Traffic-BEE 1.0

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Abstract— Indians are estimated to be working 8.1 hours a day, which is mostly higher than any other country in the world. 56 millions suffer from depression while another 34 million are victims of anxiety. While most part of our day is spent on work, it becomes truly important to make travelling a lot more easier. Though the scenario is totally opposite In Bangalore people spend a whopping 470 hours per employee per year on traffic.

Statistics shared by Traffic Logix (www.trafficlogix.com):

- India is only the country in the world that faces more than 15 fatalities and 53 injuries every hour as a result of road crash.
- Traffic collisions are more frequent in any state in India as compared to any international country.
- Over-speeding is one of the main concerns of maximum road rages and accidents which is generally counted as a fault of driver in maximum cases due to his/her lack of attention on the road.
- It is counted that 78% fault is of drivers in maximum cases as compared to other scenarios, leading to road accidents.

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Fig. 1: describes in detail statistics as produced by Traffic logix.

- Concerns regarding two-wheelers and road deaths by age group:

1) Two wheelers are the deadliest as said according to the Ministry of Road, Transport and Highways of India.
2) The most fatal accidents in 2017 were those of two-wheeler riders accounting for 33% deaths on Indian roads as represented by the below scenario:

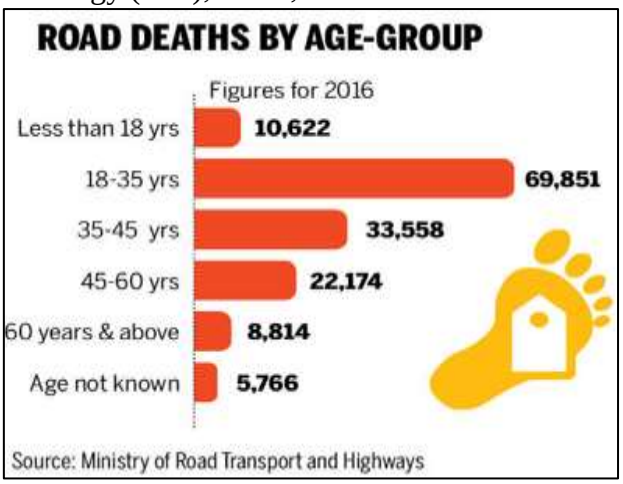


Fig. 2: bar chart representation for road deaths as per age-groups for year 2016-India

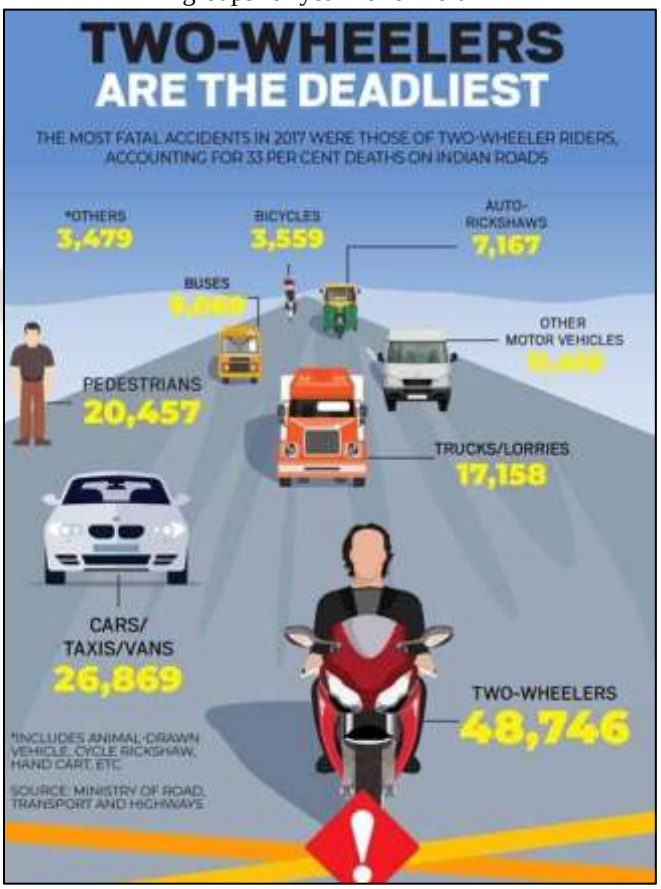


Fig. 3: Figures for road deaths by age-group as per 2016:

- Approx. 70,000 hit in the age group between 18 and 35 years, comprise maximum from all the age groups as counted.
- Approx 33,600 hit for the age group ranging between 35 and 45 years.
- 5,766 is the count of road deaths which have not yet been compiled into any age group.

– A total of 1,50,800 total death recorded from all age groups in single year of 2016 , sounds worst.

This is a tiny drop of clean water in a big polluted ocean, but its impact will be huge. Hence this is a novel yet feasible solution.

Keywords: IoT, firebase, NodeMCU, E-challan, traffic congestion, Jupyter notebook

I. INTRODUCTION

Traffic congestion is a problem regarding transportation movement that is characterised by slower speed, increased in trip times and long vehicular queuing. Traffic congestion in urban road networks has become increasing problematic since 1950s. As the demands of vehicle increases the capacity of roads extreme level of traffic congestion sets in leading to a huge kiosk. If seen mathematically congestion can be said to be as number of vehicles that pass through a point in a flow. There are number of specific circumstances which cause or aggravate congestion most of them leading to increase in number of volumes required for a given number of people. In terms of congestion, rainfall increases traffic capacity and speed thereby, resulting in greater congestion and road network productivity loss. Traffic researchers can't still predict under which condition a "traffic jam" may suddenly occur. It has mostly been noticed that congestion of cars at a single red light may lead to increase in the congestion of others due to a single incident or any wrong movement of any individual causing congestions at the next lights and further so on. Traffic movement can be understood to be as similar to that of a fluid running across a pipe at a certain long distance with taps in between unlike a red light to manage the overflow or to provide a break to overflow of that fluid. Incase damage occurs at one tap or can be said at one stoppage it will lead to overflow further forward resulting in excess deposition of fluid at the next tap resulting in unnecessary damage to the construction setup and will further congest all coming points in its way to spoil the whole system . It is necessary to setup a system that will nullify the congestion or will lead to reduce the over congestion incase any breakpoint occurs in between the proper functioning of system to reduce the effects that will come in its way.

Fig. 3: Comparison and Graphical Statistics of Road Accidents

Considering the statistics of road accidents from 2016 to 2017 there has been an increase in road accidents of approximately 0.2 percent. As we can see a major increase in road accidents, we have developed a dynamic regulating traffic model that can help in reducing the consistent number of traffic accidents as well as regulating the traffic effectively without any human efforts or traffic police physically present over there.

The solution for regulating the traffic congestion is calculating the number of vehicles present in that lane and as the number of cars present in any particular lane increases it would show the green light so that traffic is being regulated. It is repeated every after certain interval of time so that traffic is regulated over time and no congestion is created. Now elaborating on the actual solution, consider a real life situation of traffic congestion on intersection of roads. There is need of camera to be installed on each lane such that the live stream of the camera is provided and here begins the actual interpretation of the live streaming of the traffic on the road. The number of cars in each lane is calculated and then on comparing the numbers of cars in each lane we provided the comparable time for the traffic to be dissipated.

II. LITERATURE REVIEW

A. Existing Practices in Different Countries

1) United States of America

The United States have systematic programmes to identify the traffic congestion and to handle the congestion problems. California Department of Transportation (Caltrans): Caltrans defines congestion as occurring on a freeway when the average speed drops below 35 mph for 15 minutes or more on a typical weekday (Varaiya, 2001). In Minnesota, freeway congestion is defined as traffic flowing below 45 km/h for any length of time in any direction, between 6:00 a.m. and 9:00 a.m. or 2:00 p.m. and 7:00 p.m. on weekdays (Bertini, 2006). Michigan defines freeway congestion in terms of LOS F, when the volume/ capacity ratio is greater than or equal to one (Bertini, 2006). Denver Regional Council of Governments (DRCOG) examines traffic congestion (DRCOG, 2011) by studying the regional vehicle miles travelled measures and regional freeway bottlenecks time to time and discuss the key reasons for the bottleneck, possible mitigation strategies and congestion measurements. Council monitors various congestion measures like: Vehicle Miles and Hours of Travel, Average Travel Speed (mph), 287 Mohan Rao A. et al. Measuring Urban Traffic Congestion – A Review International Journal for Traffic and Transport Engineering, 2012, 2(4): 286 – 305 Person Miles of Travel (VMT), and Person Hours of Travel, etc. The council's web site is operational and available for public use and review. Web site displays the congested corridor if the speed on the corridor is less than 15 mph. The greater Montréal considers the vehicle have joined a highway queue when its speed drops below 25 km/h and is considered to have left the queue when its speed rises above the 60 km/h mark. Rhode Island State DOT attempts to use objective congestion performance measures such as percent travel under posted speed and volume/capacity ratios (Bertini, 2006).

2) India

Traffic congestion is a major problem for transportation professionals in India. Most of the cities are suffering from medium to high level of traffic congestion. Although in some major cities the growth of private vehicle usage has increased at a faster rate, in general, car ownership and usage has remained at a much lower level in Indian context. The poor roadway condition, non-uniform roadway features in terms of

carriageway and shoulder width, encroachment of road, abutting land use and resulting pedestrian activities, poor lane discipline, improper bus stop location and design, vehicles of wide ranging characteristics of technology and operating condition, heterogeneity of traffic, uncontrolled on-street parking, etc. indicate that the nature and cause of congestion in India might be substantially different from that in the developed countries. Unstructured: We have already discussed about the Structured and Semi Structured formats. Moving on to the unstructured format, this type would consists of formats that cannot be easily indexed.

Although the roads are becoming at a fast rate, there has been no serious attempt to quantify the growth of congestion in different cities in India. The non-availability of funds for additional roadway infrastructure has seriously constrained the growth of the supply side.

Roy et al. (2011) discuss a novel and interesting way to detect the congestion on the urban arterials in India. They suggest using a Wi-Fi signal emitting device and a receiver across the road to identify the congestion. This method was found to be successful in terms of high accuracy of classifying the road as congested or free flowing. Sen et al. (2009) discussed the characteristics of the ITS techniques that need to be developed to cater the traffic conditions and congestion in developing regions and presented a brief description of a few efforts being made in this direction. Merugu et al. (2009) discuss the project INSTANT (INfosys-STANford Traffic project), carried out for six months from Oct 6, 2008, to April 10, 2009 and which involved about 14,000 employees of Infosys. The aim of the project is providing incentives to decongestors. The project succeeded in incentivizing many commuters to travel at uncongested times, thereby significantly reducing their commute times. Dewan and Ahmad (2007) conducted a survey for car-pooling in Delhi and willingness of commuters for car pooling and they observed that car-pooling is one of the solutions to reduce the traffic congestion in Delhi. Pucher et al. (2005) summarize key trends in India's transport system and travel behaviour, analyze the extent and causes of the most India's urban transport crisis, severe problems, and recommend nine policy improvements that would help mitigate the problems.

3) Asian Countries

Sun et al. (2009) studied the relations between traffic flow parameters of traffic bottleneck and phase transitions in profiles of traffic flow fundamental parameters. Zhengyu et al. (2009) studied the spatio- temporal characteristics of urban traffic congestion, and identified the frequent congested sections in the network of Shanghai city using floating car data. Hao et al. (2008) focus on experimental observations and theoretical analysis of urban freeway congestion due to complex features of traffic flow, shock wave and state transition. Study observed that the theory of shock wave speed could be used to help establishing traffic control strategies and to control queue length. Hao et al. (2007) classify the traffic states and define types of recurrent congestion according to their evolvement. An approach of identifying traffic control area and congestion source using spatial-temporal speed figure is introduced. Pattara-atikom et al. (2006) investigates way to estimate degrees of road traffic congestion based on GPS measurements from main roads in urban areas of Bangkok, Thailand. The study used human perception to obtain classification thresholds and evaluated the performance of the proposed method. Zhang and Gang (2009) studied the system objective function of minimum network congestion – values and the quantitative analysis model of traffic congestion state for the Sioux Falls network. Lam and Tam (1997) investigate why the standard modelling and evaluation procedures currently used by the Hong Kong Government are inadequate for assessing the traffic congestion measures. Empirical evidence is given together with discussion on modelling and evaluation issues raised by the existence of suppressed/induced traffic. 290.

III. ANALYSING DATA

After organizing data, it has to be analyze to get fast and efficient results when a query is made. Python based frameworks are mainly used to analyze data. Juypter notebook - one of the python based web application is very efficient for this purpose.

A. Explaining Jupyter Notebook:

Jupyter notebook is one of the python based tool impounded in anaconda simulator holding the power to draw graphical analyses along with indulging python libraries.
Command: pip3 install Jupyter Notebook
Some features:

1) An interactive web application for writing and running code interactively and authoring notebook documents.
2) Separate processes started by the notebook web application that runs users' code in a given language and returns output back to the notebook web application. The kernel also handles things like computations for interactive widgets, tab completion and introspection.
3) Self-contained documents that contain a representation of all content visible in the notebook web application, including inputs and outputs of the computations, narrative text, equations, images, and rich media representations of objects. Each notebook document has its own kernel.

B. Dynamic Dataset:

The data from the camera is being captured and is being analysed that is the no. of cars surpassing through each lane . The numbers of cars in each lane is analysed through Jupyter Notebook (2.2) and then the data is sorted in ascending order and the lane with maximum numbers of cars is allocated with proportional time, which is sent on Google Firebase, the time allocated for that particular lane is now set on the Arduino according to which the light signals varies.

Whether you are counting cars on a road or products on a conveyer belt, there are many use cases for computer vision with video. With video as input, automatic labeling can be used to create a better classifier with less manual effort. This Code Pattern shows you how to create and use a classifier to identify objects in motion and then track the objects and count them as they enter designated regions of interest.

In this Code Pattern, we will create a video car counter using PowerAI Vision Video Data Platform, OpenCV and a Jupyter Notebook. We'll use a little manual labeling and a lot of automatic labeling to train an object

classifier to recognize cars on a highway. We'll load another car video into a Jupyter Notebook where we'll process the individual frames and annotate the video.

Fig 4. Flowchart Explaining the Working Of The Procedure

Steps Involved:

1) Using Jupyter Notebook (2.2) w e can calculate the no. of cars present in the lane .
2) Now, The result of the no. of cars according to the mean time for 10 seconds(as we have to plot the graph for no. of cars present in that lane to represent the car density) and then is sent to the database.
3) Here, we will use Google Cloud (Firebase) to recieve data.
4) Every city will have a unique index, so that we can access each city through a webapp
5) The cloud database will recieve 2

Fig 4. An Example of Clearing Traffic Congestion

Parameters:

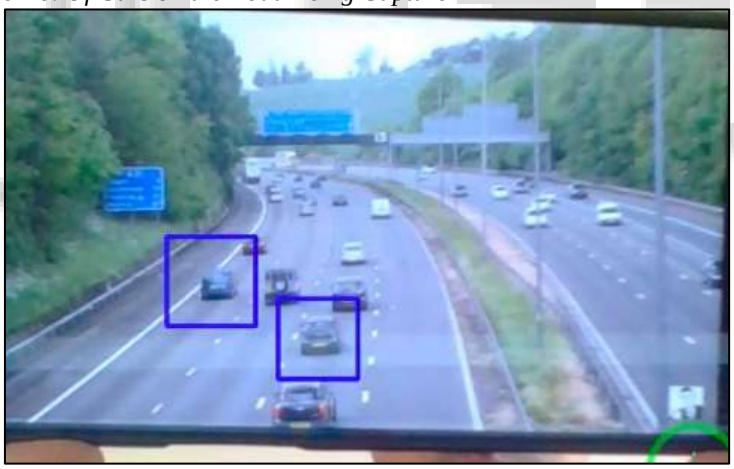
1) Time
2) Result

which will furthur be reckoned (calculate) by Grafana to make a graph.

6) Now the graph is interepreted by a computer system i.e. Raspberry PI and using peak values in the graph it will check the car density at particular time.
7) A webpage or a webapp will act as GUI for the user to interpret which will further send green signal if required.

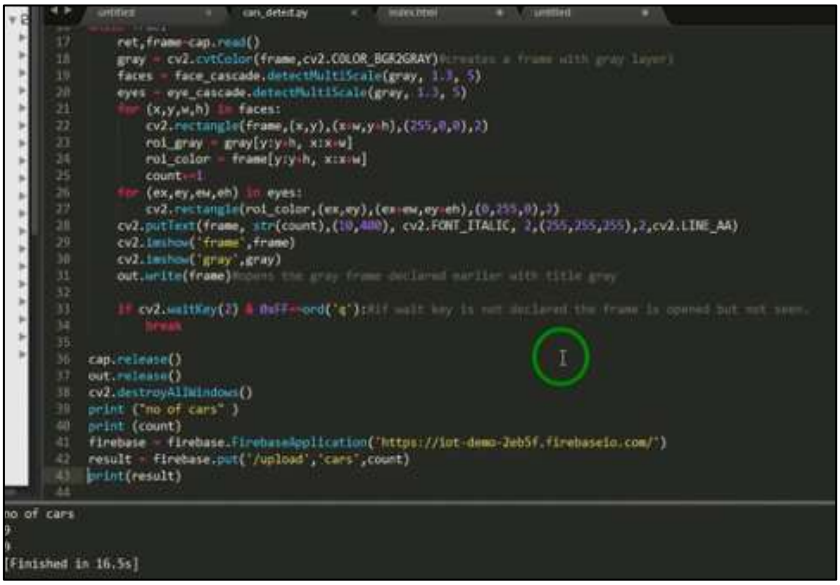
IV. FIGURES

1) An Image Displaying Live No. Of Cars on the Road Being Capture



2) Counting the Number of Vehicle

3) Images of the Code



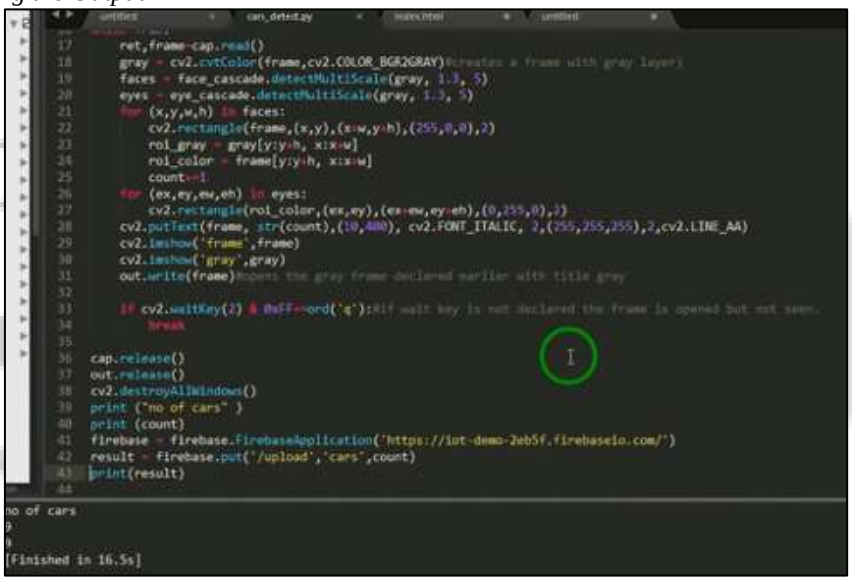
```
    ret,frame=cap.read()
    gray = cv2.cvtColor(frame,cv2.COLOR_BGR2GRAY)#creates a frame with gray layer
    faces = face_cascade.detectMultiScale(gray, 1.3, 5)
    eyes = eye_cascade.detectMultiScale(gray, 1.3, 5)
    for (x,y,w,h) in faces:
        cv2.rectangle(frame,(x,y),(x+w,y+h),(255,0,0),2)
        roi_gray = gray[y:y+h, x:x+w]
        roi_color = frame[y:y+h, x:x+w]
        count+=1
    for (ex,ey,ew,eh) in eyes:
        cv2.rectangle(roi_color,(ex,ey),(ex+ew,ey+eh),(0,255,0),2)
    cv2.putText(frame, str(count),(10,400), cv2.FONT_ITALIC, 2,(255,255,255),2,cv2.LINE_AA)
    cv2.imshow('frame',frame)
    cv2.imshow('gray',gray)
    out.write(frame)#saves the gray frame declared earlier with title gray

    if cv2.waitKey(2) & 0xFF==ord('q'):#if wait key is not declared the frame is opened but not seen.
        break

cap.release()
out.release()
cv2.destroyAllWindows()
print ("no of cars" )
print (count)
firebase = firebase.FirebaseApplication('https://iot-demo-2eb5f.firebaseio.com/')
result = firebase.put('/upload','cars',count)
print(result)
```

```
no of cars
9
9
[Finished in 16.5s]
```

4) Code with Displaying the Output



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V. REFERENCES

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