Traffic Light Management System Using Traffic Density

A project report of Phase-I submitted to
Rajiv Gandhi Proudyogiki Vishwavidhyalaya, Bhopal
towards partial fulfillment of
the degree of
Bachelor of Engineering in Computer Engineering

Guided By:
Mr. K. P. Singh
Professor
Department of Computer Engg.

Dr. Soma Saha
Assisstant Professor
Department of Computer Engg.

Submitted By:
0801CS161076 - Sanjay Gautam
0801CS161098 - Vaibhav Gupta
0801CS161080 - Satyam Dubey
0801IP161033 - Nidhi Dongre
0801CS173D16 - Swati Jog

DEPARTMENT OF COMPUTER ENGINEERING
SHRI G.S. INSTITUTE OF TECHNOLOGY AND SCIENCE, INDORE(M.P.)
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SHRI G.S. INSTITUTE OF TECHNOLOGY AND SCIENCE, INDORE(M.P.)

RECOMMENDATION

The project report of Phase-I entitled ***Traffic Light Management System Using Traffic Density*** submitted by: **0801CS161076 - Sanjay Gautam, 0801CS161098 - Vaibhav Gupta, 0801CS161080 - Satyam Dubey, 0801IP161033 - Nidhi Dongre, 0801CS173D16 - Swati Jog**, students of B.E. IV year in the session 2019-2020, towards partial fulfillment of the degree of **Bachelor of Engineering in Computer Engineering** of Rajiv Gandhi Proudyogiki VishwaVidhyalaya, Bhopal is a satisfactory account of their work.

Mr. K. P. Singh
Project Guide
Department of Computer Engg.

Dr. Urjita Thakar
Head
Department of Computer Engg.

Dr. Soma Saha
Project Guide
Department of Computer Engg.

Dean (Academics)
S.G.S.I.T.S. Indore

SHRI G.S. INSTITUTE OF TECHNOLOGY AND SCIENCE, INDORE(M.P.)

CERTIFICATE

The project report of Phase-I entitled ***Traffic Light Management System Using Traffic Density*** submitted by: **0801CS161076 - Sanjay Gautam, 0801CS161098 - Vaibhav Gupta, 0801CS161080 - Satyam Dubey, 0801IP161033 - Nidhi Dongre, 0801CS173D16 - Swati Jog**,

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Internal Examiner **External Examiner**

Date:

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0801CS161076 - Sanjay Gautam _____

0801CS161098 - Vaibhav Gupta _____

0801CS161080 - Satyam Dubey _____

0801IP161033 - Nidhi Dongre _____

0801CS173D16 - Swati Jog _____

ABSTRACT

Nowadays, due to increase in automobiles, controlling the traffic is the major issues in the cities. It has been estimated that average person spends 4-6 months of his life by waiting for the green signal. So to solve this problem and reduce the waiting time we have proposed a density based traffic light control system. Our Proposed system uses density based dynamic traffic light control system. Our System includes IR sensor which measure the traffic density at the junction. Sensor is interfaced with microcontroller. The microcontroller used in our system is ATMEGA-328 that is inbuilt in Arduino uno board.Arduino uno is widely used circuit for various circuit designing.**Note: This system is only for demonstration purpose for implementing real life IR sensor doesn't work, we have to use industrial sensor like ultrasonic, sonar etc.**

CONTENTS

Chapter 1

Introduction

1.1 Preamble

Traffic is major issue in metropolitian city, government is involving technology in every field of social issue.Now a days traffic is managed by traffic police or old method of traffic management using constant traffic timer. We have proposed with new idea to manage traffic light using flexible traffic timer that is managed by software that uses sensor to calculate traffic density. This arduino software give signal to traffic light according to traffic Density ***(IR sensor used only for demonstration purpose for implementing in real life we have to use industrial sensor)*** .

1.2 Need of the Project

Now days Traffic is managed using constant traffic timer we are solving this problem by making flexible traffic timer and change traffic light according to traffic density. For counting traffic density we are using IR(Infrared Sensor) sensor count number of vehicle as traffic density after counting traffic density of lane then call function traffic it written in arduino code.

1.3 Problem Statement

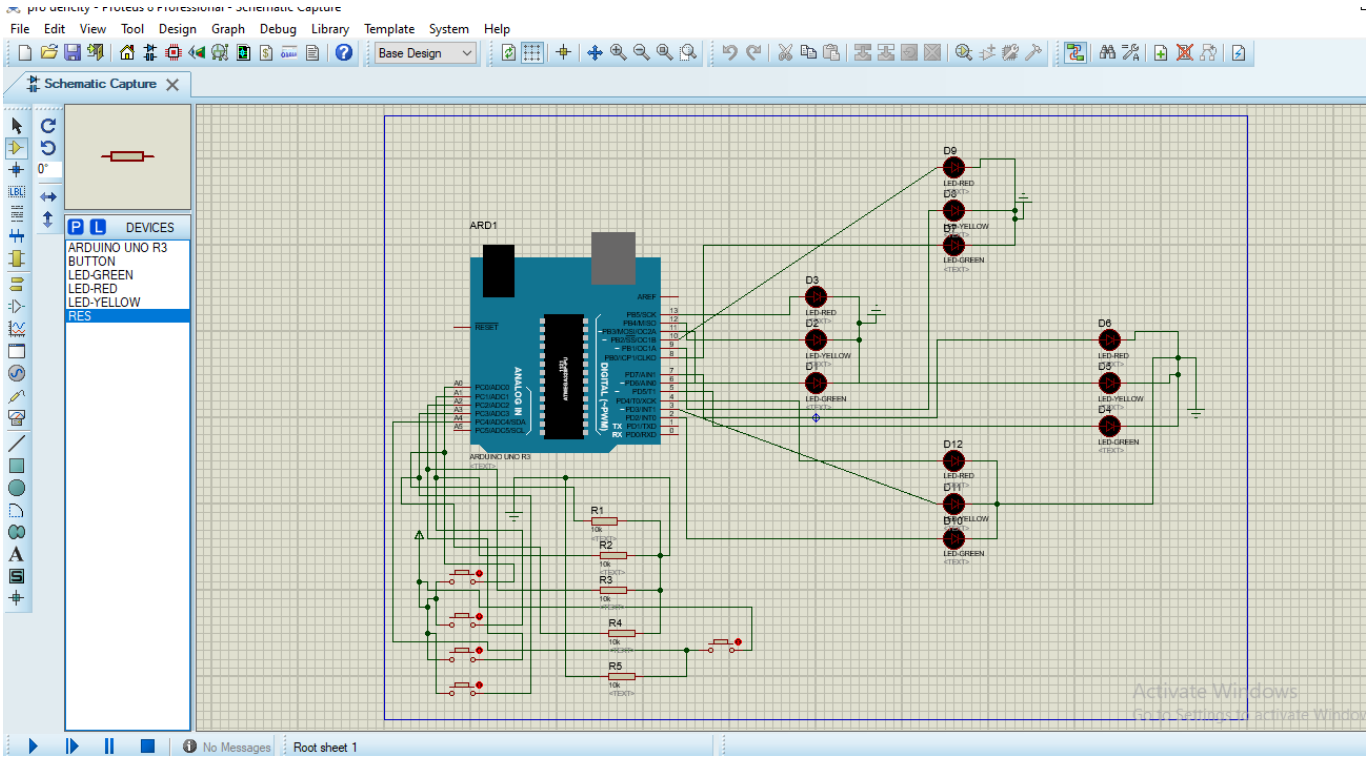
Conventional traffic light system uses fixed time delays. It is not according to the density. This increases the traffic jams and waiting timing on the lane increases. After a certain interval of time priority has to be changed dynamically based on number of vehicles on the road.

1.4 Objective

The objective is to design an intelligent traffic signal control system, Conventional traffic light system uses fixed time delays. It is not according to the density. This increases the traffic jams and waiting timing on the lane increases. After a certain interval of time priority has to be changed dynamically based on number of vehicles on the road.

1.5 Proposed Approach

We have proposed a system that uses density based dynamic traffic light control system which has the ability to prioritize the lane dynamically based on number of vehicles on the road.



Chapter 2

Background

2.1 Tools & Technologies

- Arduino software used for running code of embedded c.
- IR sensor used for identify objects on lane then send signal to LED lights blink.
- LED use for demonstrating traffic light that control by arduino micro-controller.
- Arduino uno board used upload program.
- Proteus software using for simulating purpose.

Chapter 3

Literature Review

3.1 Summary of reviewed Literature

The system will detect vehicles through using IR sensors connected in each lane of road. A sensor will be installed alongside the traffic light. It will track object along side the lane. Using sensor is a better technique to control the state change of the traffic light. It shows that it can reduce the traffic congestion and avoids the time being wasted by a green light on an empty road.IR sensor used only for demonstration purpose for real life implementation of this model used Industrial sensor that's cost very high or can use ultrasonic sensor or sonar sensor.

Chapter 4

Analysis

4.1 Existing Systems

Existing system are using fixed timer to each lane of road to control traffic light.So improvement this technique by making flexible timer that is depending on traffic density. The traffic lights used in India are basically pre-timed wherein the time of each lane to have a green signal is fixed. In a four lane traffic signal one lane is given a green signal at a time. Thus, the traffic light allows the vehicles of all lanes to pass in a sequence. So, the traffic can advance in either straight direction or turn by 90 degrees as shown in Fig.1. So even if the traffic density in a particular lane is the least, it has to wait unnecessarily for a long time and when it gets the green signal it unnecessarily makes other lanes wait for even longer durations.

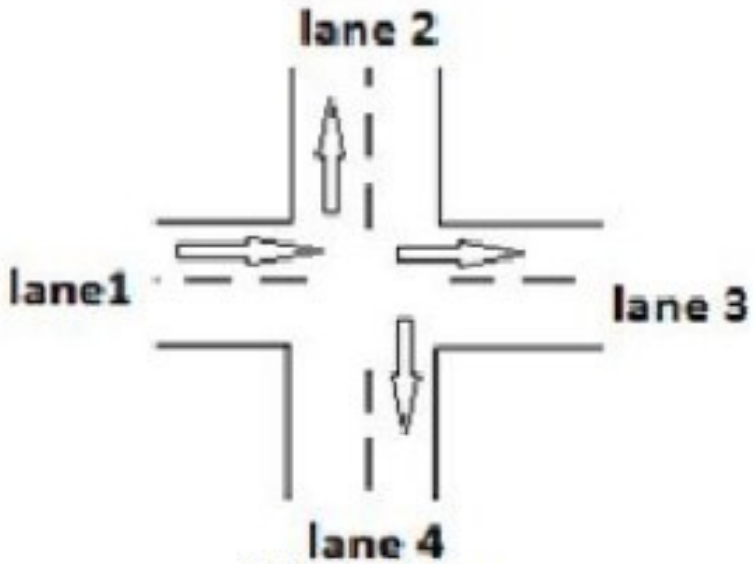


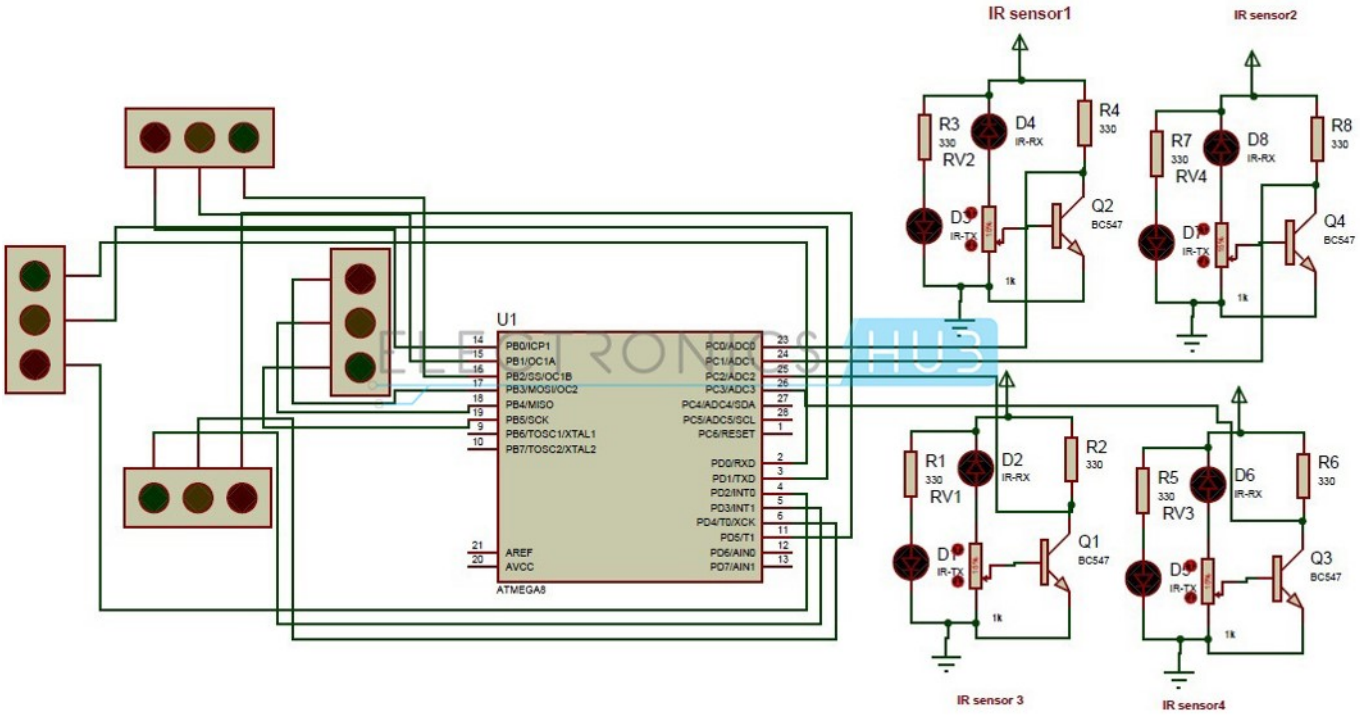
Fig.1 Lane diagram

4.2 Requirement Analysis

4.2.1 Functional Requirements

- IR Sensor detect object than arduino micro-controller send signal to traffic light.
- identify number of vehicle using IR sensor.
- traffic light control according to traffic density.
- arduino take input as traffic density from IR sensor and control traffic light.

4.2.2 Model Representation



4.3 Non Functional Requirements

- **Availablity** System should be available every time and on every window it should support.
- **Reliablity** System should be reliabale enough to satisfactorily the performance.
- **Maintainability** System should be easily maintainable. it should be flexible enough to stand with change and exceptions.
- **Security** Security is the main issue. System should be safe ensure the security. it will ensure secure transfer data.

4.4 System Requirements

4.4.1 Software Requirements

- proteus softawre for simulation
- arduino software

4.4.2 Hardware Requirements

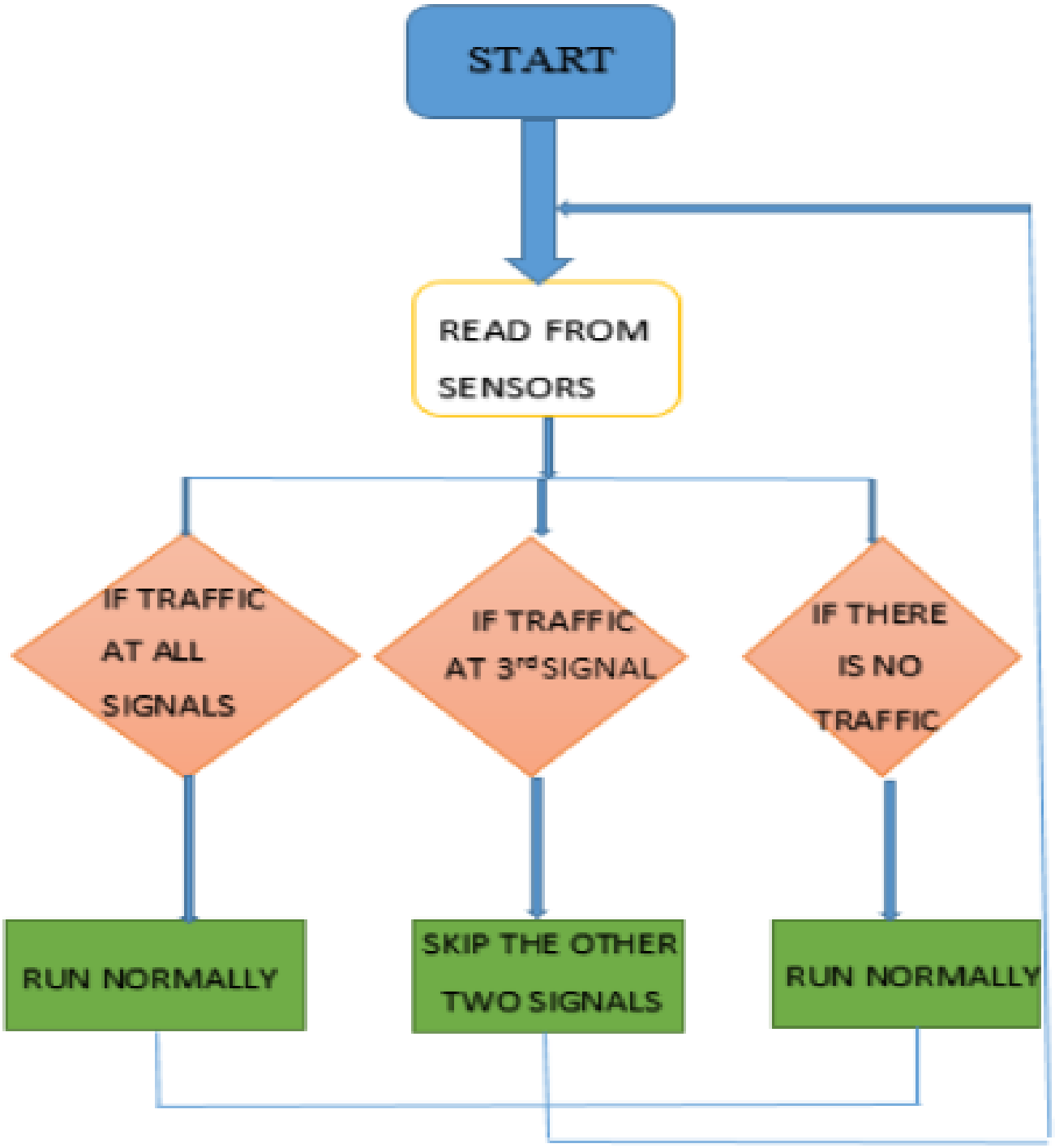
- ATmega8 controller
- PCB board
- IR sensors -4
- LED's-12(4-red,4-green,4-yellow)
- 12v Battery or adaptor
- Serial cable
- Connecting wires

Chapter 5

Implementation

5.1 Algorithm & Flow of algorithm

- Initially the signals are started by giving the power supply. The first step is to make sure that the signals are all in ON condition. During this all the traffic signals will blink in red light out of three signal one is green signal. This indicates that they are all in the working condition.
- The time delays have already been set for certain specific counts in the microcontroller. As soon as the microcontroller receives the counts from the IR circuit it will immediately detect the density of each road and accordingly allot the time delays for which each signal will show the green light. The higher the traffic density, the longer will be the time delay allotted.
- the microcontroller makes sure that the lowest density road is also opened and that the delay of the green light for that particular signal also comes to an end. Once all the roads are opened in a sequence, then the microcontroller again goes back to the second step where it checks for the density of traffic in each road. The whole process is repeated like a cycle.
- The main point that is to be noted regarding this process is that, whenever a particular road has no traffic, correspondingly, then traffic light glowing continue normally.


START
READ FROM SENSORS
IF TRAFFIC AT ALL SIGNALS
IF TRAFFIC AT 3rd SIGNAL
IF THERE IS NO TRAFFIC
RUN NORMALLY
SKIP THE OTHER TWO SIGNALS
RUN NORMALLY

Chapter 6

Testing & Results

6.1 Input & Output Of Algorithm

- if all lanes of road are clear traffic continue normally.
- if traffic is detected any one sensor then open green signal of this lane to clear traffic until not cleared traffic.
- for detecting multiple vehicle for demonstration we can increase number of sensor.

Chapter 7

Conclusion

Solution has been deducted which is controlling the traffic using Density based traffic light control system in a city using Arduino and IR sensors. A traffic light system has designed and developed with proper integration of both the hardware and the software. Besides all this we can say that this is just a prototype and an idea for controlling and managing the traffic lights which may be much costlier and difficult to implement on real life situations.To control the traffic light this project programmed in a way that it will be useful for proper planning of the road system.

Appendix A

Code

```
//#include "Timer.h"
//Timer t;

#define red1 13
#define yellow1 12
#define green1 11

#define red2 10
#define yellow2 9
#define green2 8

#define red3 7
#define yellow3 6
#define green3 5

#define red4 4
#define yellow4 3
#define green4 2

#define sensor1 14
#define sensor2 15
#define sensor3 16
#define sensor4 17
#define sensor5 18

#define yellowLightTime 2000
#define greenLightTime 5000
#define sensorCheckTime 5000

int line=0;
```

```
void setup()
{
  for (int i = 0; i < 14; i++)
  {
    pinMode(i, OUTPUT);
  }
  for(int i=14;i<20;i++)
  {
    pinMode(i, INPUT_PULLUP);
  }

//  int tickEvent = t.every(2000, doSomething);
  digitalWrite(red2, HIGH);
  digitalWrite(red3, HIGH);
  digitalWrite(red4, HIGH);
}

void loop()
{
   if(digitalRead(sensor1) == 1)
   line=0;
   else if(digitalRead(sensor2) == 1)
   line=1;
   else if(digitalRead(sensor3) == 1)
   line=2;
   else if(digitalRead(sensor4) == 1)
   line=3;
    else if(digitalRead(sensor5) == 1)
   line=4;

   traffic(line);
   line++;
   if(line == 5)
   line=0;
}

void traffic(int line)
{
  switch(line)
  {
    case 0:
    digitalWrite(red1, LOW);
    digitalWrite(yellow1, LOW);
    digitalWrite(green1, HIGH);
    Delay(greenLightTime);

   digitalWrite(green1, LOW);
   digitalWrite(yellow1, HIGH);
```

```
Delay(yellowLightTime);

digitalWrite(yellow1, LOW);
digitalWrite(red1, HIGH);
break;

case 1:
digitalWrite(red2, LOW);
digitalWrite(yellow2, LOW);
digitalWrite(green2, HIGH);
Delay(greenLightTime);

digitalWrite(green2, LOW);
digitalWrite(yellow2, HIGH);
Delay(yellowLightTime);

digitalWrite(yellow2, LOW);
digitalWrite(red2, HIGH);
break;

case 2:
digitalWrite(red3, LOW);
digitalWrite(yellow3, LOW);
digitalWrite(green3, HIGH);
Delay(greenLightTime);

digitalWrite(green3, LOW);
digitalWrite(yellow3, HIGH);
Delay(yellowLightTime);

digitalWrite(yellow3, LOW);
digitalWrite(red3, HIGH);
break;

case 3:
digitalWrite(red4, LOW);
digitalWrite(yellow4, LOW);
digitalWrite(green4, HIGH);
Delay(greenLightTime);

digitalWrite(green4, LOW);
digitalWrite(yellow4, HIGH);
Delay(yellowLightTime);

digitalWrite(yellow4, LOW);
digitalWrite(red4, HIGH);
break;
```

```
     case 4:
     digitalWrite(red1, LOW);
     digitalWrite(yellow1, LOW);
     digitalWrite(green1, HIGH);
     Delay(greenLightTime);

    digitalWrite(green1, LOW);
    digitalWrite(yellow1, HIGH);
     Delay(yellowLightTime);

     digitalWrite(yellow1, LOW);
     digitalWrite(red1, HIGH);
     break;
   }
  }

/* void doSomething()
{
    if(digitalRead(strLight1))
    {
     digitalWrite(light1, HIGH);
    }

    else
    {
     digitalWrite(light1, LOW);
    }

        if(digitalRead(strLight2))
    {
     digitalWrite(light2, HIGH);
    }

    else
    {
     digitalWrite(light2, LOW);
    }
}*/

void Delay(int Time)
{
   for(int i=0;i<Time;i++)
   {
    // t.update();
     delay(1);
   }
}
```