Vehicle Number Plate Extraction Using OCR

INCLUDED: SPEED DETECTION USING IR SENSOR

Submitted in complete fulfilment of the course project of

ECE-1005 Sensors and Instrumentation

In

Bachelor of Technology

By

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Under the guidance of

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I am very grateful to Vellore Institute of Technology for allowing me to pursue this project which helped me gain great knowledge towards my field and gave me quite an experience that will be useful for the implementation of such works in the future.

Nevertheless, I express my gratitude towards my family for their kind co-operation, constant support and encouragement which helped me in the completion of this project.

~ Swarnim Kulshreshtha

Contents of the Project

Objective

The objective of our project “Vehicle number plate extraction using OCR” is to help the society by punishing those who are involved in breaking traffic rules. In India, millions of people die every ear due to careless driving and not following the traffic rules.

The project also aims at finding alternative methods to control the offence by using some automatic smart systems that could be useful in the future.

Main Idea of the project

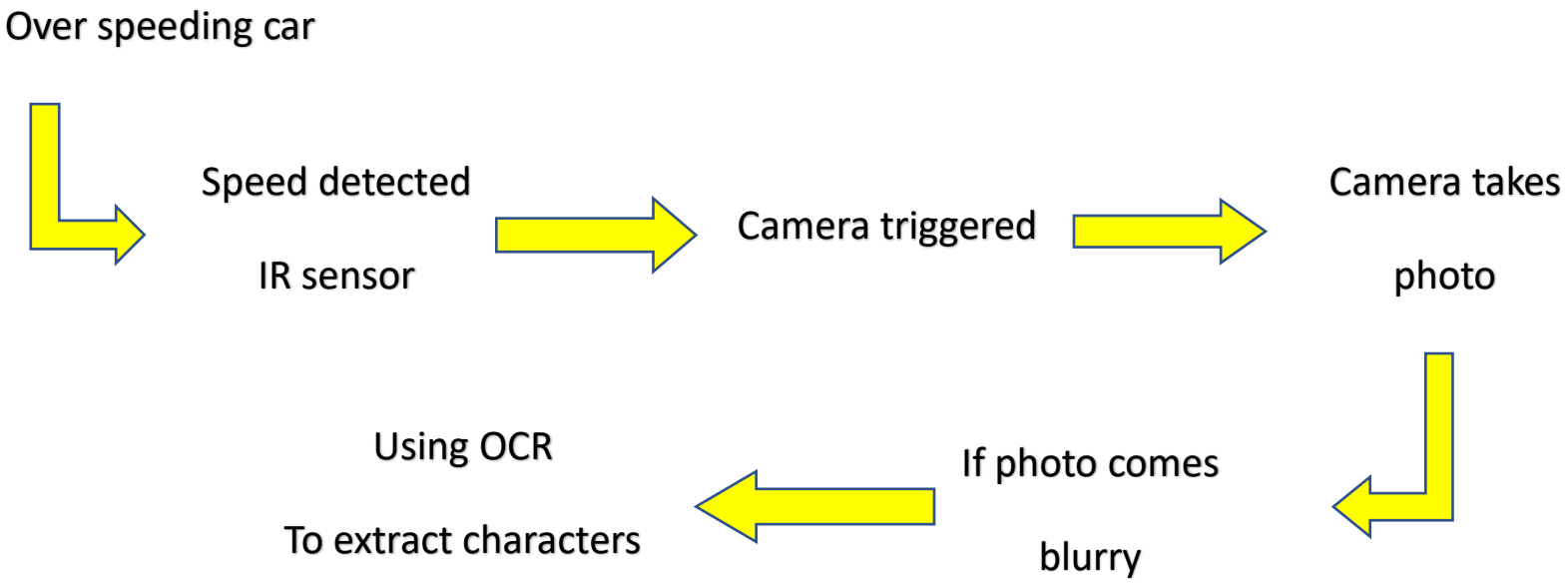
Two simultaneous ideas

1. First idea is to develop a software which can clean the blur images and display the characters properly which are readable. For example, a car which breaks traffic and the traffic policeman takes the photo of the number plate of fast-moving car. But unfortunately, the photo comes out to be blurry; in this case the photo can be given to a MATLAB software which can process the image and can generate proper output characters.
2. The second idea comes from highways where there is no one to monitor the speed of the car. In this case we can use an IR SENSOR which can be used as a speedometer to monitor the speed of the car. If speed is more than the legal

values, the sensor can TRIGGER the camera (I call it TRIGGER MECHANISM) to take photo of the car.

A small flowchart will explain the process of these two ideas linked together--

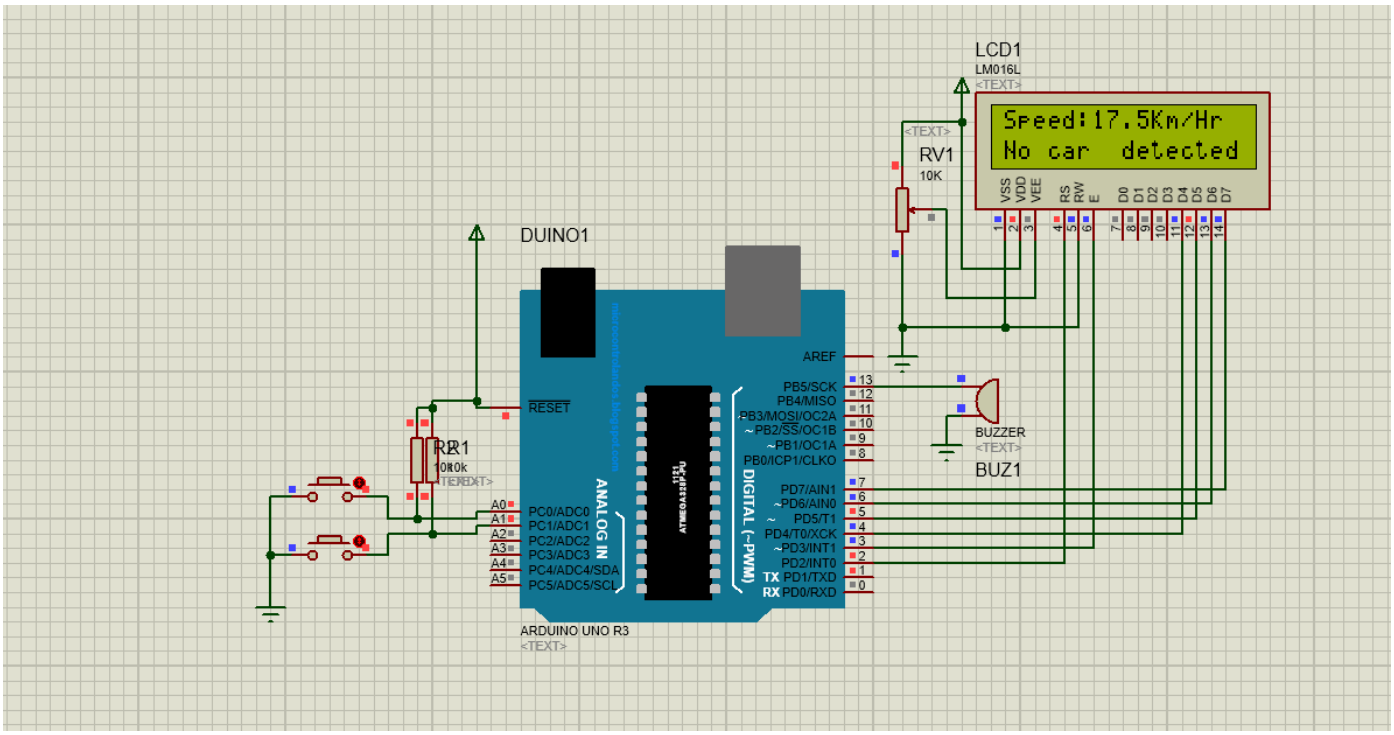
Simple Logic Flowchart



Circuit design and explanation

For detecting speed of a car in a highway, I am using two IR sensors in my circuit. As this is a software project, I am using proteus software.

Below is my circuit design



In the bottom left, I have used two push buttons to simulate a car speed.

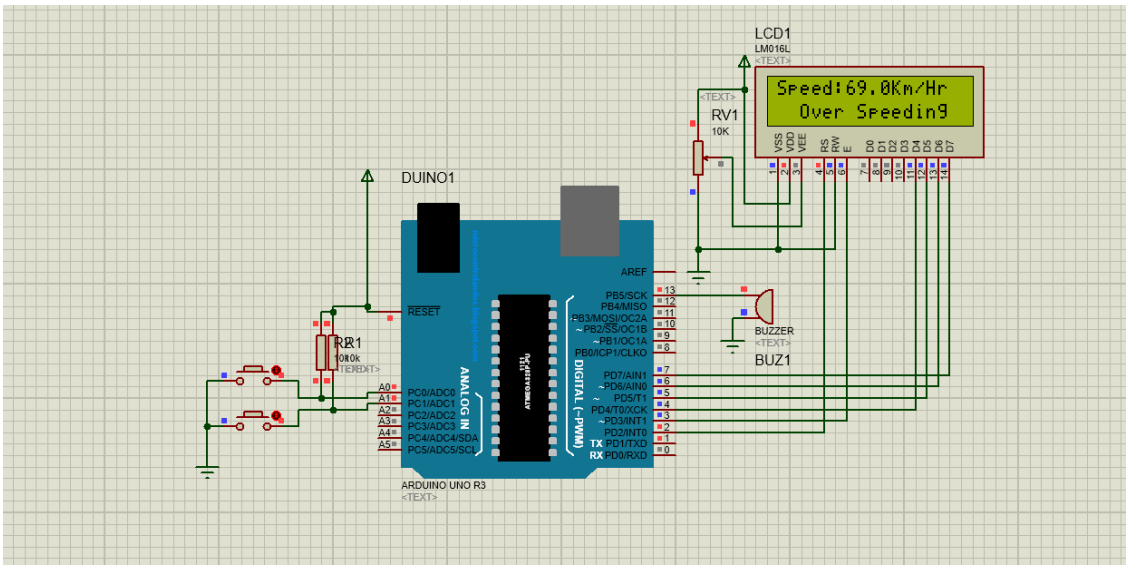
Clicking them fast or slow together one after the other decides the speed of the car. In the above diagram I have clicked the buttons slowly, that's why the speed came out to be 17.5 Km/Hr.

To calculate speed

I took an Imaginary distance of 5 units between the two IR SENSORS. The time when a car passes a sensor is recorded. Also, the time when it leaves the other sensor is also recorded. This difference in time is calculated. Now I calculate speed from the simple formula.

Speed = Distance/Time

Below is the circuit response when I clicked the two push buttons very fast together—



Here, I have kept the threshold limit of the speed to be 60 KM/Hr

Below is the Arduino code for the above circuit—

Sensors

```
#include<LiquidCrystal.h>
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);

int timer1;
int timer2;

float Time;

int flag1 = 0;
int flag2 = 0;

float distance = 5.0;
float speed;

int ir_s1 ;
int ir_s2 ;

int buzzer = 13;

void setup(){
  pinMode(ir_s1, INPUT);
  pinMode(ir_s2, INPUT);
  pinMode(buzzer, OUTPUT);

  lcd.begin(16,2);
  lcd.clear();
  lcd.setCursor(0,0);
```

```
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print(" Swarnim K ");
  lcd.setCursor(0,1);
  lcd.print("19BEC0449");
  delay(2000);
  lcd.clear();
}

void loop() {
if(digitalRead (ir_s1) == LOW && flag1==0){timer1 = millis(); flag1=1;}

if(digitalRead (ir_s2) == LOW && flag2==0){timer2 = millis(); flag2=1;}

if (flag1==1 && flag2==1){
     if(timer1 > timer2){Time = timer1 - timer2;}
else if(timer2 > timer1){Time = timer2 - timer1;}
 Time=Time/1000;//convert millisecond to second
 speed=(distance/Time);//v=d/t
 speed=speed*3600;//multiply by seconds per hr
 speed=speed/1000;//division by meters per Km
}

if(speed==0){

lcd.setCursor(0, 1);
if(flag1==0 && flag2==0){lcd.print("No car  detected");}
                    else{lcd.print("Searching...    ");}
}
else{
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Speed:");
    lcd.print(speed,1);
    lcd.print("Km/Hr  ");
    lcd.setCursor(0, 1);
  if(speed > 50){lcd.print("  Over Speeding  "); digitalWrite(buzzer, HIGH);}
           else{lcd.print("  Normal Speed   "); }
    delay(3000);
    digitalWrite(buzzer, LOW);
    speed = 0;
    flag1 = 0;
    flag2 = 0;
 }
}
```

Trigger mechanism

After a car which is running at high speed is detected, a camera placed at 20-25 m can be triggered and made use of it. It will then take the photo of the culprit car. But this part can only be implemented in person. Now I will show the use of OCR software If the photo comes out to be blurry.

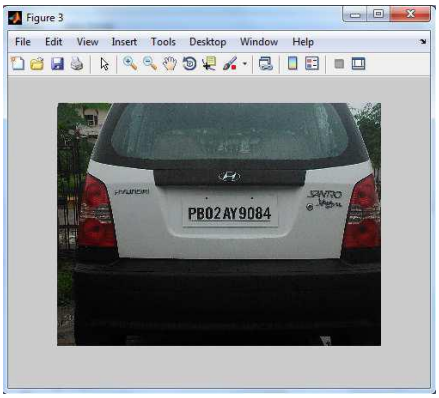
Use of OCR software

The main purpose of OCR technology is to take a picture into account, try to match it with **already known symbols** and to produce the characters. It is also useful in areas where the image is **blurry** or where the characters are dirty. It also uses the technology like **pixel binning** to improve the sharpness of the image.

FROM THIS

Unclear image of number plate

TO THIS



Clear image

This can be done using MATLAB SOFTWARE

Here is the code given below

```
close all;

im = imread('C:\Users\swarnim\Downloads\ car number
plate dectection\kode4u car number plate
dectection\img');
im = imresize(im, [480 NaN]);
imgray = rgb2gray(im);
imbin = imbinarize(imgray);
im = edge(imgray, 'sobel');


im = imdilate(im, strel('diamond', 2));
im = imfill(im, 'holes');
im = imerode(im, strel('diamond', 10));


Iprops=regionprops(im,'BoundingBox','Area',
'Image');
area = Iprops.Area;
count = numel(Iprops);
maxa= area;
boundingBox = Iprops.BoundingBox;
for i=1:count
   if maxa<Iprops(i).Area
       maxa=Iprops(i).Area;
       boundingBox=Iprops(i).BoundingBox;
   end
end

%all above step are to find location of number
plate

im = imcrop(imbin, boundingBox);

%resize number plate to 240 NaN
im = imresize(im, [240 NaN]);
```

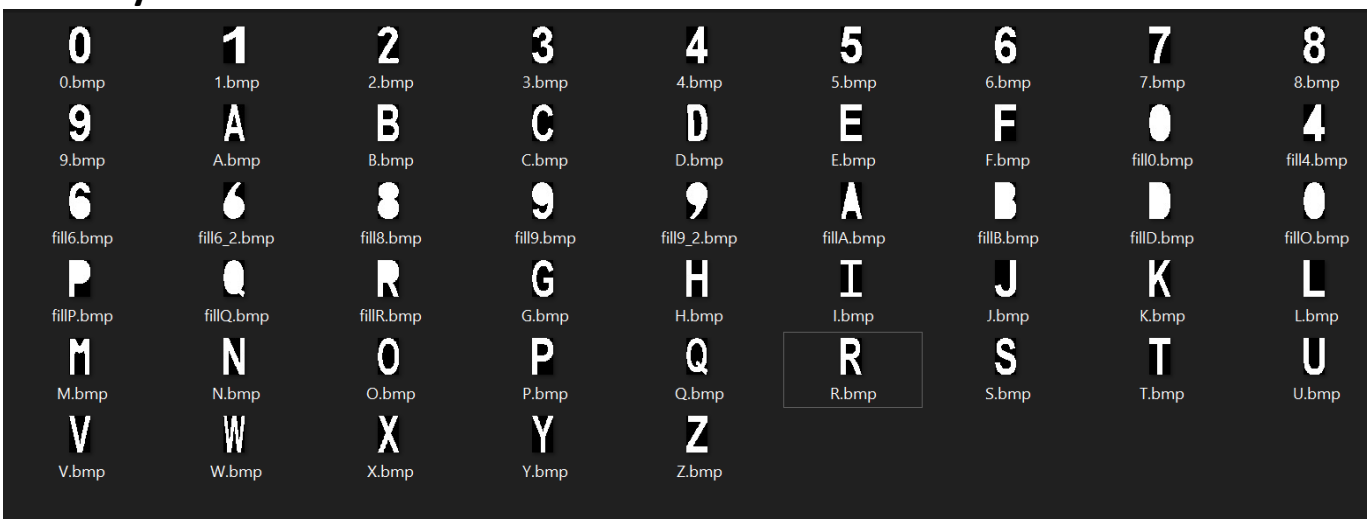
```
%clear dust
im = imopen(im, strel('rectangle', [4 4]));

%remove some object if it width is too long or too
small than 500
im = bwareaopen(~im, 500);
%%%get width
 [h, w] = size(im);
% Iprops=regionprops(im,'BoundingBox','Area',
'Image');
% image = Iprops.Image;
% count = numel(Iprops);
% for i=1:count
%    ow = length(Iprops(i).Image(1,:));
%    if ow<(h/2)
%         im = im .* ~Iprops(i).Image;
%    end
% end


imshow(im);


%read letter
Iprops=regionprops(im,'BoundingBox','Area',
'Image');
count = numel(Iprops);

noPlate=[]; % Initializing the variable of number
plate string.

for i=1:count
   ow = length(Iprops(i).Image(1,:));
   oh = length(Iprops(i).Image(:,1));
   if ow<(h/2) & oh>(h/3)
       letter=readLetter(Iprops(i).Image); %
Reading the letter corresponding the binary image
'N'.
```

```
        figure; imshow(Iprops(i).Image);
        noPlate=[noPlate letter]; % Appending every
subsequent character in noPlate variable.
    end
end
```

Explanation

This code takes a blurry photo and compares it to already known characters like 26 alphabets and numbers 0 to 9.
It the displays the output of nearest matching character.
Sometimes it may go wrong but for most of the time, it is correct.

Already known CHARACTERS



Conclusion

I would like to conclude this project for the fact that this project has a good potential to be implemented in real life applications. This technique will not only help to catch the traffic breakers but can also be used to curb accidents which occur due to carelessness.

One real life application that comes in my mind is our VIT campus itself. Sometimes auto annas and bus drivers speed up and drive rashly. This is certainly not good for students and others when there are rush hours.

Some camera triggering monitor systems can be installed in our entire campus which will monitor the speed of various vehicles in our college. If this gives positive results, this can be implemented outside too.