Traffic Speed Violation Detection System

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TABLE OF CONTENTS

List of Figures

Abstract

The main objective of this project is to prevent traffic speed violation with an automated detecting system.

The main concerns of this system project are given below:

- To recognize texts from real time video while driving
- To build algorithm for detecting traffic speed limit from recognized texts
- To measure current speed of vehicle using GPS
- To compare between current and maximum speed of that particular area
- To give warning and necessary information if current speed exceeds maximum speed

Introduction

In the era of civilization, roads and vehicles are some major transportation mediums. Day by day, development on this sector of transportation is increasing. But it is an irony of fate that road accident also happen quite often which is the most unwanted thing to happen to a road user. In some populated countries like Bangladesh, this type of accident becomes an alarming issue nowadays. In 2018, at least 7,221 people were killed and 15,466 others injured in 5,514 road crashes across Bangladesh[1]. Reckless driving without obeying traffic rules is the main reason behind this. Most of the drivers do not care about the speed limit of a particular area. Thus, road accident occurs so rapidly nowadays.

So, to prevent this problem, we are proposing a solution to help drivers to maintain the speed of their vehicles using technology. It can also be helpful for police or law enforcement authorities who can easily get data about traffic speed limit violation automatically.

High Level Design

Block Diagram

Block diagram of our proposed system is given below:

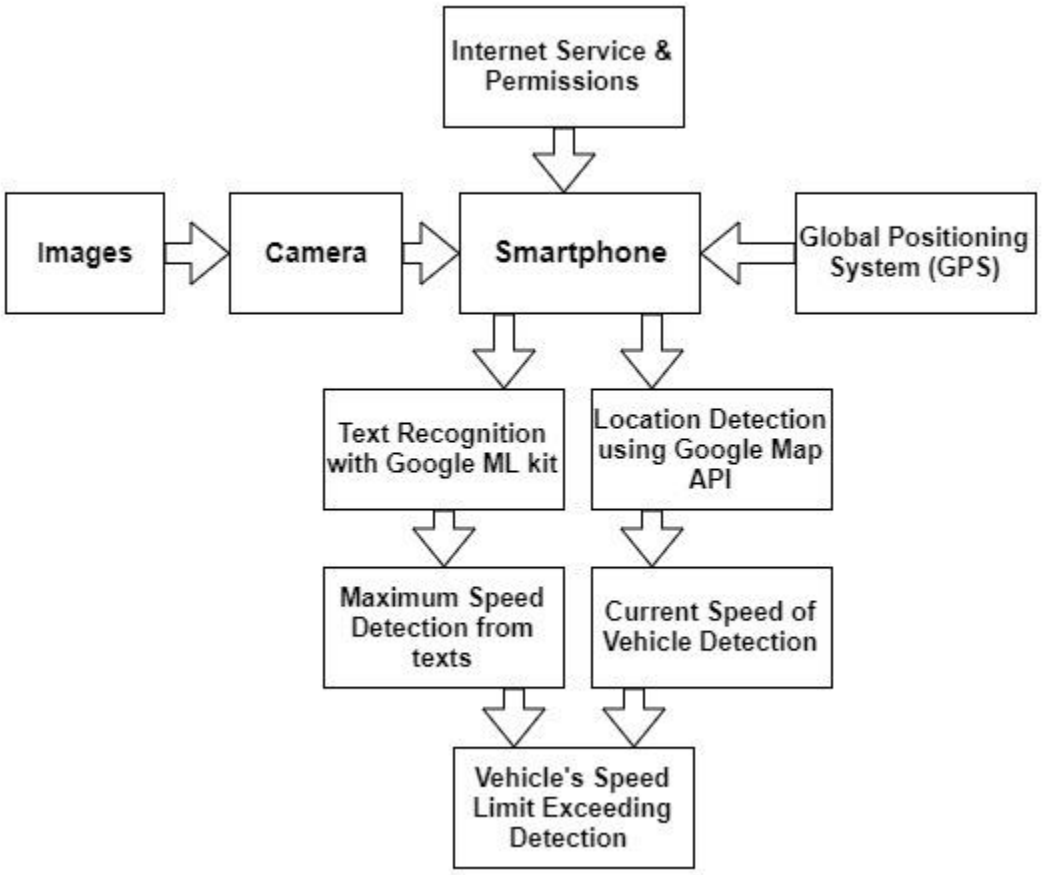

Fig. 1: Block Diagram for Traffic Speed Violation Detection System

Flowchart

Flowchart of the system will be like this:

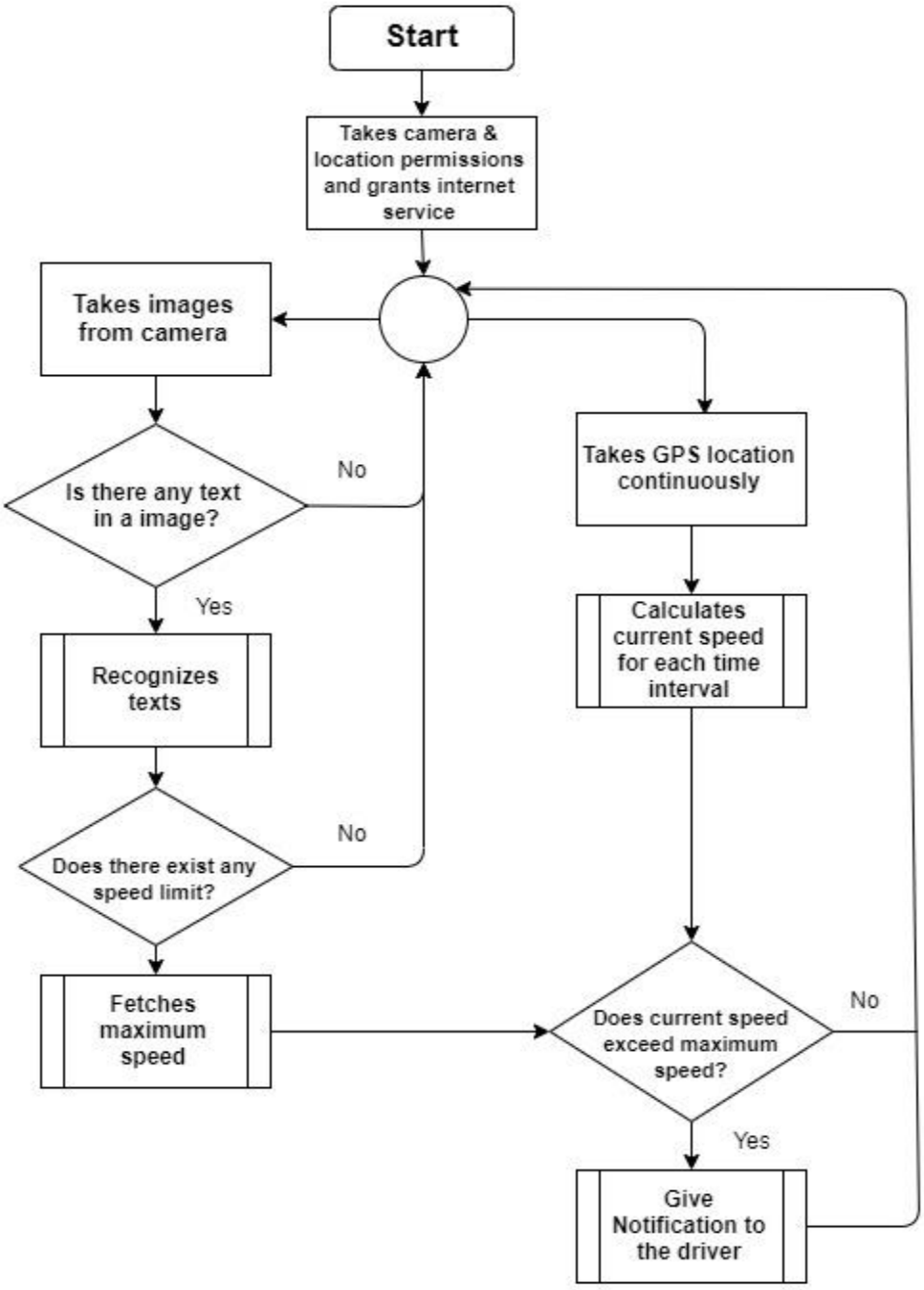

Fig. 2: Flowchart for Traffic Speed Violation Detection System

Prototype Design & Implementation

In order to design and implementation of detecting speed limit while driving, first of all, we need to build a module which can easily detect texts and recognize these from images in real time. For this purpose, Google Machine Leaning (ML) kit was selected. We have used Google Vision API[2] to recognizes texts from images taken from camera continuously.

After recognizing texts, we need to fetch data about speed limit. We have done some string processing to fetch speed limit. If there exists a speed limit, maximum speed limit for that particular area will be updated.

Now, to compare current driving speed of a vehicle, we have used Google Maps API[3] which uses Global Positioning System (GPS). For each time interval, location will be continuously changed. Thus, the velocity can be calculated for the time interval which is the current speed of the vehicle.

Now, all we have left to do is checking if current speed is exceeding or not. If current speed exceeds the maximum speed, there will be a warning to notify the driver. Thus, the driver can be notified and slow down his driving speed.

System Testing

We have done our project by two steps. The first one is speed limit detecting from the roadside by using Google API for string separating from a video. And the second one is real time speed measuring of the vehicle by using Google Maps API.

1. In fig. 3, there can be seen the interface of the project which is measuring maximum speed limit allowed. With the usage of phone camera string has been recognized by Google API. And after that string has been processed to achieve the maximum speed limit.

2. In fig. 4, there can be seen the accuracy of achieving maximum speed limit is too high. If there has been unaccepted space or wrong text formatting the app will work perfectly.

3. In fig. 5, there can be seen that when start calculation button is clicked the app is seeking permission for GPS service of mobile for the very first time. And then every time it will be trying to get location by calling Google Maps API. This part is required to check the vehicle's current speed.

4. In fig. 6, there can be seen that at the moment vehicle's current speed is exceeding maximum speed limit of the road, a toast is seen with "speed limit exceeded" message. The meaning of this part is the vehicle is exceeding the speed limit.

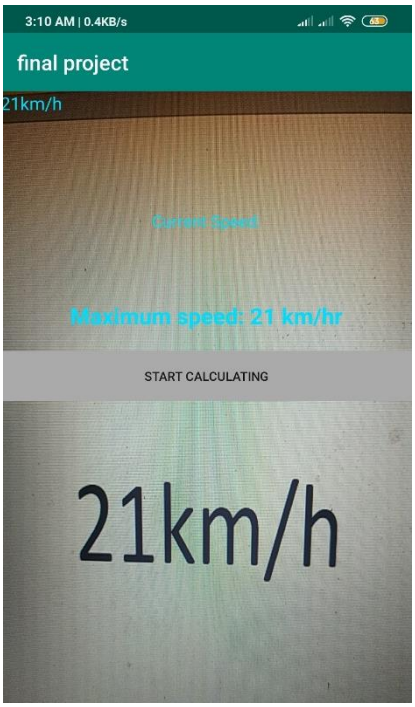

Fig. 3

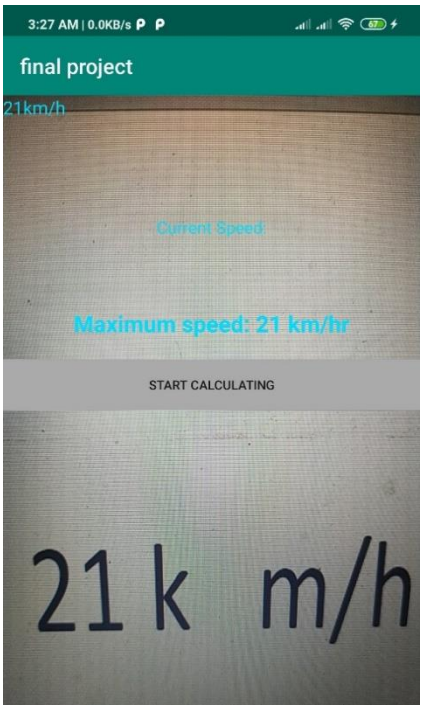

Fig. 4

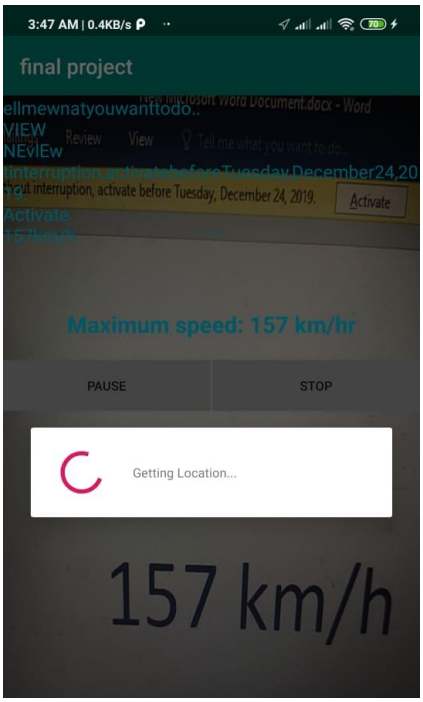

Fig. 5

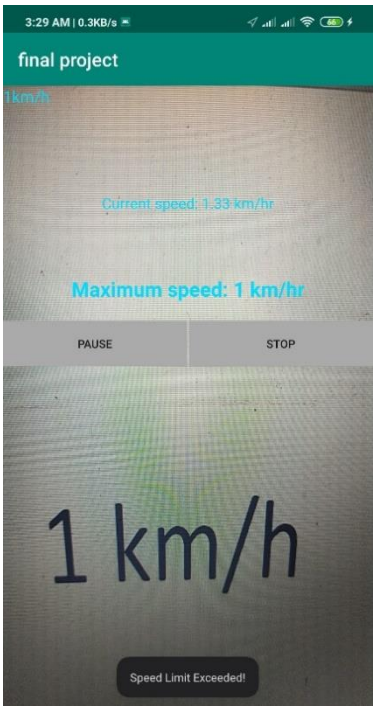

Fig. 6

Experimental Result

We have experimented that the string processing from live video captured is nearly 90% accuracy with low velocity. But if speed goes higher, 50% string cannot be recognized. On the other hand, with very low velocity the vehicle's current speed was 30% right. But with high velocity of the vehicles, the current speed gave the right reading. The reason behind this was that the Google Maps API works by the differences between the device's present and past location with the respect of small amount of time. And Google Vision API for text recognition from real time video works with the picture frame taken from the live video. This whole process is done by Google Machine Learning kit. So, if the picture frame be blurry, it is too hard to recognize texts.

Discussion

The reason behind this project or app was to minimize the accident by controlling vehicle's speed. In this app, an automated speed limit checking has been produced which will help the driver to acknowledge about their speed goes higher than the maximum speed limit. And the traffic police will get the facilities from the app as manually speed limit checking will be no more needed. In this project we cannot get 100% accuracy but it is a prototype which can be rebuilt with higher accuracy for business purpose. For example, text recognition from real time video depends on shutter speed of camera. The faster the shutter speed, the most reliable data it can assure us to detect. Hence, we will get the most beneficial result from this project.

Conclusion

This app is represented a great milestone in traffic sector. We believe this can reduce the road accident by half. The app will pressure for a driver to drive by abiding a traffic rule which one is controlling the speed. Now-a-days in the urban area, traffic rules are broken too much. So, the app will help to reduce them.

However, some academic courses directly helped us to develop this system project. These are:

- CSE 2101 - Object Oriented Programming
- CSE 2102 - Object Oriented Programming Laboratory
- CSE 2200 - Advanced Programming
- CSE 3119 - Software Engineering and Information Systems
- CSE 3120 - Software Engineering and Information Systems Laboratory

References

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