

PROJECT REPORT :

VEHICLE QUEUE MANAGEMENT

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The motivation of the Project

When we were discussing different projects to choose, we found this one to be one of the most realistic projects. Because each and every one of us has at some point of time experienced the hassle of filling all our details and waiting for the guard to leave us while coming through the main gate. So we thought of eliminating the frustrating and time consuming queue in front of the gate to the best of our ability and the resources provided.

Brief description of the Project

Our project is to manage the queue in front of the main gate as smartly as possible.

Normally the students coming inside the campus (or coming to pick'em) has to come out of the vehicle in front of the main gate and enter both student's and drivers personal details. We are trying to make the system such that they don't need to come out of the vehicle and can pass through the gate in less than a minute.

We have divided the arrivers into 3 different types.

1. Professors have their details saved in the database beforehand, so they can enter the gate without any previous requests.

2. IITG Students need to send a request including their as well as their drivers(Cab) through the web for both pickup and drop. Login is done using their webmail credentials.

3. Others also need to send the request to enter with their details before entering the gate through the web page.

Once the vehicle arrives ,it is detected and the number plate is scanned to check whether it has sent the request already or not. If not it has to be sent from there itself. If yes they are allowed to enter the gate.

Same applies to returning from the gate.

Features of the project

- Pre-request sending system using web with all the necessary details of the student and the driver, and thereby drastically minimizing the time taken in writing them manually in the gate.
- Previously saving the required data of professors so that they can go through without request.
- Automatically detecting the Vehicle using Ultrasonic distance sensor.
- Using the buzzer to notify the guards that vehicle has arrived immediately after sensor detects it.
- Webcam automatically takes a photo of the vehicle just after detection and extracting the vehicle number from the number plate using image processing and MQTT to send the image.
- You can see the LCD display printing 'YES' or 'NO' depending on whether the vehicle has previously sent the request or not.
- Practically it may print 'NO' sometimes (eg: Heavy rain, so couldn't get good quality image) even when vehicle has already sent a request due to image processing faults, so there is a web page made where the taken photo itself is directly sent and a page to enter the vehicle number manually and check if it has already sent request or not to ensure 100% reliability.
- Automatic gate which opens when the display prints no (Not in the real system)

*Everything works in real-time and is tested

Working of the project

Components of project :

1. Hardware

- Raspberry Pi 2 Model B
- HC-SR04 Ultrasonic Sensor
- Groove-Buzzer
- Usb Webcam
- Wifi dongle
- Lcd 16x2 Alphanumeric Display
- Jumper Wires

2. Software

- Opencv
- Php web server

Working :

- Since this project has real-world implementation , all its hardware components need to be fixed appropriately for the successful implementation of system.
- We have made request form separately for students and delivery guys(like zomato, amazon,etc) in which they have fill required details. Students also need to mention whether it is drop or pickup request.This is mandatory to fill the form before arrival of vehicle at the main gate of college.
- First of all , as any vehicle has arrived at the main gate, it is detected by ultrasonic sensor , buzzer (fixed at security desk) makes a sound so that they can know that a vehicle has arrived, also on the same moment , a snapshot of car is captured using usb webcam.

- As soon as the image is clicked , it is sent to the local machine (a computer or a laptop installed at security desk) via mqtt.
- Transfer of image takes some time (about 20-30 sec) depending on the speed of the internet. As the image is received in local machine via mqtt , image processing is done using opencv.This process has several steps.First it extracts the segmented part of number plate from the whole image of car and then processing is done on segmented part of number plate for conversion of text in image to real text.This whole process takes about 12 seconds.
- As image processing is done , it checks the output text whether it matches with any of the request made earlier from the database.
- String matching takes max 5 sec , as it is done a sound is made at security desk using buzzer to see on the Lcd display.
 - **Case 1** : If the vehicle number matches , the display will show “YES” and Guard will allow the vehicle to enter
 - **Case 2** : If the vehicle number does not match , display will show “NO”.It is also the possibility that image processing is not done properly so we have developed a simple webpage in which guard can manually enter the vehicle no. by watching the image received in their machine and webpage will show YES or NO.
 - **Case 3** : If the vehicle number does not match , display will show “NO”. If the vehicle has not fill the form there will be no such entry of that vehicle in the database . So then the driver has to fill the request form on the spot.
- For keeping track of vehicles inside the campus , we have one table in the database “INSIDE” which can have a 0 or 1 . If it is 0 , the vehicle has not arrived yet.Currently guard takes license of the driver. If it is 1, the vehicle is inside the campus security desk in the main gate has their license. When vehicle goes outside , driver takes its license back.

Conclusions and Drawbacks

So the queue in front of the gate is managed. Now in real-time it can be implemented to the gate system.

Drawbacks:

Often the image processing exactly doesn't match the original vehicle number, which depends on the clarity of the image captured, font-style of the vehicle number etc. Even though back-up case of typing the image from the photo sent to the page and manually checking through webpage is there, complete automation is not assured in the real-world.

Scope of Future Work

- This can be implemented in our IITG gates in real-time as demonstrated by us.
- As of now security personnels are taking the license of the drivers and allowing them to go inside, that can also made automatic with a secure system to get the details of the driver.
- Barricade can be set up to make even the gates automatic to avoid opening and closing of the gate manually every time.
- This can also be implemented in the KV gate in a similar manner.
- If the license is not taken the vehicle can enter from one gate and exit through the other as the database we used is shared. Actually we programmed this case but as of now it is not possible with submitting the license at the main gate. If security guards allow not to take license but only the details of student and driver , we also developed a new database. Here along with INSIDE , we have OUTSIDE. If $(\text{INSIDE}, \text{OUTSIDE}) = (0, 0)$, the vehicle has not arrived yet. If it is $(1, 0)$,the vehicle is inside the campus. If it is $(1, 1)$,the vehicle has gone from the campus.