
Work System Design Project

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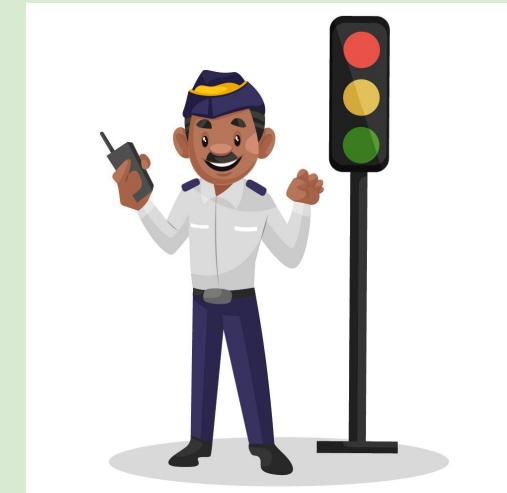
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Defense and Security

Traffic Police Work System

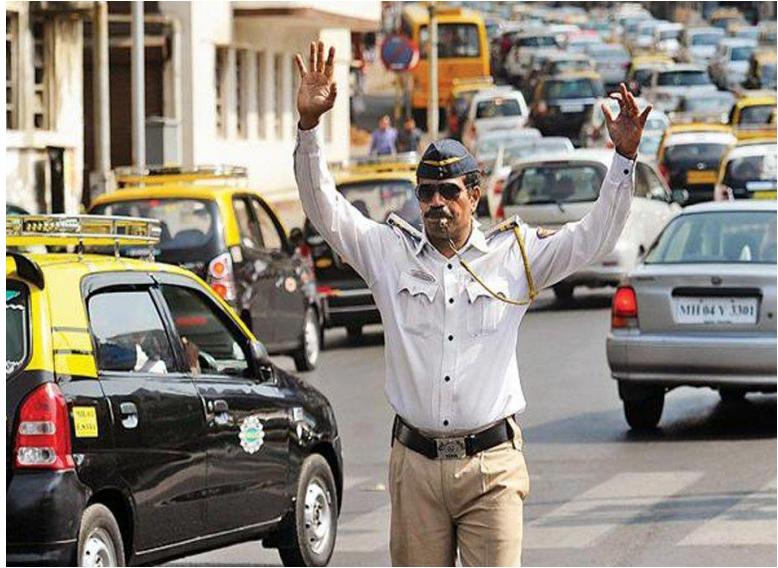


Our Problem Statement



- When we go around in city and we see Traffic Policemen stand in extreme weather conditions like hot sun, rain, etc and get exposed to air and noise pollution.
- Also, especially during peak hours, when people don't follow rules policemen have a lot of vehicles and noise to handle, and thus causing mental stress and fatigue.





Air pollution affects lungs of traffic police: Study

APD foundation conducts pulmonary function test on cops

MANGALURU, DHHS: The pulmonary function test (PFT) conducted on the traffic police by the Anti-Pollution Drive (APD) Foundation has shown a significant correlation in lung function and exposure to vehicular pollutants.

According to the results of the test and the subsequent study, the use of protective gear can reduce the number of traffic police falling prey to restrictive lung disease. Reduction in exposure by use of protective gear and air purifiers and reduction in the duration of exposure in a day would also help in improving their lung function. Monitoring vehicles which have been in service for 10 years for pollutants, would also help in minimising the level of pollution, the foundation said, in a press release.

The test, done by computerised spirometer, measuring FVC, FEV1/FVC, PEFR, and FEF25-75 per cent, was measured by pulmonologists from the Department of Respiratory Medicine at Yenepoya Medical College.

The test showed that significant number of traffic personnel have affected lungs. The re-



ACP (Traffic) Uday Nayak undergoes a pulmonary function test conducted by the Anti-Pollution Drive (APD) Foundation in Mangaluru.

sults indicated that 22.3 per cent of the policemen having five and less than five years of service had suffered from restrictive lungs. About 26.3 per cent policemen, having more than five years' experience, are showing restrictive lung capacity.

The foundation has observed that Mangaluru is one of the rapidly growing cities in the country and the growth is associated with an enormous

increase in vehicular traffic emitting exhausts and polluting the atmosphere. Airborne pollutants play a major part in overall atmospheric pollutants and motor vehicle emissions are the most significant sources of pollution in an urban environment.

Respiratory pollutants emitted by traffic induce volatile organic compounds, suspended particulate matter, oxides of sulphur, oxides of nitrogen, and carbon monoxide which makes adverse health effects on the exposed population, it said.

It said the traffic-related air pollution poses a threat to daily life, mainly to individuals who commute to offices, school and colleges. Several students use the public transportation or the private vehicles provided by the educational institutions where they are exposed to hazardous fumes in the air. Schoolchildren, who are exposed to pollution at a tender age, develop health hazards in their respiratory system due to automobile exhaust. Even today, the percentage of asthmatic children is increasing in urban areas. Vehicular pollution is the sole pollution contributing elements in a large scale to the health-affecting residents, school students and officer goers.

APD Foundation Founder Abdullah A Rehman said observing the health condition among the retired traffic police would help in studying the long-term effects of the occupation. "The study will also ascertain whether we will be able to identify the impact on the most-affected group based on the PFT results. We will then identify the locations and environment they are working in and start monitoring the pollution levels in these areas. We will also use this information to work towards categorisation of the pollution," he said.

ACP (Traffic) Uday Nayak said the tests conducted by the foundation have helped the police a lot. "It is good to know that our health condition is deteriorating, especially the traffic police personnel," he said and added that the hospitals have offered to provide free treatment to the affected police personnel.

Hence, we thought of some Work System Design that can improve and ease his life, and keep a check on people who don't follow rules.

Drawbacks of current Work System

- Traffic Policemen get exposed to extreme weather conditions and pollution. Recent studies have shown that the L_{eq} average during peak traffic load hours and in the least traffic conditions is 77.2 ± 2.1 and 64.5 ± 2.2 dB, respectively which is way higher than the acceptable levels (55dB).
- A lot of workforce is spent in enforcing traffic rules.
- No special arrangements for smooth movements of emergency/VIP vehicles.
- Inefficient and unoptimized Traffic Lights.



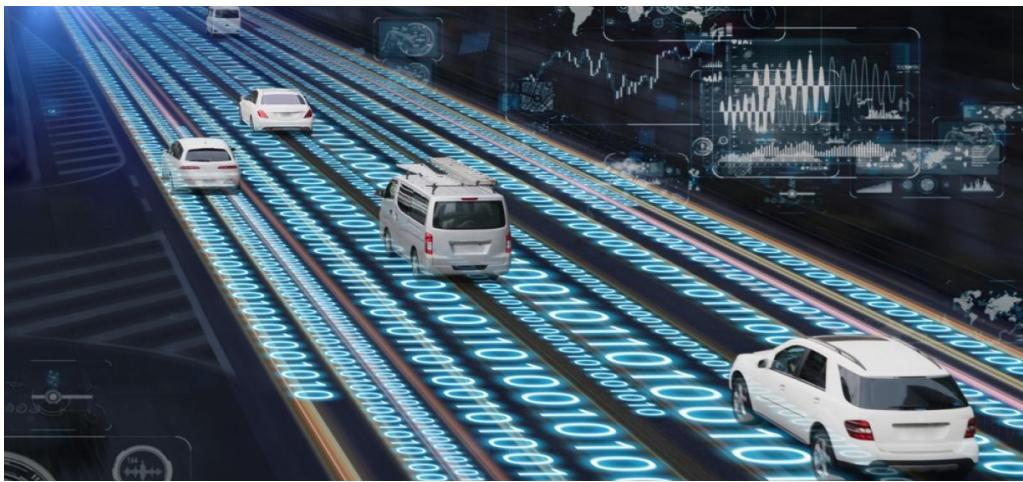
Workforce spent in enforcing traffic rules and current challan system:



Improvements Possible in current Work System

- Challan facility can be digitised and automated.
- Work of traffic policemen can be semi-automated and some special arrangement can be made which can reduce their exposure to weather conditions and pollution.
- Traffic Management can be improved and optimised as per traffic density.
- When required, Special Traffic Arrangements can be made for smooth movement of VIP and emergency Vehicles.





Our Strategies to provide an integrated system that can tackle all these

- Set up of Traffic Police control Room (In accordance with Ergonomic Principles).
- Use of Metallic hands, with integrated, synchronized and optimised systems work to handle heavy traffic.
- High performance affordable cameras, to detect driver faces and vehicle number plates of rule breakers.
- Automatic Challan system integrated with an email system that generates bills and re-directs it to the owner of the vehicle.
- Facilitating Communication among Control Rooms to allow quick and faster implementations of internal plans.



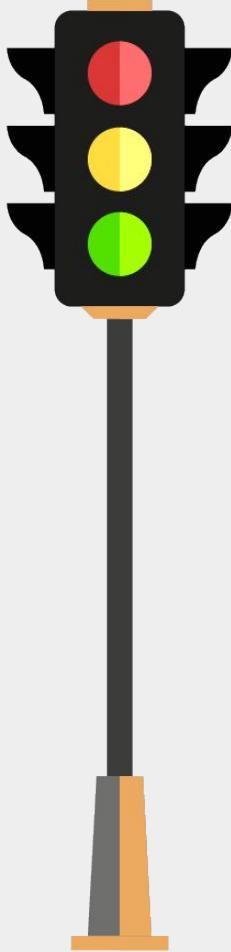
That's the transition we want to bring!!

We are starting our project by designing the Control Room!

Through this, we attempt to address one of the most significant drawbacks i.e. reducing the exposure of Traffic Police.

This setup will help in maintaining their health and consequently improve their efficiency and alertness at working hours to a great extent.

The Traffic Police Control Room



OVERVIEW

Design of the control room office.
(shape & structure)

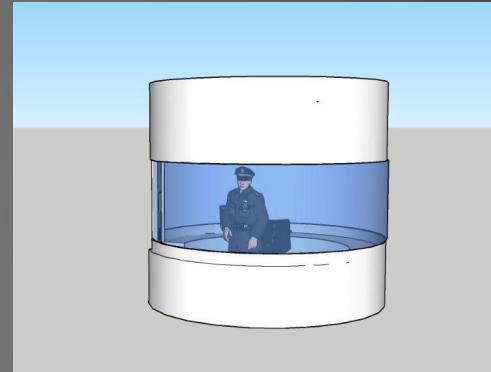
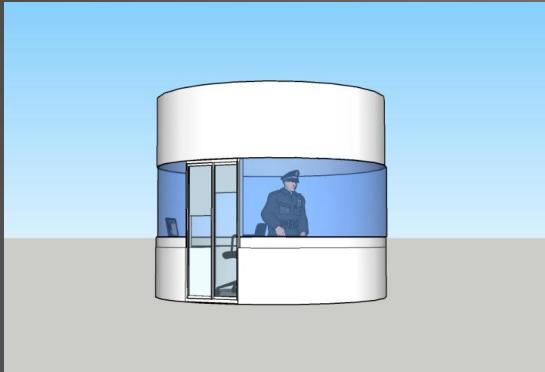
Functions of the Control Room.



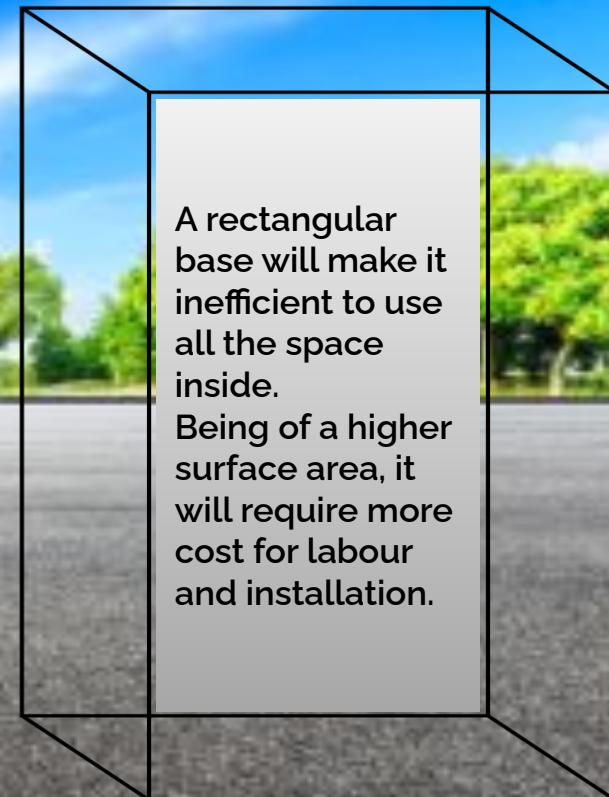
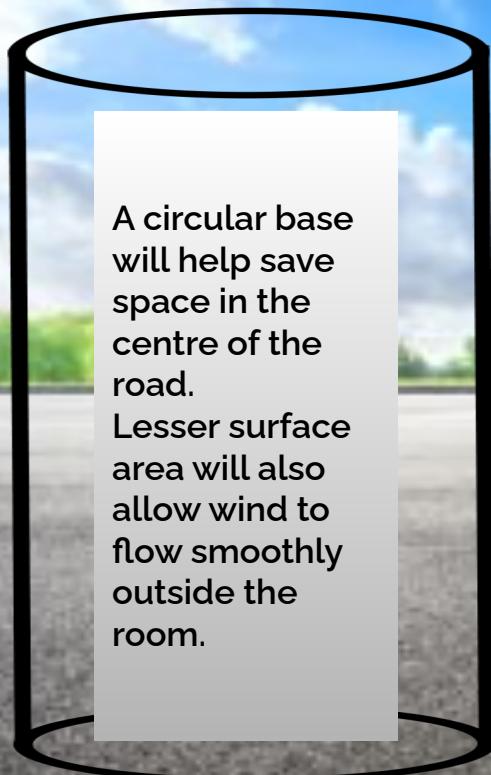
Internal features of control room which ensures comfort and effectiveness of the traffic police.

Video presentation of the control room.

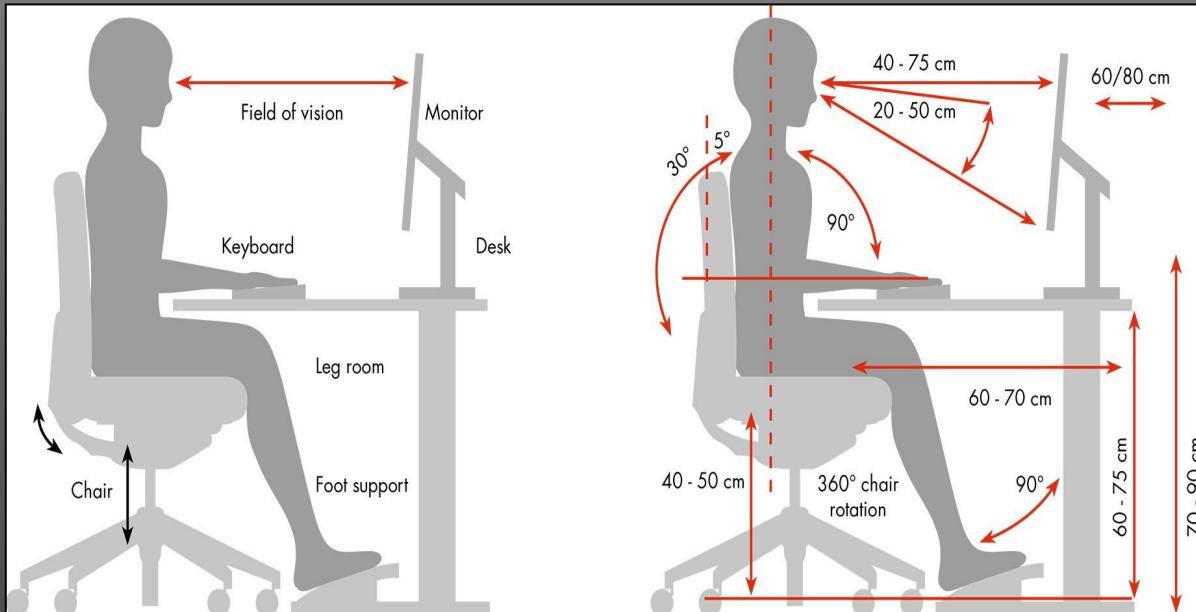
Shape & Structure of the Control Room



Why cylindrical room?



An Ergonomics Chair



Its extremely important to have a comfortable environment in order to work efficiently. Moving a step further to achieve this, we are designing a chair that serves this purpose very efficiently.

MULTIPURPOSE WINDOW GLASS

Prolonged exposure to noise pollution can adversely affect hearing, cause stress, fatigue and disturbed sleep. A practical solution to the problem of increasing levels of outside noise- be it the blaring of car horns, the racket from construction sites, accident scenarios, is to opt for soundproof glass or acoustic glass for windows and doors :

A laminated glass manufactured by joining two layers of glass with an interlayer of Polyvinyl Butyral or PVB in between them.

- **Noise Reduction** : It creates a near-impregnable barrier between the external noise and your ear and blocks external noise by up to 90%.
- **Enhanced Safety** : As the soundproof glass consists of an inner PVB interlayer, it does not break easily. If in a rare situation, this glass type does end up breaking, the glass pieces remain stuck to the PVB interlayer and don't shatter, thereby giving the glass a spider-web-like appearance. As this glass does not shatter and fall out, it reduces the chances of any incurring injuries from the jagged glass shards.
- **Heightened Security** : It can be constructed with multiple glass panes in different thickness, which makes it even sturdier.
- **Better Comfort** : To ensure an ideal temperature inside, a Low-E coating, can insulate the interiors optimally i.e. during the summer, it keeps the interiors cool by reflecting the sun's heat away while during winters, these glass windows prevent heat from escaping through them. As a result of this, the need for artificial cooling or heating systems reduces, making it quite an energy-efficient.
- **UV-Protection** : These laminated glasses block harmful UV & IR rays and also protects from solar glare.

FUNCTIONS OF THE CONTROL ROOM

- We will be measuring the traffic density through cameras fitted on the outer body of control room which will be utilised in the synchronisation of metallic hands and traffic lights.
- Whenever the traffic density will be low ,we will be using the as usual traffic lights while in case of high density, the control room shuts the lights functioning and turns on the metallic hands which will then be operated by the traffic policeman sitting on chair through buttons.
- The data that we would be collecting from control room could also be communicated to other checkposts which can be highly useful in trapping criminals,terrorists. In this way our system would be also extending it's hands towards the concept of security.
- The workload on the policemen would be drastically reduced,hence improving the overall health of individual.





Our Next Step...

**Next week we will discuss the challan
redesigned system which is synchronised with
our control room facilities along with
Integration of external components with
control room**



TRAFFIC LIGHT

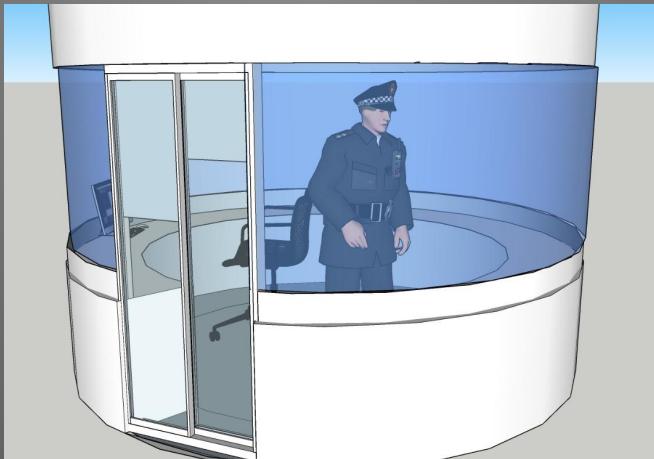
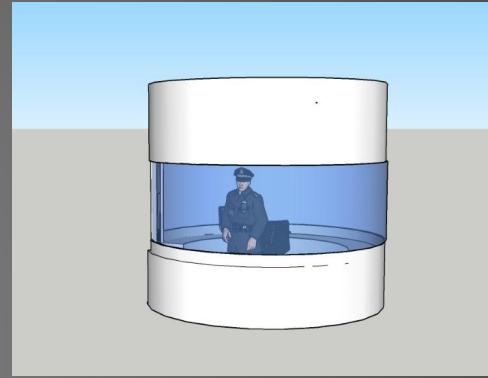
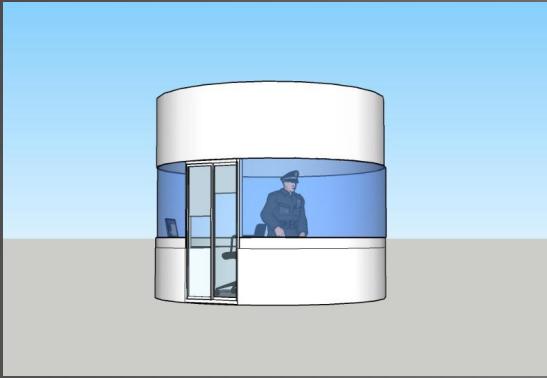
FOLLOW RULES





That's the transition we want to bring!!

The Control Room



We are integrating a Smart e-Challan System to control Traffic Violations!

Through this, we attempt to reduce the high amount of workforce being spent in enforcing traffic rules.

This setup will help in controlling traffic violations in a simplified and digitized manner.

Smart e-Challan System integrated with The Traffic Police Control Room



OVERVIEW

Introduction to the Smart e-Challan System

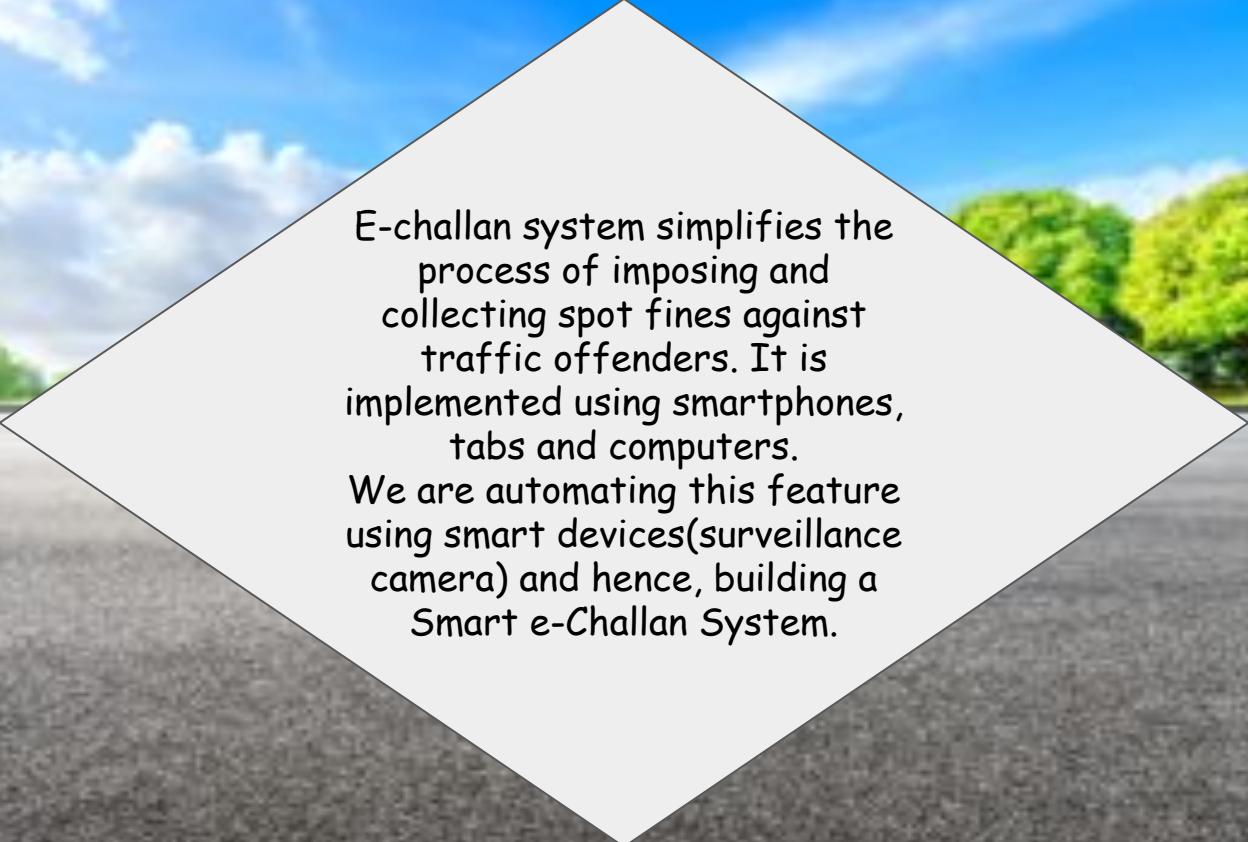
Flowchart of the Working

Requirements, Technology Stack & Key Features

Benefits



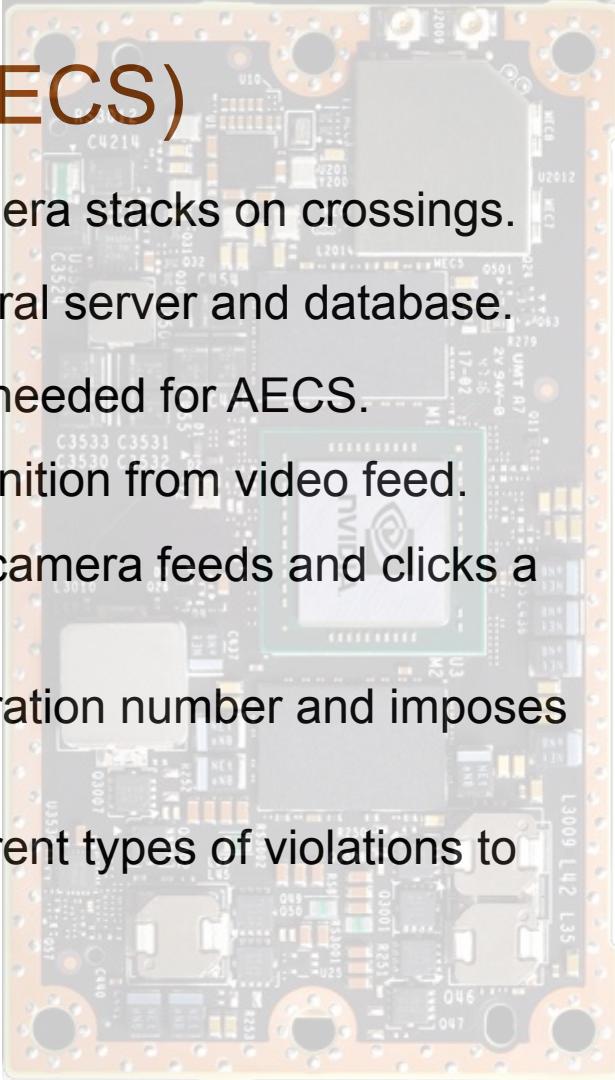
Smart e-Challan System



E-challan system simplifies the process of imposing and collecting spot fines against traffic offenders. It is implemented using smartphones, tabs and computers. We are automating this feature using smart devices(surveillance camera) and hence, building a Smart e-Challan System.

Automatic E-Challan System (AECS)

- An addon computer module is installed to all the camera stacks on crossings.
- Module consists of Nvidia Jetson linked with the central server and database.
- Jetson is capable of performing deep learning tasks needed for AECS.
- OpenALPR Rekor API is used for licence plate recognition from video feed.
- A Policeman sitting in the control room monitors the camera feeds and clicks a picture when they spot a violation of the rule.
- API takes the cropped images, recognizes the registration number and imposes fine along with a UPI payment link to the violator.
- Another DL model can be trained to classify the different types of violations to streamline the process further.



Manual E-Challan System(MECS)

- The control rooms are installed with all required softwares.
- The software is designed in accordance with Motor Vehicles Act, 1988.
- Policeman have to enter Vehicle registration number and select the offence.
- An SMS/E-Mail will be sent to the violator regarding the imposed challan.
- The SMS/E-Mail contains a UPI payment link for easy transactions.
- Challans can also be cleared via Pragya Kendras.
- The system works online as well as offline by using a local buffer and syncing with the Central server when back online.

Technology Stack

- **Front End:** Android and IOS applications
- **Back End**
 - Python V3.10.2
 - JAVA 8
 - TensorFlow API v1.6.0
 - OpenALPR API v2.3.0
 - Razorpay (Payment gateway)
 - JAVA Mail API
 - Text Local API
- **Database:** MongoDB/Oracle
- **Server:** Google SMTP (Email), Apache



Razorpay

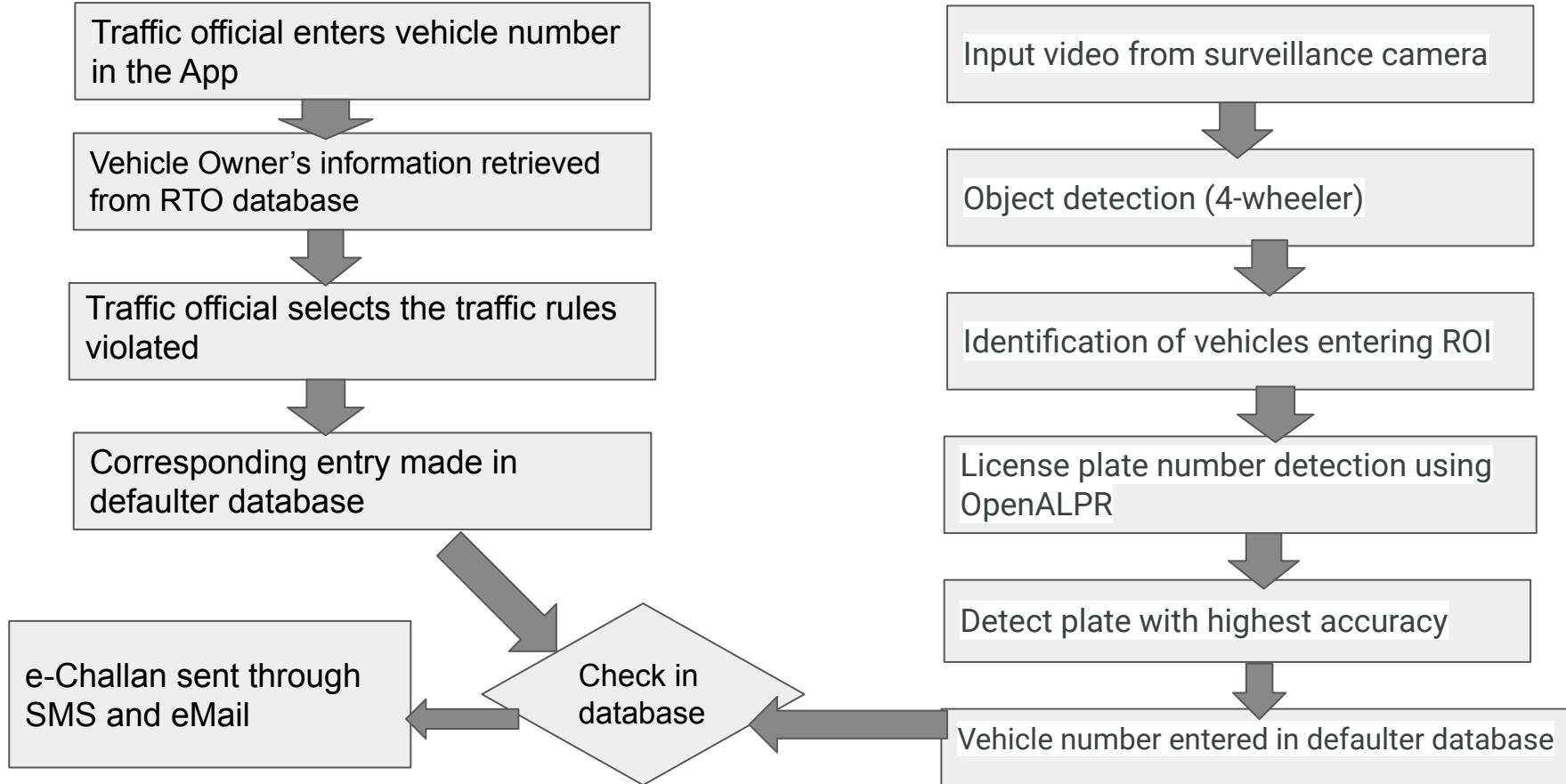


TensorFlow

Key Features

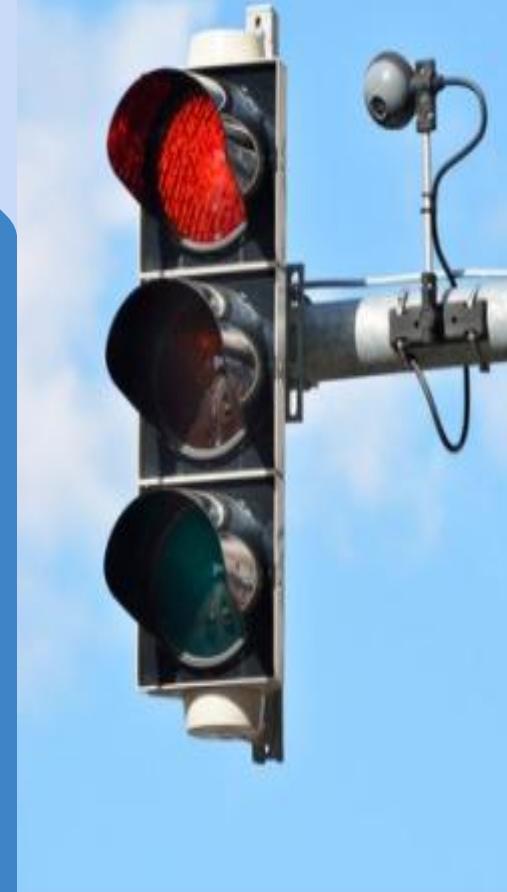
- Identification of traffic rule violators using Deep Learning
- Integration with Traffic Control Rooms
- e-Challan using police Tablets (Contact)
- e-Challan using evidence Camera (Contactless)
- Integration with Razor Pay, PayTM, Billdesk, SBI & ICICI gateways
- Incremental challans for serial offender
- Challan delivery via eMail and SMS
- Centralised data storage
- Local data storage when in offline mode
- Identification of theft vehicles against Police FIR via Android App
- IVRS for reminding e-challan defaulters

e-Challans



Advantages of Smart e-Challan System

- Increased Accountability
- Centralized Data Storage
- Repeated Violator Identification
- Decentralized Administration
- Paperless Challans (SMS & eMail)
- No cash transactions on road
- Multiple payment options
- Minimal Infra cost for police units
- Easy UI for police officers
- Common Modus Operandi
- Identification of theft Vehicles
- Live Dashboards to Control Room Unit Officers



Our Next Step...

**Next week we will present a strategic solution
to facilitate some special arrangements for
smooth movements of emergency/VIP
vehicles.**



TRAFFIC **LIGHT**

FOLLOW RULES





That's the transition we want to bring!!