TECHNICAL ANSWERS TO REAL WORLD PROBLEMS

ECE1901

SMART STRRET LIGHT BASED ON VEHICLE MOVEMENT

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SUMMER SEMESTER SPECIAL 2021-22

DECLARATION BY AUTHORS

This is to declare that this report has been written by us as part of our coursework. No part of the report is plagiarized from other sources. All the information included from other sources has been duly acknowledged

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CERTIFICATE

This is to certify that the project report entitled “SMART STREET LIGHT BASED ON VEHICLE MOVEMENT” was done by S ADITYA SAGAR, J L V S SAI SANTHOSH, KOTHURU SAI PAVAN, B V S R G S N ADITYA, BASAVA PAVAN SRIRAM of Vellore institute of technology under the supervision of Ms Prayline Rajabai c, VIT Vellore.

In fulfilment of TARP during period Summer Semester Special 2021-22

DATE: 26 August 2022

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ABSTRACT:

- we all see the lights on the highway or on a Long Straight Road (L.S.R) glow all night even there is no vehicle passing through and we might not no, but there is a lot of energy wastage that is being used by the street lights unnecessarily. The project that our group is working is designed to detect vehicle movement on highways or on LSR's to switch ON only a block of street lights ahead of it (vehicle), and to switch OFF the trailing lights to save energy
- In general, our project proposes a solution for energy conservation

INTRODUCTION/DEFINING PROJECT:

- The project that our group is working is designed to detect vehicle movement on highways or on LSR's to switch ON only a block of street lights ahead of it (vehicle), and to switch OFF the trailing lights automatically to save energy. So, when there are no vehicles on the highway, then all the lights remain OFF.
- However, there is another mode of operation where instead of switching OFF the lights completely, they remain ON with 10% of the maximum intensity of the light. As the vehicle approaches, the block of street lights switches to 100% intensity and then as the vehicle passes by, the trailing lights revert back to 10% intensity again

PROBLEM STATEMENT:

- This proposed system provides a solution for energy saving. This is achieved by sensing an approaching vehicle and then switches ON a block of street lights ahead of the vehicle. As the vehicle passes by, the trailing lights switch OFF automatically. Thus, we save a lot of energy. So when there are no vehicles on the highway, then all the lights remain OFF. However, there is another mode of operation where instead of switching OFF the

lights completely, they remain ON with 10% of the maximum intensity of the light. As the vehicle approaches, the block of street lights switches to 100% intensity and then as the vehicle passes by, the trailing lights revert back to 10% intensity again. High intensity discharge lamp (HID) presently used for urban street light are based on principle of gas discharge, thus the intensity is not controllable by any voltage reduction. White Light Emitting Diode (LED) based lamps are soon replacing the HID lamps in street light. Intensity control is also possible by Pulse Width Modulation (PWM) generated by the microcontroller. Sensors used on either side of the road senses vehicle movement and sends logic commands to microcontroller to switch ON/OFF the LEDs. Thus, this way of dynamically changing intensity ON/OFF helps in saving a lot of energy.

LITERATURE REVIEWS:

1) This papers mainly aims at saving energy by detecting the vehicle movement on highways and switching on the block of street light ahead of it and simultaneously switching off the trailing lights. This project requires a sensor to detect the day and night and an array of piezoelectric sensors to detect the vehicle movements and accordingly switching on the lights ahead of it. So when there are no vehicles on the highway, then all the lights remains off. Sensors used on either side of the road senses vehicle movement and sends logic commands to microcontroller to change the intensity of the lamps accordingly. Thus this way of dynamically changing intensity helps in saving a lot of energy. The aim of smart street lights is to save energy, and to save cost. In our project we make use of the piezoelectric sensors, which is cost effective. ZIGBEE technology is used to communicate between the lights and internet of things to calculate parameters as well as store the information about the vehicles

2) This paper concerned with the development and implementation of smart street lighting control system based using Led lamp and Lora Wireless communication. Currently, a traditional street lights are automatically turn on or off based on timer or day/night sensor. Recently, the conventional light sources are replaced by Led, the street lighting system integrates with technology and control capabilities to reduce energy costs for every city this paper gives us the idea about the street lighting system using LoRaWAN data transmission technology introducing outstanding features like energy savings, long lifetime, high reliability, pure light color, fast response, and friendliness to the environment. Furthermore, the intensity of the LED can be controlled easily. In this paper, the smart lighting system is designed to control and monitor devices via wireless transmission frequencies below 1 GHz.

3) This paper introduces a smart street light controlling system to boost energy efficiency of the city. Now a days people are so busy that they rarely find the time to switch OFF the light when it has no use. This results in consumption of lot of energy. This paper proposes the system where street light changed to ON state in the evening before sun sets and they are switched off in the morning after sunrise when there is enough light on the street. This leads to reduce of energy consumption. In this system the movement of vehicle and human is detected on highways to switch on a chunk of street light ahead of it and switch off the trailing lights. This is achieved by processing the image of the object and sending control message to the street light block. Additional feature of the system such as using a suitable sensor of the detection of failed street light and then sending the SMS to control authority using GSM mode to take appropriate action regarding failure

4) Nowadays the main reason anyone thinks about saving electrical energy in their houses alone is to save energy bills but there are many more reasons to save electrical energy beyond saving our

wallet. Most of the energy resources we currently use are non-renewable sources of energy and on top of that they also cause tons of pollution. Roadside Street lights consume tons of energy every year and their energy inefficiency waste a lot of it. IoT enables us to think and implement ideas which can save a lot of energy. One such idea as proposed by this article was an automatic highway lighting system which is designed to detect movement of vehicles on the road and accordingly turn ON and turn OFF the street lights ahead of the vehicles to save energy as compared to turning them on permanently.

Intensity control is also possible by Pulse Width Modulation to dynamically change the intensity of light and turn the light ON and OFF saving lots of energy. The existing systems are manually operated and in case of any manual failure the lights can stay ON even during daytime wasting energy and the timing of turning the lights ON also has to be done manually which is a very inconsistent and unreliable way of completing the said task. LDRs can be used to alter intensity alongside regulated power supply. Solar street lights can also be converted into smart automated street lights for more power saving and offers a cheap, long term, reliable and efficient way of saving energy.

COMPONENTS:

Power supply: A power supply is a component that supplies power to at least one electric load. Typically, it converts one type of electrical power to another, but it may also convert a a different form of energy

Voltage regulator: voltage regulator, any electrical or electronic device that maintains the voltage of a power source within acceptable limits. The voltage regulator is needed to keep voltages within the prescribed range that can be tolerated by the electrical equipment using that voltage.

Rectifier: an electrical device which converts an alternating current into a direct one by allowing a current to flow through it in one direction only.

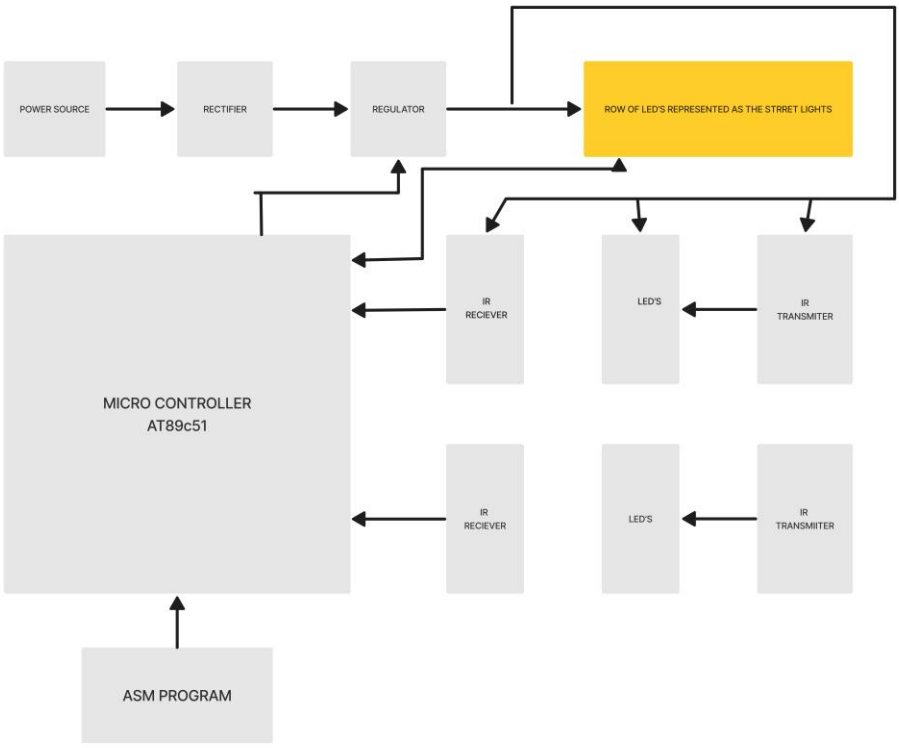
Micro controller AT89C51: The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pinout.

LED'S: used for the representation of street lights

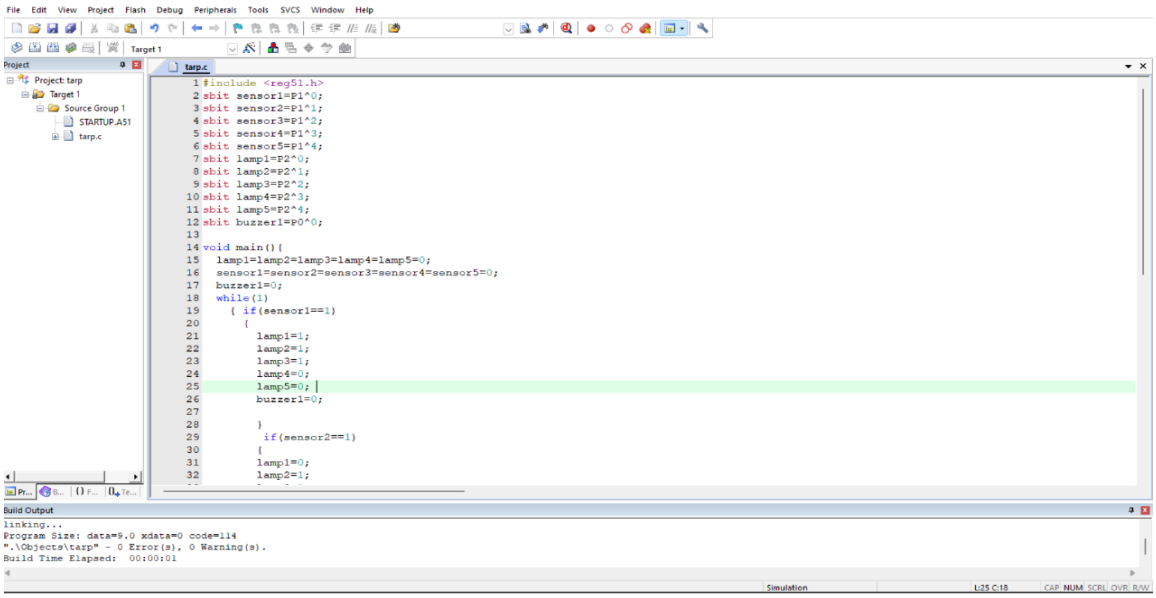
IR TRANSMITTER & RECEIVER: The photo-diode's resistance and output voltage change in proportion to the IR light received. This is the underlying working principle of the IR sensor. When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver**.**

and diodes, resistors and capacitors are used

BLOCK DIAGRAM:



CODE IN KEIL:

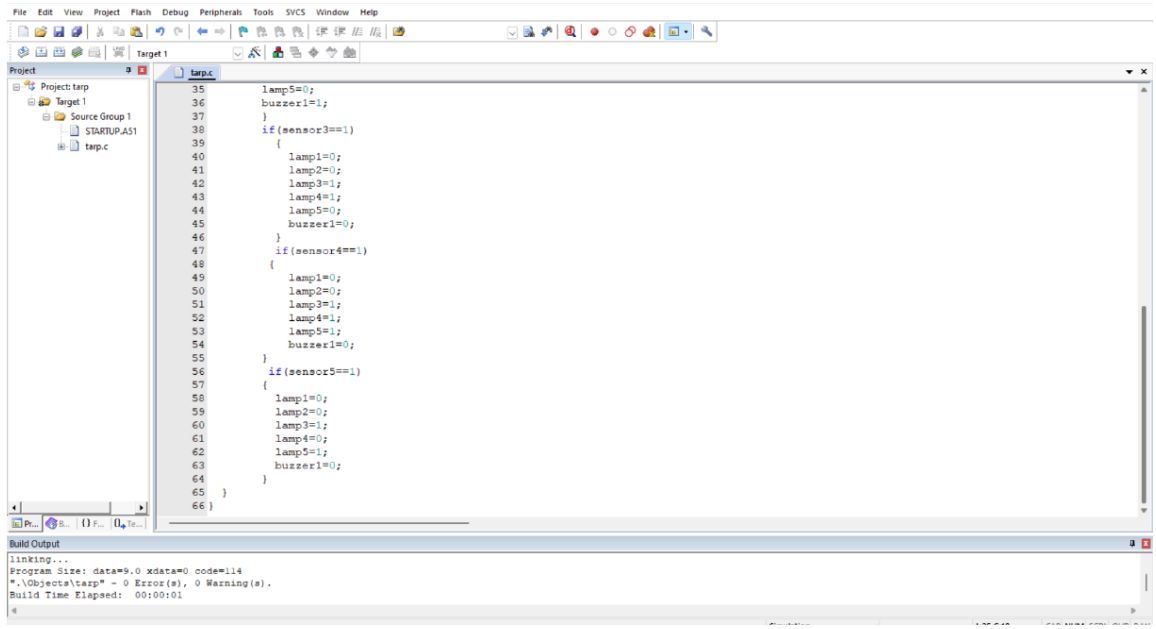


```
#include <reg51.h>
sbit sensor1=P1^0;
sbit sensor2=P1^1;
sbit sensor3=P1^2;
sbit sensor4=P1^3;
sbit sensor5=P1^4;
sbit lamp1=P2^0;
sbit lamp2=P2^1;
sbit lamp3=P2^2;
sbit lamp4=P2^3;
sbit lamp5=P2^4;
sbit buzzer1=P0^0;

void main(){
  lamp1=lamp2=lamp3=lamp4=lamp5=0;
  sensor1=sensor2=sensor3=sensor4=sensor5=0;
  buzzer1=0;
  while(1)
     { if(sensor1==1)
       {
         lamp1=1;
         lamp2=1;
         lamp3=1;
         lamp4=0;
         lamp5=0;
         buzzer1=0;

         }
          if(sensor2==1)
         {
         lamp1=0;
         lamp2=1;
```

```
Build Output
linking...
Program Size: data=9.0 xdata=0 code=114
".\Objects\tarp" - 0 Error(s), 0 Warning(s).
Build Time Elapsed:  00:00:01
```

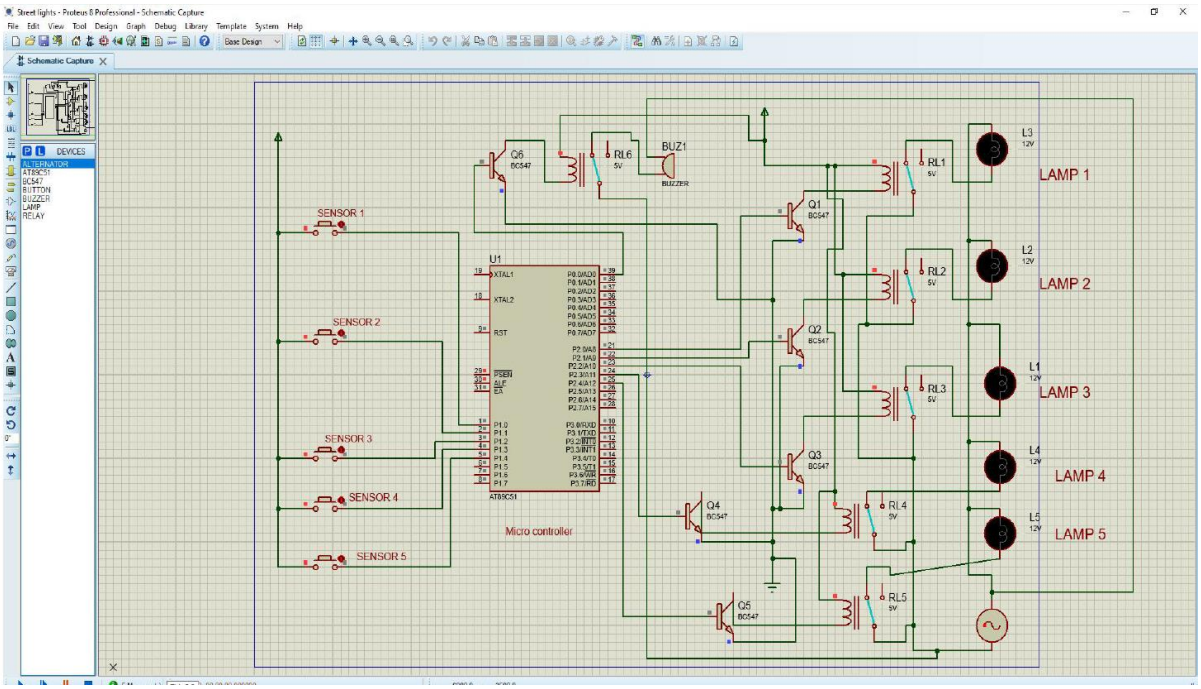


```
         lamp5=0;
         buzzer1=1;
         }
         if(sensor3==1)
           {
             lamp1=0;
             lamp2=0;
             lamp3=1;
             lamp4=1;
             lamp5=0;
             buzzer1=0;
           }
           if(sensor4==1)
          {
             lamp1=0;
             lamp2=0;
             lamp3=1;
             lamp4=1;
             lamp5=1;
             buzzer1=0;
         }
          if(sensor5==1)
         {
           lamp1=0;
           lamp2=0;
           lamp3=1;
           lamp4=0;
           lamp5=1;
           buzzer1=0;
         }
  }
}
```

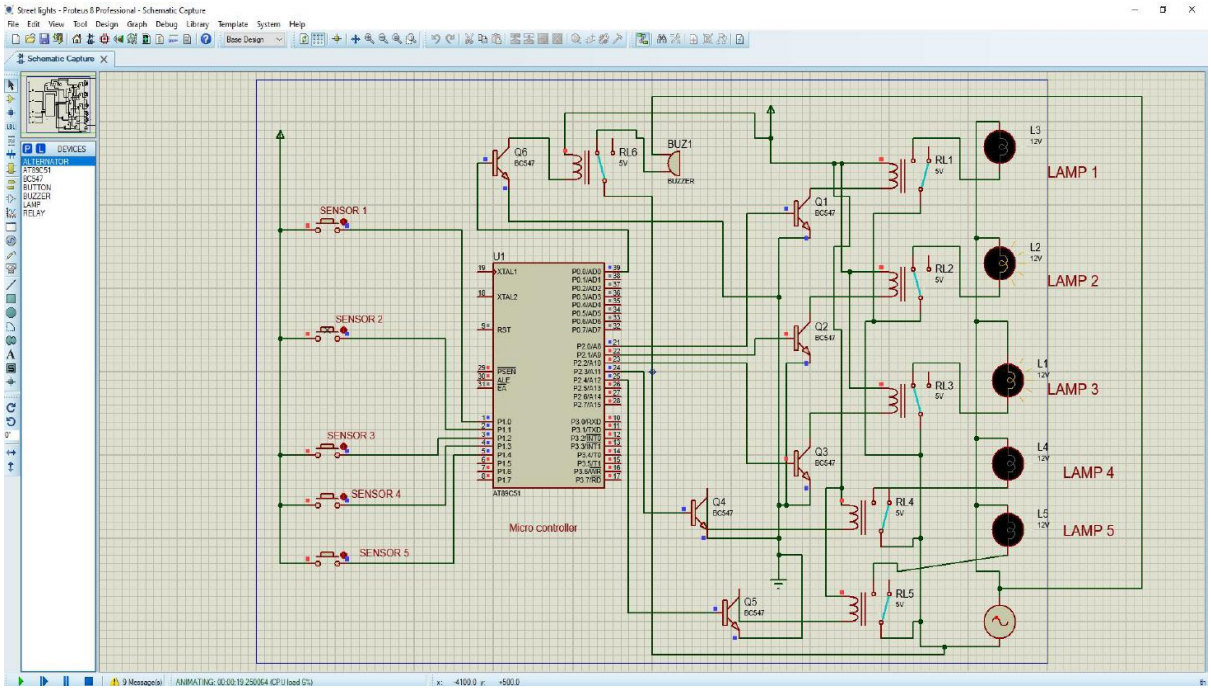
```
Build Output
linking...
Program Size: data=9.0 xdata=0 code=114
".\Objects\tarp" - 0 Error(s), 0 Warning(s).
Build Time Elapsed:  00:00:01
```

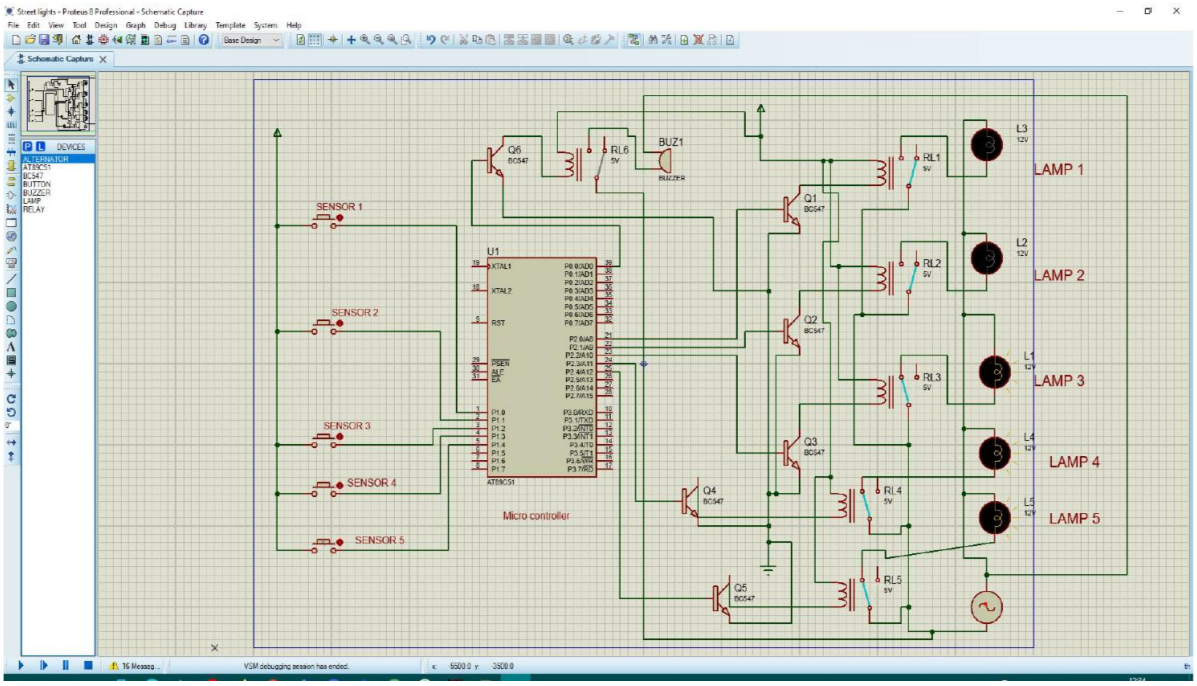
PROTEUS SIMULATIONS:

BEFORE DUMPING THE CODE:



AFTER DUMPING THE CODE:



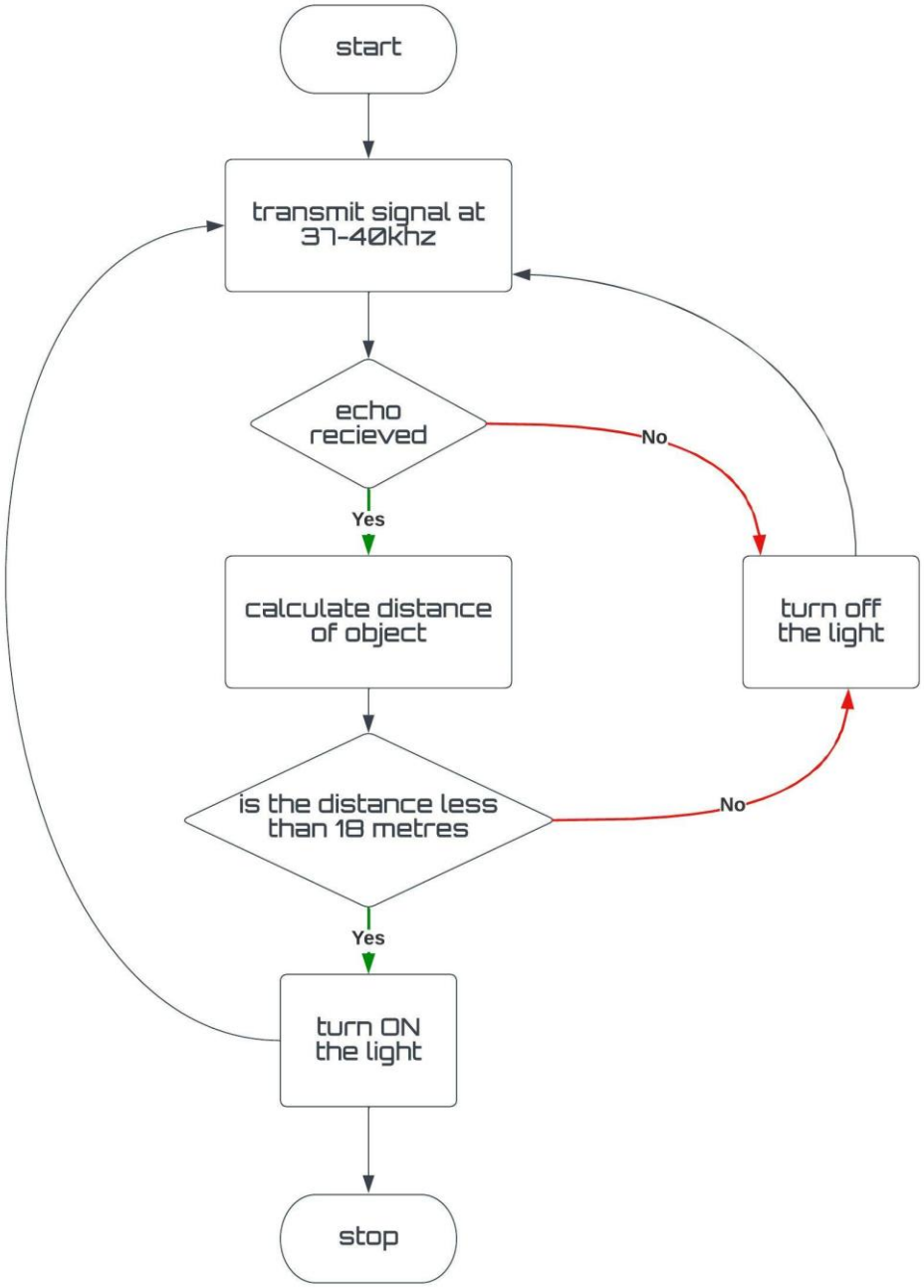


WORKING:

- So as seen in block diagram we are going to create the circuit using proteus and for the simulation we are using executed code in Keil software. As the vehicles reaches the sensor 1 lamp1 and lamp2 will turned on and when it reaches sensor2 lamp 2 and 3 will be turned on and lamp1 will be offed automatically. By this we can reduce electricity consumption.
- Consider we have any speed breaker on road, we have placed a Buzzer before the speed breaker and the light near the speed breaker will always be kept on. When the vehicle reaches sensor before the speed breaker, the Buzzer will be on & this will alert the nearing vehicle.

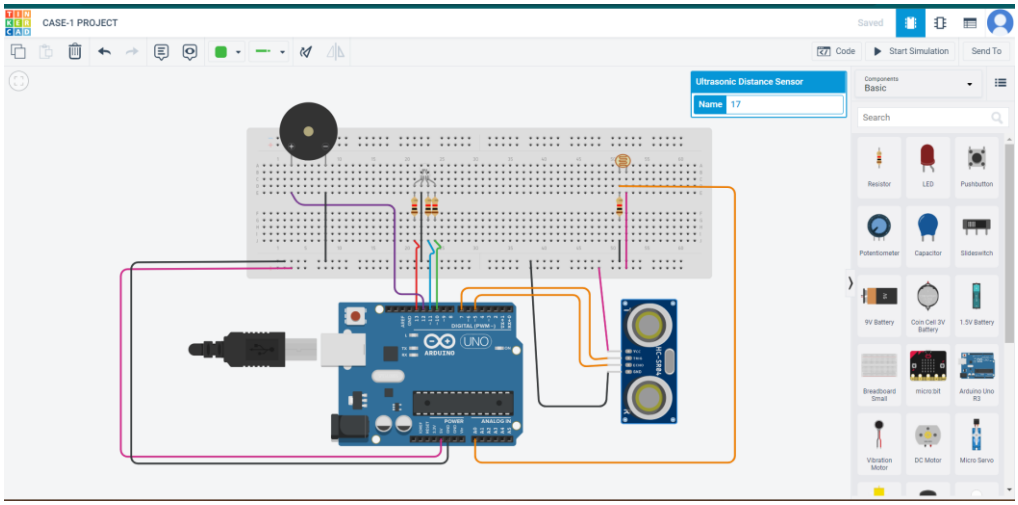
So this version of proteus has an tinker cad version that just explains the base idea of the project

TINKER CAD VERSION BLOCK DIAGRAM

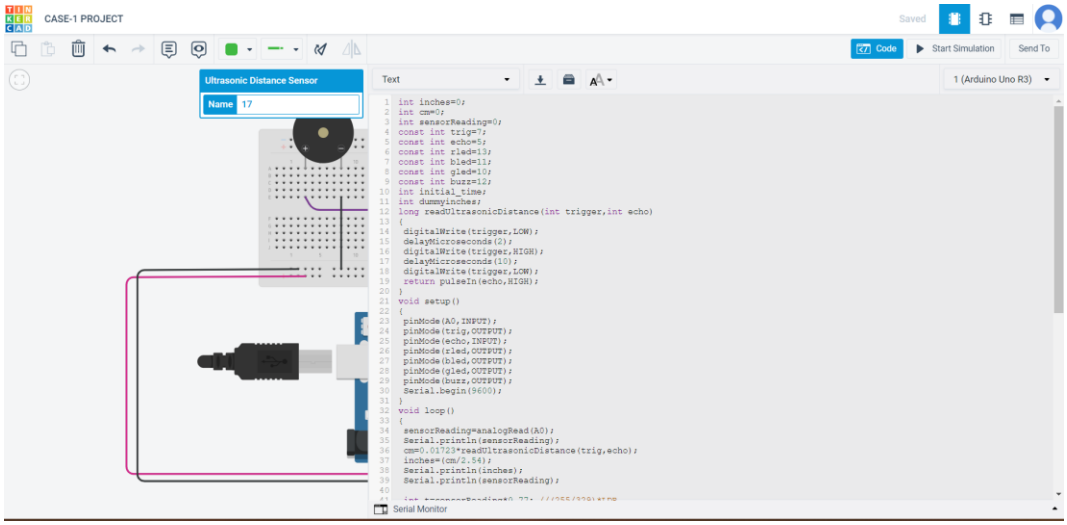


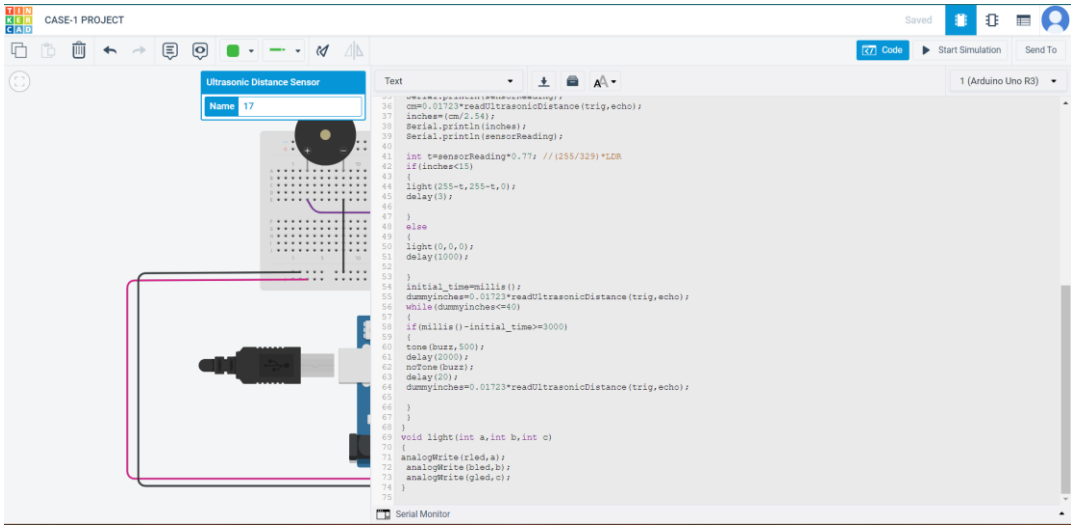
This is the second implementation of our project model that is if the sun light intensity is very less (i.e., cloudy days) and also if ultrasonic sensor detects any object in its range, then the street lights will glow. The street light intensity will be off when the sunlight light intensity is high and also if ultrasonic sensor doesn't detect any of the objects in its range which helps us to save energy. This method here we are going to simulate it in **TINKER CAD**

TINKER CAD SIMULATION:



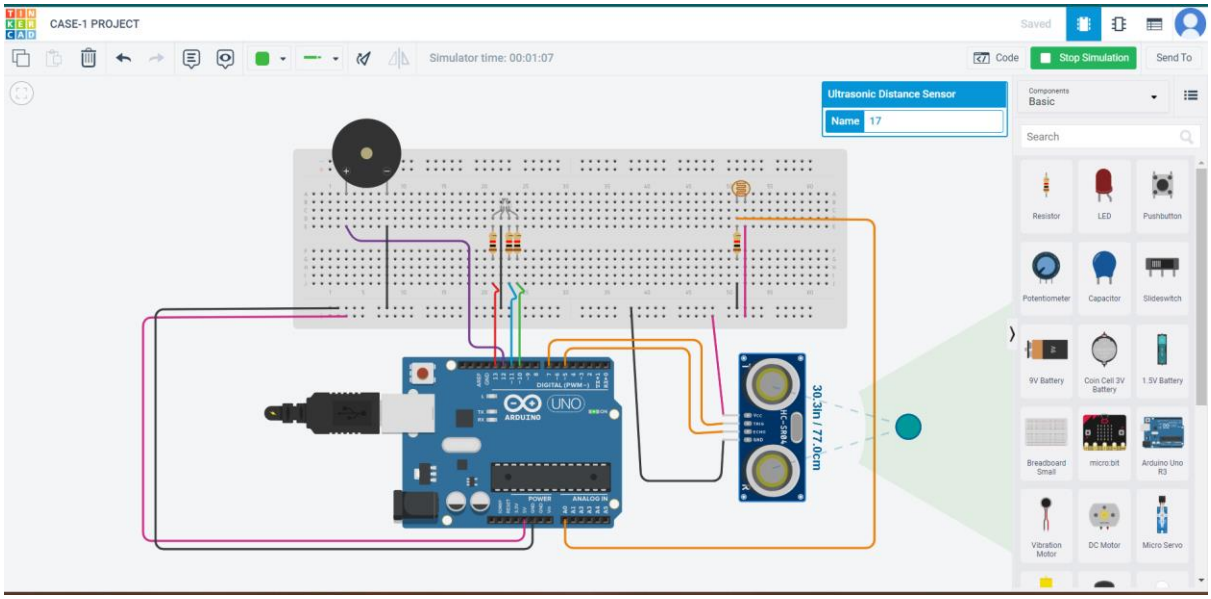
CODE:





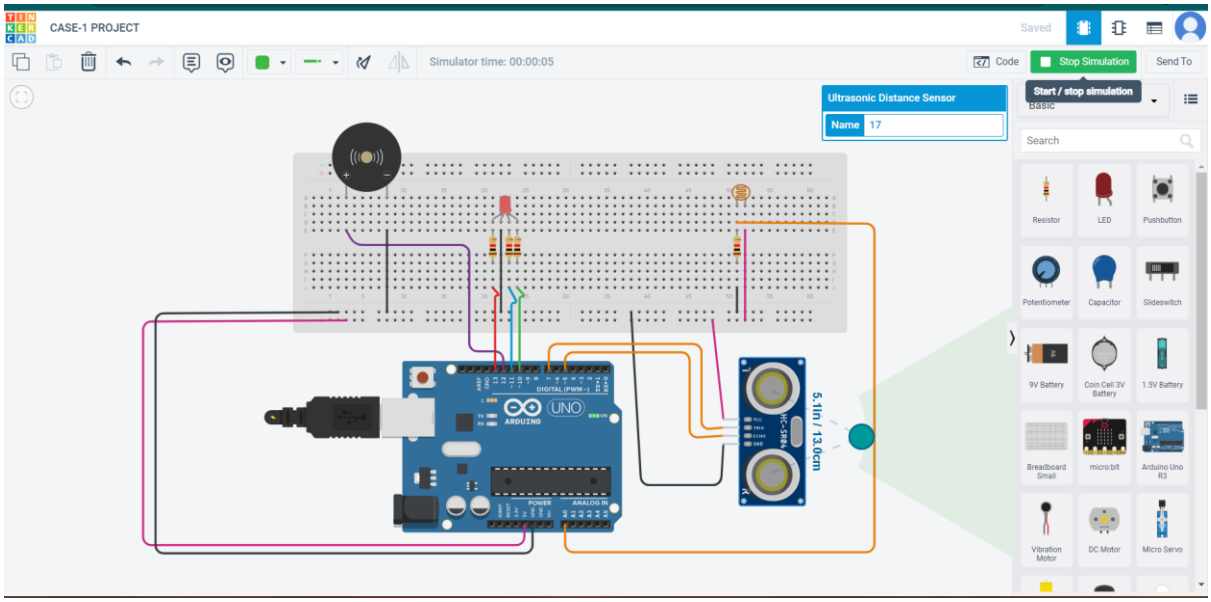
AFTER SIMULATION:

When not in range:



When not in range the buzzer won’t ring and the lights doesn’t ON

When in range:



when in range the buzzer will ring and lights will be ON

FUTURE DEVELOPMENTS:

- GREEN INITIATIVE:

  As of 2030, most of the four wheelers are electrical and there will be need of more charging stations and lot of power and form our project we aim to save electricity and here we circulate that energy-to-energy stations,

  And we aim to set up these stations on the way of highways as travelling long distance make difficult on EV vehicles and keeping these stations would be very helpful and these stations are under government control

REFERENCES:

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- https://ieeexplore.ieee.org/document/8921028
- https://ieeexplore.ieee.org/abstract/document/8058303
- https://www.irjmets.com/uploadedfiles/paper/issue_5_may_2022/23382/final/fin_irjmets1652953856.pdf