Traffic

Estimator

CSE 316 Project

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YouTube Link

https://youtu.be/E8nwg-ULj6c

Basic description of the Project

Our project is "Traffic Estimator". We have developed the system where the traffic signals are controlled by the number of vehicles on a particular segment of road in a crossing. Our traditional signal system is time based. After a certain time one segment of road gets green signal and all others get red signals. But in the practical sense it is impossible to maintain this system in a densely populated city like Dhaka. Now a days, our traffic surgeons use their own manual signal based on density of the road segment. We have made exact the same system but ours is automatic.

If we consider a crossing of 4 roads, there are 8 segments. Among those, 4 are incoming and another are outgoing. For that crossing only the incoming segments have signals. We have counted the number of vehicles in each 4 segments and give priority to the segment with most number of vehicle to move on.
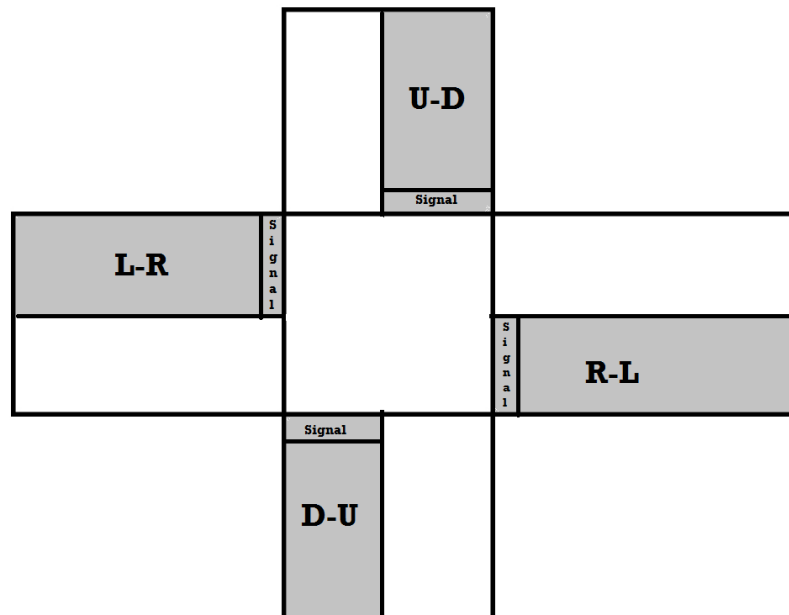


Figure 1: Crossing of 4 roads

At all 4 segments 3 movements are possible: front, left and right. If we consider the traffic system of our country (follow British traffic rule). Left movement is always allowed and that will make no collision. Our concern is for front and right movement. We can allow exactly one segment to have those movements. If we allow more, there will be collision. So at a time exactly one segment will be allowed for all movements, and that will have green signal. Another all segments will get red signal.

Working principle

We used here

1. ATmega32
2. LED(4 pcs Red and 4 pcs Green)
3. IR sensor (TCRT 5000)(8 pcs)
4. Resistance(100Ω & 10KΩ)
5. USB Loader
6. Power Adapter(2 pcs)
7. Wires(M-M, M-F & F-F a lot)
8. Bread Board
9. Working Model

We placed 2 IR sensors in each incoming segments. One is at the point of entering the segment, another is at the point of leaving the segment. IR sensor detects any object placed in front of it by varying output voltage. This input is taken from PORTA of ATmega32.
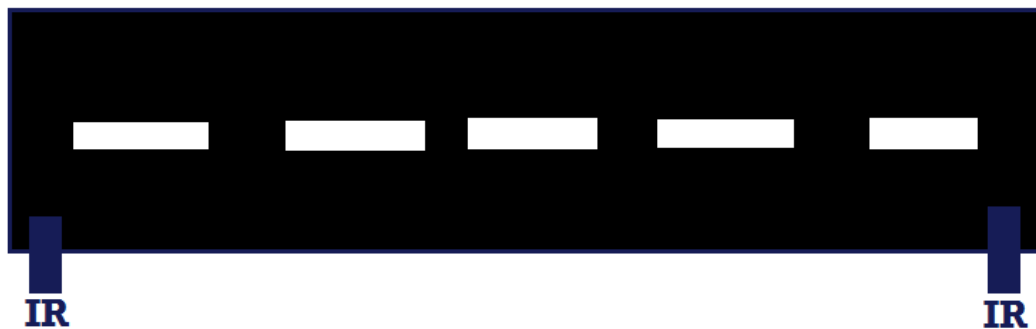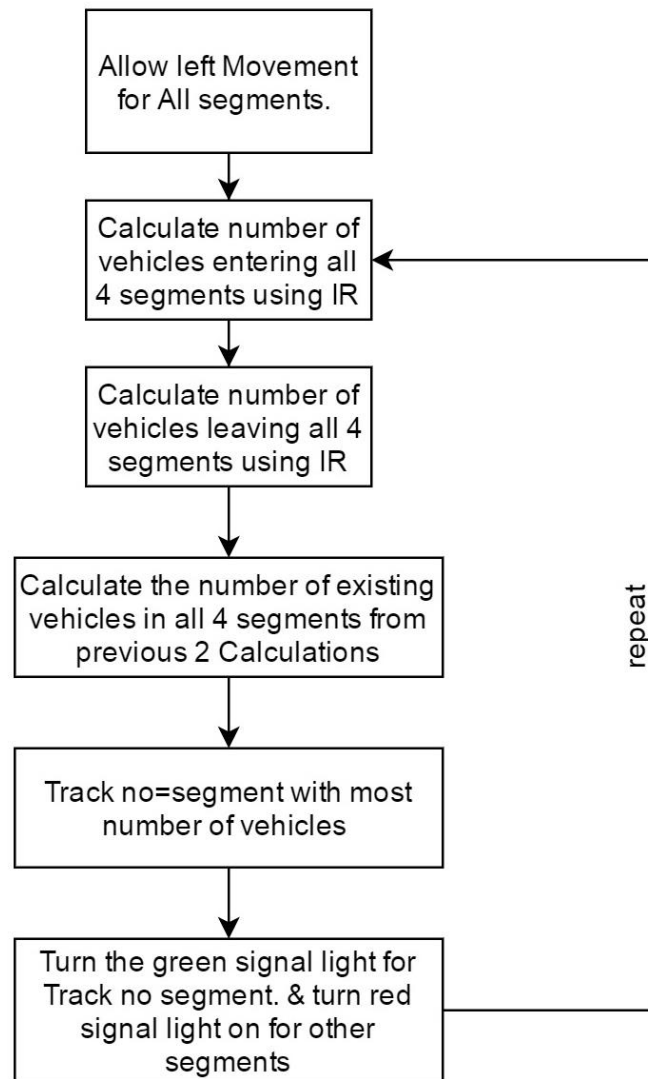

Figure 2: IR sensor in the road segment

In the coding part we have counted the number of vehicles moving in front of each IR. The first IR gives the number of vehicles entering the segment and the second one gives the number of vehicles leaving the segment. The difference of these count gives the number of vehicles standing in the segment of the road.
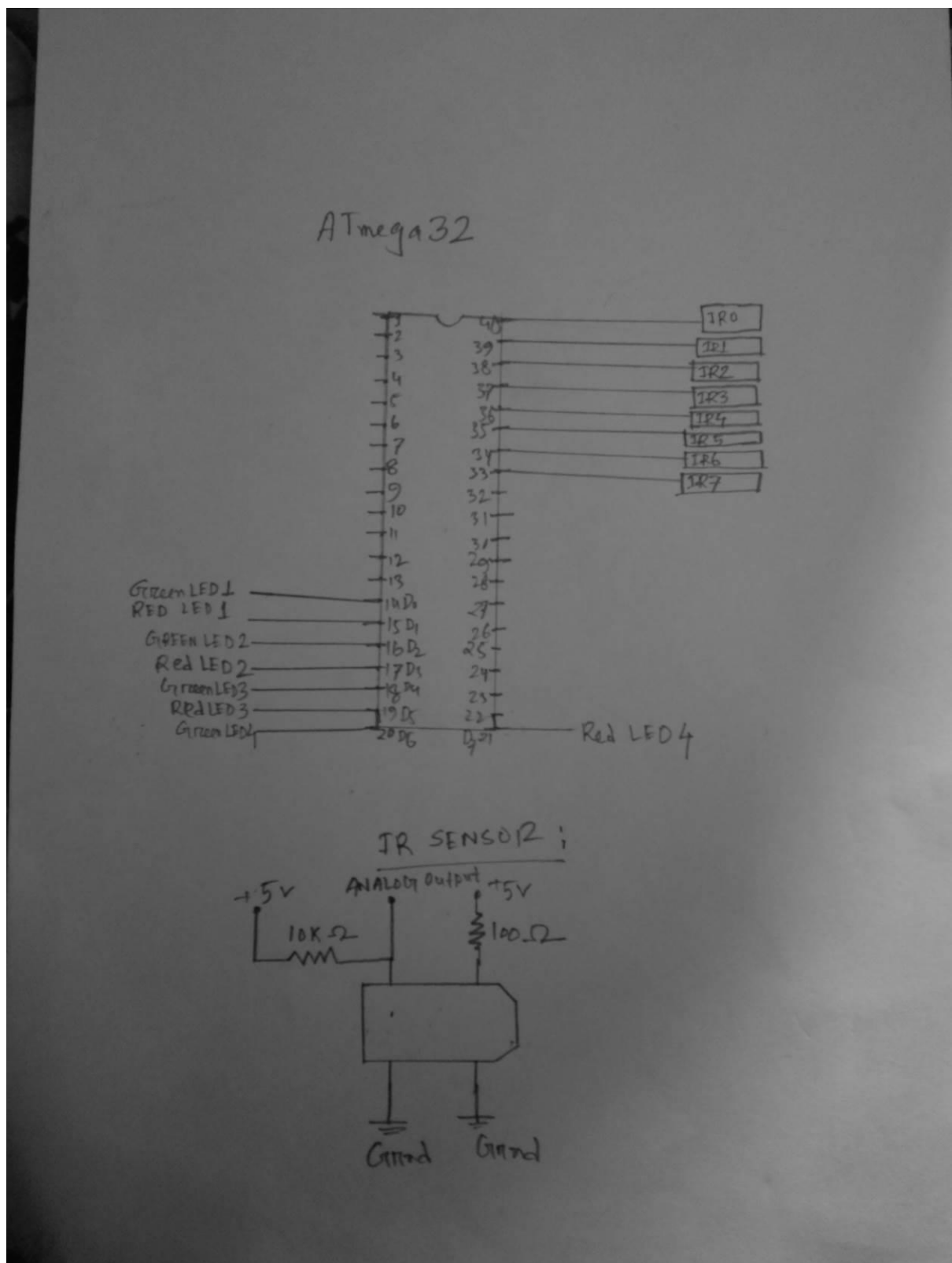
The signal-stand has two LEDs. The Red signal means you are allowed only the left movement. Green signal means you are allowed for all directional movements. The 8 LEDs are connected to PORTD of ATmega32. We chose the segment with most number of vehicle. The green LED of that segment is turned on and red is off. The exact opposite for another 3 signals. This part is handled with coding.

FLOWCHART

Allow left Movement for All segments.

Calculate number of vehicles entering all 4 segments using IR

Calculate number of vehicles leaving all 4 segments using IR

Calculate the number of existing vehicles in all 4 segments from previous 2 Calculations

Track no=segment with most number of vehicles

Turn the green signal light for Track no segment. & turn red signal light on for other segments

repeat

Flowchart: Traffic Estimator

Circuit Diagram

Interfacing IR sensor

In our project, we are using analogue IR sensor (tcrt5000) for detecting the passing of a vehicle. This sensor works by sending and receiving Infrared Ray. If the ray sent by the sender is reflected by a car, the receiver receives it and gives the output voltage at ADC ports(pin 33-40).Comparing that voltages with the marginal values of different IRs we can decide whether there is any car or not.

Libraries:

We have not used any special library in our project. We have written different functions

Features (Completed)

- At first all counts are initialized to zero. Randomly one Segment is kept green and all three others are kept Red
- When any one is Green, which means that it contains maximum number of vehicles. It can be red if two of the following happens.
    o As all movement is allowed. If some vehicles leave the segment
    o Any of the other getting more vehicles entered and that becomes greater than this one

  In both cases this signal turns into red smoothly.
- When any signal is RED, it can be green in two ways
    o If more vehicles enters and it crosses the current maximum count value.
    o If some vehicles left the Green signal segment and that count becomes less than this one

  In both cases this signal turns into Green smoothly.

Features not Added

- We could use 4 sensors each segments. Which could detect if two vehicles entering the front at the sensor area and leaving the back at the sensor at exactly same time. But, that is a rare case and it would make our tiny models more congested.
- We could use yellow LEDs for transition signals. But we used the 8 ports of PORTD as output and we used only one ATmega32. So we kept it simpler. We focused on current manual signal process of our traffic surgeons. That doesn't contain any transitory signal.

Problems we faced and solution we used

Problem: At first with power of ATmega32 the IR sensors did not gave the desired variation

Solution: We used power adapter to give power to IR sensors.

Problem: Threshold values of all IR sensors were not practically same.

Solution: We calculate various values of output voltage varying the distance of obstacles in front of IR sensors and taking output voltage by multimeter. From there we calculated threshold values for individual IR sensors and put them in code.

Problem: There was no fixed time how much a vehicle will be in front of a sensor. So, it was tough to generate the counting algorithm.

Solution: We used flag in the C program and keep track of the transitions of the output values.

Problem: Noise in the IR sensor output. If long time no object in front of IR sensor, count somehow increases some time by 1.

Solution: Ignore the noise. It is very small compared to the maximum numbers. This Error can be ignored.