Project Title: A Real Time Vehicle Location and Passenger Number Monitoring System for the Public Transportation System

Introduction

This is an intuitive device that can monitor the vehicles and passengers' end to end movement that means the device is smart enough to monitor the vehicles' location and how many passengers have entered into and left the vehicle in a particular place. This device will help the owners of the vehicle to monitor how many people have travelled and the place they have started and ended their journey, which will eventually help them to calculate the total earnings in the end of each day. This device is based on Arduino Nano. Two sonar sensors have been used in this device. One helps to count how many people have entered and the another one helps to count how many people have left and after comparing the data our algorithm helps to count the total number of people. GPS NEO-6m helps to get the location of the vehicle and the number of people has entered in a particular location. Since our device is in testing and debugging state, we show our output in a LCD display, however, in future, we want to show it in a smart phone in real time. There is a push button available which helps to see the number of people has entered in the previous place. In addition, potentiometer helps to increase or decrease LCD display brightness and whenever a passenger enters the buzzer beeps sound.

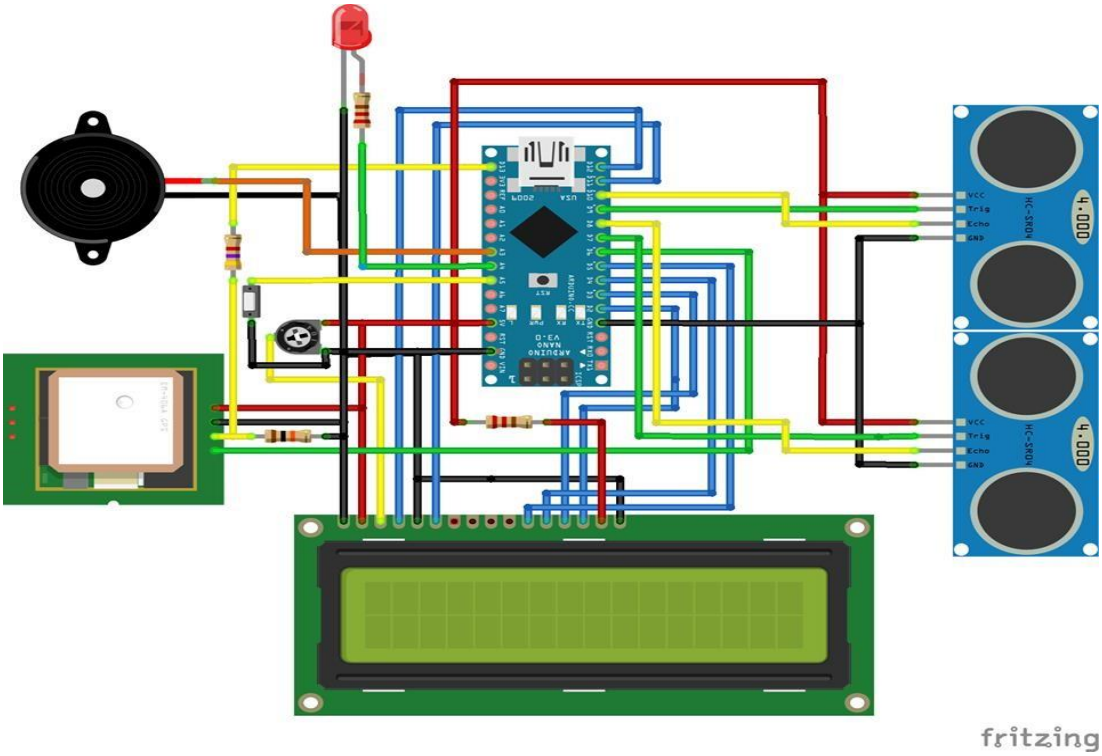
This device will reduce the cost of extra manpower that the owners are used to keep after a certain distance to check the number of passengers and each check point takes roughly 2-3 minutes so if a passenger has to clear 3 check points, then this device will help him/her to save roughly 6-9 minutes.

Equipment

- ⇨ Arduino Nano
- ⇨ Sonar Sensor
- ⇨ GPS NEO-6m
- ⇨ LCD Display
- ⇨ Resistor

- ⇨ Buzzer
- ⇨ Potentiometer
- ⇨ Push Button
- ⇨ Breadboard

Circuit Diagram



Pinout Connection in Words

A3 analog pin 3 to buzzer anode pin and buzzer cathode to gnd

A4 analog pin 4 to yellow led anode pin and led cathode to gnd though resistor 330 ohm

a5 analog pin 5 to push button pin 1 and button pin 2 to gnd d7 digital pin 7 to sonar sensor 1 (hc-sr04) trig pin d8 digital pin 8 to sonar sensor 1 (hc-sr04) echo pin d9 digital pin 9 to sonar sensor 2 (hc-sr04) trig pin d10 digital pin 10 to sonar sensor 2 (hc-sr04)

echo pin sonar sensor 1 and 2 vcc pin to arduino nano 5v pin and gnd pin to arduino nano

gnd pin lcd vdd pin to arduino nano 5v pin vo pin to 10k pot r/w pin to arduino gnd pin

led+ pin to 5v pin though 500ohm resistor

led- pin to gnd pin d12 digital pin 12 to

lcd rs pin d11 digital pin 11 to lcd e pin

d5 digital pin 5 to lcd d4 pin d4 digital

pin 4 to lcd d5 pin d3 digital pin 3 to lcd

d6 pin d2 digital pin 2 to lcd d7 pin

d6 digital pin 6 to gps (neo-6m) rx pin though 4.7k resistor

and rx pin 10k resistor to gnd d13 digital pin 13 to gps

(neo-6m) tx pin

gps vcc pin to arduino nano 3.3v pin and gnd to ground

Important Algorithm

For GPS

String place=""; //create place variable

double duration1, duration2; //create distance variable

int distanceCm1, distanceCm2, f=0, t=0, c=0, h=0, s=0; //s-station/b-btnState/c-min/h-hour/ttotalP/val-btnInput/

int P[5]={0,0,0,0,0}, T[5]={0,0,0,0,0}, S[5]={0,0,0,0,0};//create 3 array **For**

Sonar Sensor

distanceCm1= duration1*0.034/2; //get sonar 1 data

digitalWrite(trigPin2, LOW); duration2 =

pulseIn(echoPin2, HIGH);

```
distanceCm2= duration2*0.034/2;           // get sonar 2 data
if(distanceCm1-distanceCm2 < -2 || distanceCm1-distanceCm2 > 2){   // device working indicator
digitalWrite(led, LOW);
}else{
  digitalWrite(led, HIGH);
}
if(distanceCm1<100 || distanceCm2 < 100){    //set working threshold
if(distanceCm1-distanceCm2 > 10){     t=t+1;              //increase
passenger     f=f+1;
tone(buzzer, 650);  //tone the buzzer
delay(70);     noTone(buzzer);
delay(850);
  }if(distanceCm1-distanceCm2 < -10){
if(t>0){
     t=t-1;           //decrease  passenger
    }
```

GPS Data Processing

```
if((lat - 23.8200)<=0.00009 && (lon - 90.420)<=0.0009 && (lat - 23.8200)>=0.0000009 &&
(lon
- 90.420)>=0.000009){
s=101;
  place="Kuril Bishwa Road";
  P[0]=t;
  T[0]=h*60+c;
  S[0]=s;
}
```

Result

The outcome of this device is pretty satisfactory. However, the counting is slightly vulnerable and that's why sometimes it shows little mismatch in the result section. In addition, the GPS system we have used is not fast enough.

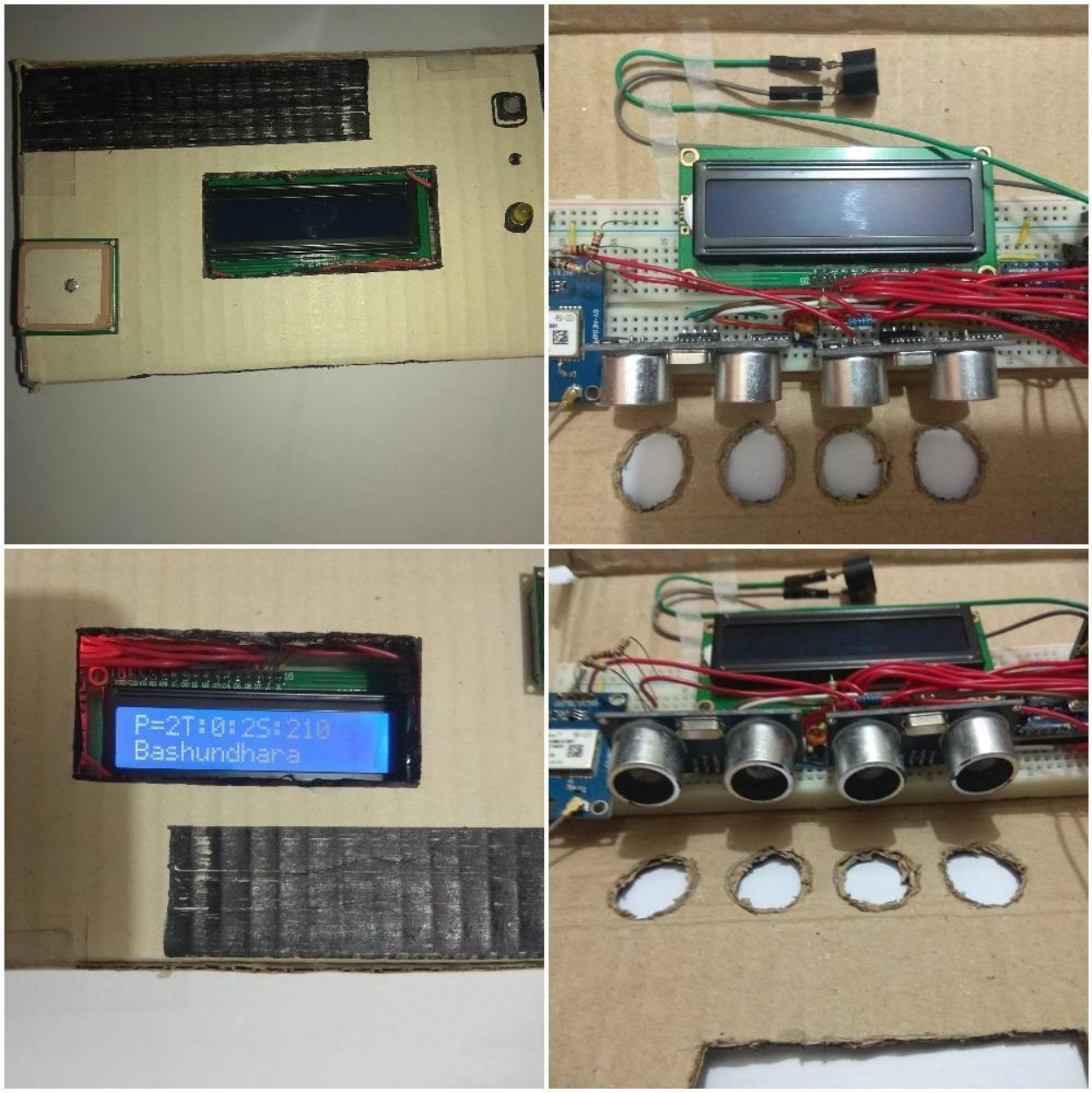


Figure: A sample output and our overall project

P=2 – the total number of passengers is 2

T: 0:2 – represents the time

S: 210 – station code

And finally, after collecting the longitude and latitude, it shows Bashundhara which is the exact location.

Conclusion

To conclude, this is an intuitive device that can reduce manpower and save time. The transportation companies won't be needing any extra man just to check how many passengers have travelled and such. This device can calculate the total number of passengers with distance. However, as we have discussed earlier, this device has some drawbacks till now. But these drawbacks can be overcome with better algorithm and equipment.

Future Work

There are a lot of things or new ideas that we can add in future such as converting it to a PCB layout or board design, using better sensors and GPS module for even better output, we can make a mobile application which will help passengers to know the vehicles location. In addition, we can use extra memory slot for more memory space.

References

1. https://www.youtube.com/watch?v=h6yRLAJ30JM
2. https://en.wikipedia.org/wiki/Vehicle_tracking_system
3. https://ieeexplore.ieee.org/document/8171564/
4. https://www.youtube.com/watch?v=7cnxj3-35OU
5. https://www.nap.edu/read/14207/chapter/2#3