Fall Semester 2020

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SCHOOL OF ELECTRONICS ENGINEERING

Department of Embedded Technology

DETERMINING THE VEHICAL COUNT USING ARDUINO

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Project Report
of
ECE3026 –IoT System Architecture

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Submitted to
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ABSTRACT

This project demonstrates how you can use **Arduino** to count the number of cars that come in and out of a mall using two sensors and later view the number of available slots in the parking lot. You do not need an Ethernet or Wifi shield for this project!

INTRODUCTION

The sensors need to be placed in the entry and exit point of the parking lot for this to work as intended. Basically, you increment the ***count*** every time a car comes in and decrement when it goes out. The LED in the system simply indicates that the vehicle is properly counted as it lights on every time a car passes through the sensor.

PROBLEM STATEMENT WITH ANALYSIS

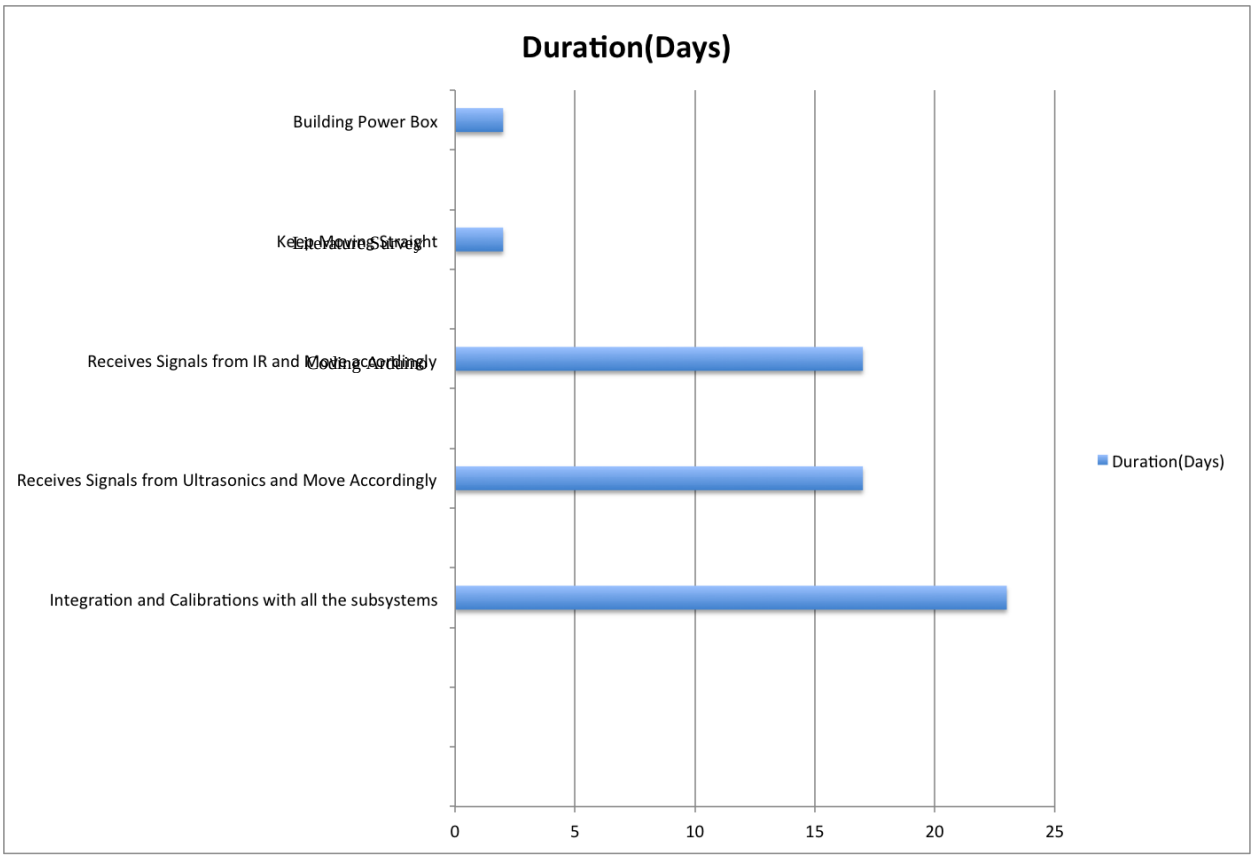
Traveling is part of our daily lives. Everyone has to be on the road, may it be on going to work, going to school, or going to the grocery store to buy any material. Every time we travel, we have to spend important time and energy on the road. India has one of the largest road networks in the world (around 4 million km at present). National Highways (NHs) are the main arterial roads connecting ports, state capitals, industrial and tourist centers, and neighboring countries. NHs constitute less than 10 percent of the total road network, but carry nearly 60 percent of the total road. Traffic a measurement system is needed to gauge the impact of travel-related problems on "quality of life" since it is insubstantial. An approximate measurement system for transportation is also recommended for the problem of overcrowding in trains and traffic congestion on roads. This system calculates the overall impact of congestion and transportation on quality of life. Number of steps have been taken by the Ministry to spread road safety culture in the country. These include road safety training, education and driving instructions, traffic regulations, measures to deal with traffic offences and improvement of both active and passive vehicle safety.

The focus problem statement comes under highway management system. Highway management system includes

- Traffic congestion control
- Safety management on highways
- Toll management
- Highway maintenance

Our goal is to build a traffic and road monitoring system for intelligent route planning, road usage and maintenance that fulfills the constraints imposed by the Indian scenario. This system should work under varied road conditions, chaotic, dense and unstructured traffic and a large variety of vehicles. It should be cost effect, easy to deploy (no need to dig or build overhead structures) and require minimal maintenance. We should avoid the need for specialized equipment. In order to meet these somewhat conflicting requirements we are willing to be content with system that does an approximate, aggregate traffic analysis and near realtime reporting. We do not want a explicit count or classification of vehicles but rather some information through which we can deduce the state of traffic on a road segment. Hence, we are willing to trade-off accuracy of reporting with ease of deployment. We want to build a road monitoring system that is able to better quantify a road anomaly. Thus, our efforts will be to try find out ways to report severity, intensity or dimensions of a pothole or a damaged road segment.

GANTT CHART SCHEDULE



THE PROPOSED SYSTEM

Smart traffic signal device is made of three basic things that are ultrasonic sensor for detecting the vehicle passing through when signal is on, microcontroller for examining the input coming from ultrasonic sensor and give instruction to camera to capture image. In STS two sensors are placed at one side of one road as shown in figure 1. That is if there are for road meet at one traffic signal then four STS should be placed at every road. Generally, width of road in India is 20 foot. The ultrasonic sensor covers the maximum area 4 meters (13.1234 foot) means sensors on both sides are able to cover all area. The number of sensors on the both sides is increased for more accuracy. If only one sensor detect the obstacle then proposed system STS is not capture image because it may be human, animals etc. The length of vehicles is nearly about equal to distance between two sensors on one side. This same system is applied on the opposite side of road. Range of this two sensors are fixed as width of the road required to block with respect to signal. This whole process is controlled by Arduino board which get input from two or more ultrasonic sensors and capture image through camera and then save it as name and date as

the name of the image to make it easier to understand whenever the vehicle paper size.

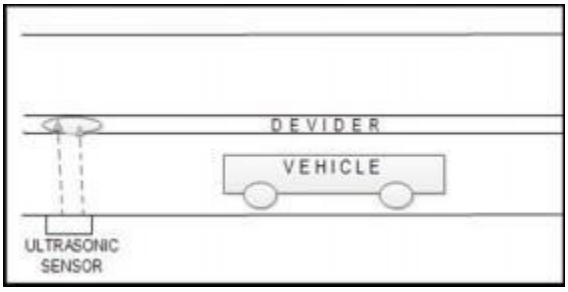


Figure 2: General block diagram of a task oriented smart traffic signal system

Figure 2. Shows a general description of STS. The input to the system is provided by ultrasonic sensor signal for accomplishing a given task. This signal is received in terms of time in Arduino wherein the time signal is decoded into distance that are meaningful according to Syntax, Semantics and Pragmatics of the STS task. When the green signal is turned off the STS will start working ultrasonic sensor detects the vehicle passing through the signal and give input to the Arduino and it will capture image through camera and store it in the given memory.

WORKING OF STS

Ultrasonic Sensor

In STS both the ultrasonic sensor can take input as duration in microseconds by a little code written as follow Microseconds = pulseIn (7, HIGH); means that sensor calculate the duration in microseconds between the transmitting and receiving time of ultrasonic waves an then it will converted into centimeters by a formula:

$$Centimeter = \left(\frac{Microsecond}{29}\right)/2$$

And if this distance is always equal to road width whenever a vehicle will cross the road during red signal this distance is surely less than width of the road in this way it will detect vehicle.

Arduino programming:

vid = videoinput('winvideo', 1);

By using videoinput () function we can activate the camera and by using getsnapshot() function we will capture the image. im = getsnapshot (vid; ssa = datestr (now,'dd- mmyyyy HH-MM-SS'); newName = sprintf('%s.jpg', ssa); imwrite (rgbmap, newName);

The datestr() function we used to store the image as name of system date and time.imwrite() function used to write data into disk.

COMPONENTS INVOLVED IN THE SYSTEM

A. Arduino board

Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32- bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller [7]. The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulsewidth modulated signals, and six analog inputs. These pins are on the top of the board, via female 0.10-inch (2.5 mm) headers. Several plug-in application shields are also commercially available. Arduino has 328P microcontroller which is used to store and execute the program

The open-source Arduino environment makes it easy to write code and upload it to the I/O board. It runs on Windows, Mac OS X, and Linux [7]. The environment is written in Java and based on Processing, avr-gcc, and other open source software. The Arduino integrated development environment (IDE) is a cross-platform application written in Java programming, and is derived from the IDE for the Processing programming language and the Wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development [7]. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click.

B. Ultrasonic Sensor

Working Voltage	DC 5 V
Working Current	15mA
Working Frequency	40 KHz
Max Range	4 M
Min Range	2 cm
Dimension	45X20X15 mm

Table 1: Specifications of Ultrasonic Sensor

An **Ultrasonic sensor** is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back

Since it is known that sound travels through air at about 344 m/s (1129 ft/s), you can take the time for the sound wave to return and multiply it by 344 meters (or 1129 feet) to find the total round-trip distance of the sound wave. Round-trip means that the sound wave travelled 2 times the distance to the object before it was detected by the sensor; it includes the 'trip' from the sonar sensor to the object AND the 'trip' from the object to the Ultrasonic sensor (after the sound wave bounced off the object). To find the distance to the object, simply divide the round-trip distance in half.

IMPLEMENTATION:

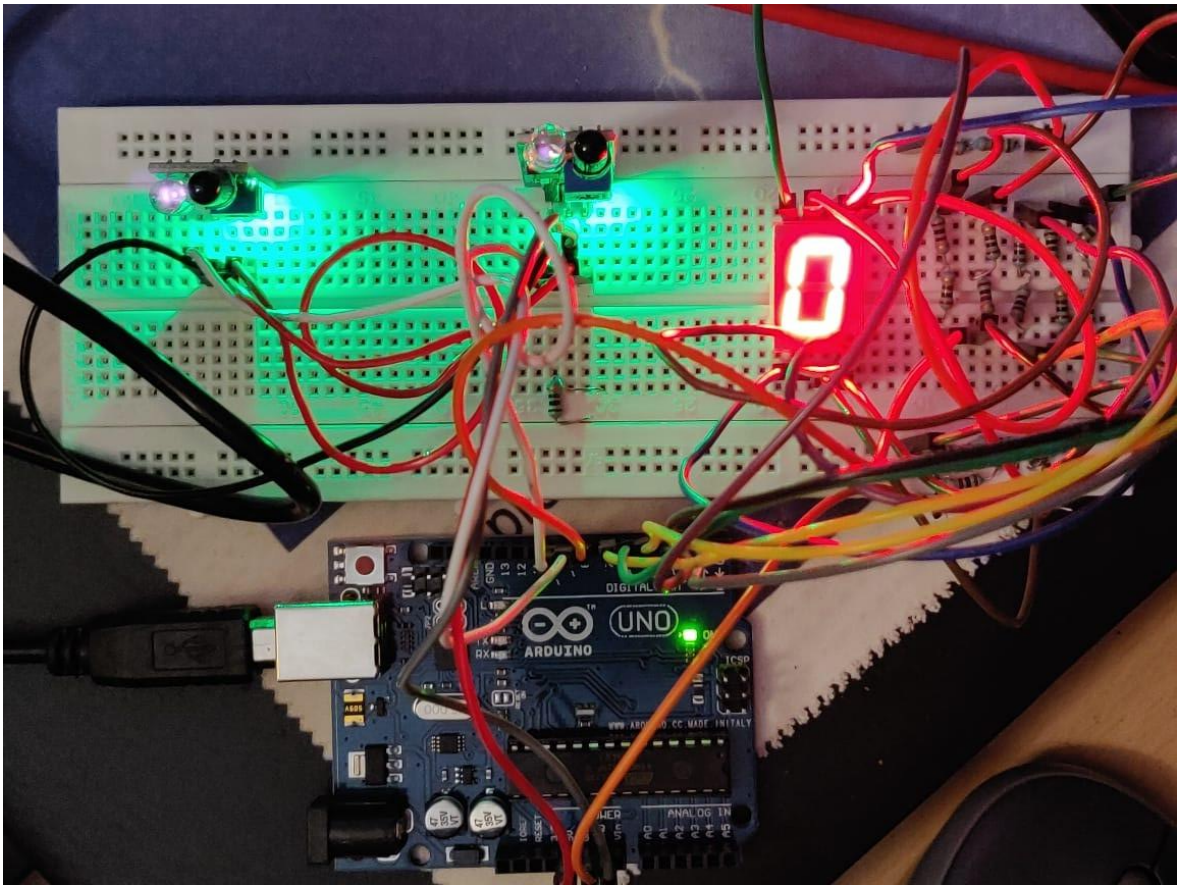
We will be "Detecting obstacle with IR Sensor and Arduino". We are going to use the IR sensor like an objects counter.

```
#include <TimerOne.h>

#define SEG_A 11
#define SEG_B 12
#define SEG_C 10
#define SEG_D 9

#define SEG_E 8
#define SEG_F 7
#define SEG_G 6

#define SEG_1 5
#define SEG_10 4

#define IR1 2
#define IR2 3

const byte SEG[] {
  0x3F,
  0x06,
  0x5B,
  0x4F,

  0x66,
  0x6D,
  0x7D,
  0x07,

  0x7F,
  0x6F
};

byte disBuff[2];

void initSegment(){
  pinMode(SEG_A, OUTPUT);
  pinMode(SEG_B, OUTPUT);
  pinMode(SEG_C, OUTPUT);
  pinMode(SEG_D, OUTPUT);

  pinMode(SEG_E, OUTPUT);
  pinMode(SEG_F, OUTPUT);
  pinMode(SEG_G, OUTPUT);

  pinMode(SEG_1, OUTPUT);
  pinMode(SEG_10, OUTPUT);
  pinMode(IR1, INPUT_PULLUP);
  pinMode(IR2, INPUT_PULLUP);

  Timer1.initialize(10000);
  Timer1.attachInterrupt(display);
}

byte activeSeg;
void out7Seg(byte dat){
  digitalWrite(SEG_A, dat & 0x01 ? HIGH : LOW);
  digitalWrite(SEG_B, dat & 0x02 ? HIGH : LOW);
  digitalWrite(SEG_C, dat & 0x04 ? HIGH : LOW);
  digitalWrite(SEG_D, dat & 0x08 ? HIGH : LOW);

  digitalWrite(SEG_E, dat & 0x10 ? HIGH : LOW);
  digitalWrite(SEG_F, dat & 0x20 ? HIGH : LOW);
  digitalWrite(SEG_G, dat & 0x40 ? HIGH : LOW);
}

void display(){
  activeSeg = activeSeg ? 0 : 1;
  out7Seg(0);
  digitalWrite(SEG_1, activeSeg ? 0 : 1);
  digitalWrite(SEG_10, activeSeg ? 1 : 0);
  out7Seg(disBuff[activeSeg]);
}

void outSeg(byte dat){
  disBuff[0] = SEG[dat%10];
  dat /= 10;
  disBuff[1] = SEG[dat%10];
}

int persons = 0;

void setup() {
  initSegment();
  outSeg(persons);
}

void loop() {
  if(!digitalRead(IR1)){
    while(!digitalRead(IR1))
      delay(10);
    persons++;

    outSeg(persons);
    delay(500);
```

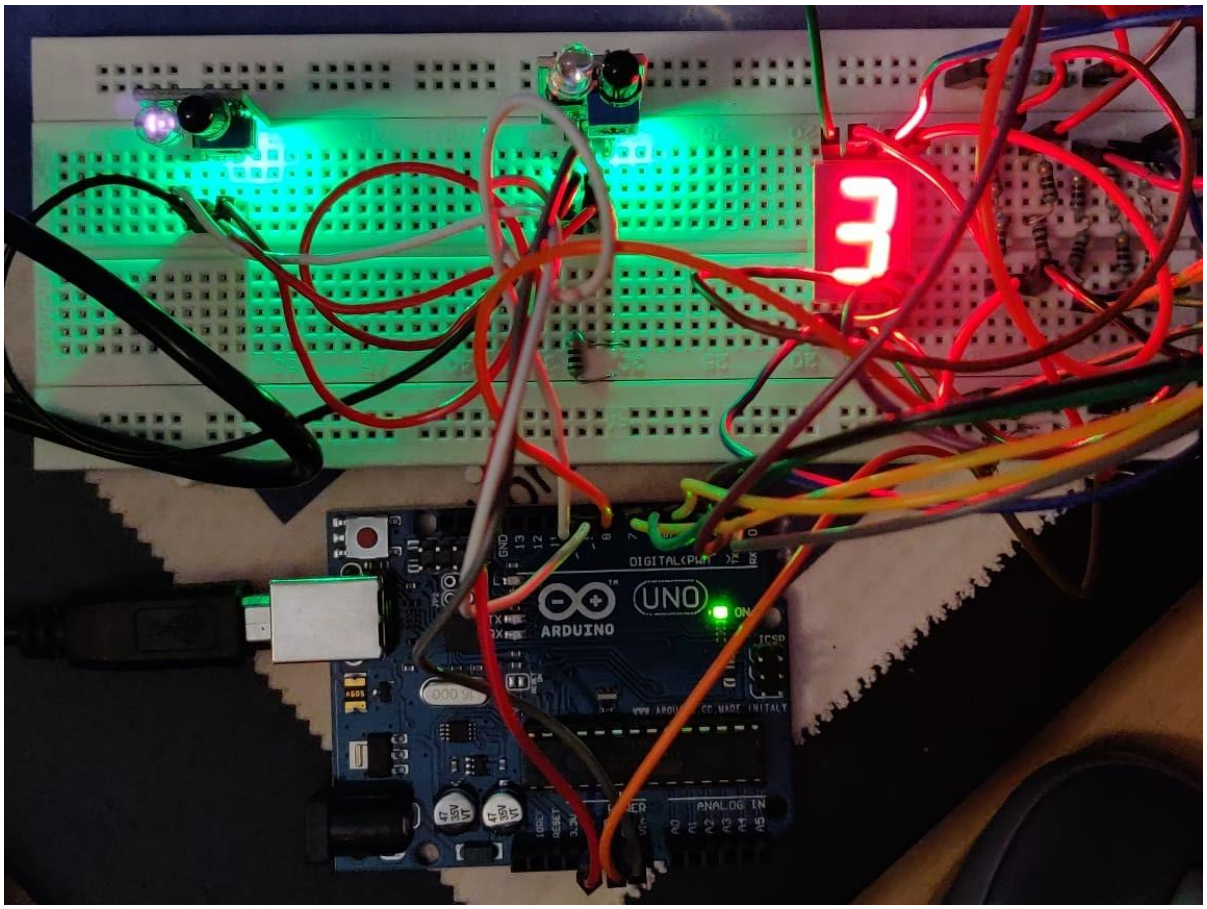
```
  digitalWrite(SEG_A, dat & 0x01 ? HIGH : LOW);
  digitalWrite(SEG_B, dat & 0x02 ? HIGH : LOW);
  digitalWrite(SEG_C, dat & 0x04 ? HIGH : LOW);
  digitalWrite(SEG_D, dat & 0x08 ? HIGH : LOW);

  digitalWrite(SEG_E, dat & 0x10 ? HIGH : LOW);
  digitalWrite(SEG_F, dat & 0x20 ? HIGH : LOW);
  digitalWrite(SEG_G, dat & 0x40 ? HIGH : LOW);
}

void display(){
  activeSeg = activeSeg ? 0 : 1;
  out7Seg(0);
  digitalWrite(SEG_1, activeSeg ? 0 : 1);
  digitalWrite(SEG_10, activeSeg ? 1 : 0);
  out7Seg(disBuff[activeSeg]);
}

void outSeg(byte dat){
  disBuff[0] = SEG[dat%10];
  dat /= 10;
  disBuff[1] = SEG[dat%10];
}

int persons = 0;

void setup() {
  initSegment();
  outSeg(persons);
}

void loop() {
  if(!digitalRead(IR1)){
    while(!digitalRead(IR1))
      delay(10);
    persons++;

    outSeg(persons);
    delay(500);
  }
  else if(!digitalRead(IR2)){
    while(!digitalRead(IR2))
      delay(10);
    if(persons)
      persons--;

    outSeg(persons);
    delay(500);
  }

  delay(10);
}
```

RESULTS

Initially the LED was at 0 .



But after waving hand near the sensors it got increment by 3 .



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