASSISTANT CODE:

```
// C++ code
//
int distanceThreshold = 0;

int cm = 0;

int inches = 0;

long readUltrasonicDistance(int triggerPin, int echoPin)
{
  pinMode(triggerPin, OUTPUT);  // Clear the trigger
  digitalWrite(triggerPin, LOW);
  digitalWrite(triggerPin, HIGH);
  digitalWrite(triggerPin, LOW);
  pinMode(echoPin, INPUT);
  // Reads the echo pin, and returns the sound wave travel time in microseconds
  return pulseIn(echoPin, HIGH);
}

void setup()
{
  Serial.begin(9600);

  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(4, OUTPUT);
}

void loop()
{
  // set threshold distance to activate LEDs
  distanceThreshold = 350;
  // measure the ping time in cm
  cm = 0.01723 * readUltrasonicDistance(7, 7);
  // convert to inches by dividing by 2.54
  inches = (cm / 2.54);
  Serial.print(cm);
  Serial.print("cm, ");
  Serial.print(inches);
  Serial.println("in");
  if (cm > distanceThreshold) {
    digitalWrite(2, LOW);
    digitalWrite(3, LOW);
    digitalWrite(4, HIGH);
  }
```

```
  if (cm <= distanceThreshold && cm > distanceThreshold - 100) {
    digitalWrite(2, HIGH);
    digitalWrite(3, LOW);
    digitalWrite(4, LOW);
  }
  if (cm <= distanceThreshold - 100 && cm > distanceThreshold - 250) {
    digitalWrite(2, LOW);
    digitalWrite(3, HIGH);
    digitalWrite(4, LOW);
  }
  if (cm <= distanceThreshold - 250 && cm > distanceThreshold - 350) {
    digitalWrite(2, LOW);
    digitalWrite(3, LOW);
    digitalWrite(4, HIGH);
  }
  if (cm <= distanceThreshold - 350) {
    digitalWrite(2, LOW);
    digitalWrite(3, LOW);
    digitalWrite(4, HIGH);
  }
  delay(100); // Wait for 100 millisecond(s)
}
```

ARDUINO UNO R3 PIN DIAGRAM:



4.1Figure-Arduino Board

PINS	*USAGE*
GND	Ground
VCC	Voltage at the common collector
A0-A5	Analog Input Pins
0-13	Input/Output Pins

FUNCTIONS DESCRIPTION:

- **SETUP function :**
  - It contains an initial part of the code to be executed. The pin modes, libraries, variables, etc., are initialized in the setup section. It is executed only once during the uploading of the program and after reset or power up of the Arduino board.
- **LOOP function :**
  - The loop contains statements that are executed repeatedly. The section of code inside the curly brackets is repeated depending on the value of variables.
- **pinMode(pin, mode):**
  - The specific pin number is set as the INPUT or OUTPUT in the pinMode () function.
  - **Pin:** It is the pin number. We can select the pin number according to the requirements.
  - **Mode:** We can set the mode as INPUT or OUTPUT according to the corresponding pin number.
- **Serial.begin(9600):**
  - Sets the data rate in bits per second (baud) for serial data transmission.
  - The above function sets the data rate as 9600 bits per second for serial data transmission.
- **analogRead(pin):**
  - Reads the value from the specified analog pin.
- **digitalWrite(pin,HIGH/LOW):**
  - Write a HIGH or a LOW value to a digital pin.
- **digitalRead(pin):**
  - Reads the value from a specified digital pin, either HIGH or LOW.

- **delay(milliseconds):**
  - Pauses the program for the amount of time (in milliseconds) specified as parameter. (There are 1000 milliseconds in a second.)
  - The code pauses the program for one second before toggling the output pin.
- **pulseIn(pin,HIGH/LOW):**
  - Reads a pulse (either HIGH or LOW) on a pin.
  - For example, if the value is HIGH, pulseIn() waits for the pin to go from LOW to HIGH, starts timing, then waits for the pin to go LOW and stops timing. Returns the length of the pulse in microseconds or gives up and returns 0 if no complete pulse was received within the timeout.
- **Serial.print():**
  - Prints data to the serial port as human-readable ASCII text.

REFERENCES
(Standard IEEE Format Sample)

[1] Advanced Microprocessors and Peripherals Edition 3 by K M Bhurchandi, A K Ray

[2] Circuits - Learn how to use Tinkercad

[3] Arduino Reference

[4] Light Sensor including Photocell and LDR Sensor

[5] Understanding How Ultrasonic Sensors Work | MaxBotix Inc.

BIODATA

Name : V.Kaarthik Shrinivas
Mobile Number : 6379809820
E-mail : kaarthikshrinivas.v219@vitstudent.ac.in
Permanent Address : D.No: 3/29, 2nd Cross Street, Jayaram Kolathur, Chennai - 99.

Name : Suraj P
Mobile Number : 9176623208
E-mail : suraj.peddhibhotla2019@vitstudent.ac.in
Permanent Address : Flat No 10, East Coast Flats, Gandhi Adyar,Chennai - 20

Name : Vinod B
Mobile Number :7010683299
E-mail :vinod.b2019@vitstudent.ac.in
Permanent Address :A2, megala nagar opposite to bethel church vengaivasal, Chennai