



### USING DRONES AS AN ALTERNATIVE TO PRESET TRAFFIC SYSTEMS AND SURVEILLANCE CAMERAS

**Anushree Kagalkar**

Prabhavati Padamshi Soni International Junior College

#### Abstract

This paper proposes unmanned aerial vehicles, or drones, as an alternative to surveillance cameras and traffic systems which depend on pre-set time or manual operations. It is a 10-year plan to implement the idea in most metropolitan cities in India, which is divided into two halves, with major traffic system changes initially, followed by additional advantages if the plan is successful. The plan is comparatively cheaper than having 5-6 surveillance cameras and a traffic system, since it combines the two. Not only does it use AI to do most of the work, it ensures that unemployment rates do not rise. It does not completely replace traffic police as it requires them to be present as supervisors.

**Keywords:** *traffic systems, drones, artificial intelligence, motion sensor, efficient traffic flow*

#### INTRODUCTION

The current traffic signal system used in most metropolitan cities in India relies on a fixed time operation system, where the timing for each signal is pre-set [1], lasting for 2-4 minutes. This means that there is a high possibility where in a junction there is one side with a green signal, but another side with a red signal lasting for two and a half minutes, and a huge line of cars constantly honking, which is the reason behind the idea proposed. To make this problem better, traffic police are stationed at the congested junction during peak hours to ease the flow of traffic. However, this does not always seem to work. The idea proposed in the paper combines various high-tech systems balanced with manual surveillance to achieve maximum possible efficiency to ensure the traffic in major cities flows better.

#### Theory

According to the Tom Tom Traffic Index, Mumbai was the most congested city in India, and the fifth-most congested city in the world in 2021 [2]. According to “The Great Reset”, a book by Richard Florida [3], building greater, wider roads does not help in reducing traffic, as it only encourages drivers to commute more often as the travel time is reduced. About 5-6 ANPR (automatic number-plate recognition) cameras are installed at junctions which measure the average speed of the motorists, and an e-challan is issued after a manual approval at the traffic control room [4]. However, these systems have not drastically affected the traffic systems, and are relatively expensive. The proposed plan is about using drones: one at each big junction. The drone consists of a camera which provides a 360-degree view of the crossroads to analyze the traffic, which will be connected to traffic signals to control the signals according to the traffic



levels rather than having a fixed time for all signals. The camera will also use the ANPR technology in order to identify various vehicle types, their speeds, classification etc.

### Experimental

For the first 5 years of the plan, a hybrid drone system will be used. The drone will use a radar based camera with a visual range up to 6 lanes in all directions. This camera will be used as a probe to analyse the live traffic levels at a junction, and the AI system will be programmed to analyse the road traffic on all sides and make a decision which will be then displayed on the traffic signals. A black visor will be added to protect it from extreme weather conditions. The drone will fly at a height of 20-25 metres, and 15-20 metres in the 12km airport range [5]. It will be able to view up to 300-400 metres in all directions. A smaller camera will be installed below the main radar camera which will consist of an ANPR system to identify the vehicles, calculate their speeds, vehicle classification, prediction of lane change, etc. The system will give priority to sides with greater traffic and give that path a green light. In the case of no cars in the junction, all the lights will turn red to ensure complete safety, and only turn green if a car is detected. The cameras which are in a 1km range of each other could be connected and coordinated to make traffic flow even smoother, so the car doesn't have to stop at every junction. It will also detect over speeding, not wearing helmets, unnecessary honking, breaking signals, wrong parking and other traffic-related crimes. However, for India, employment is extremely crucial, so instead of completely replacing humans in controlling traffic, a hybrid system will be implemented where the drone is accompanied by a traffic police officer. The detection of traffic related crimes will be linked to the E-Challan system where the recording will be sent to the traffic control room for a manual approval before the challan is issued. This also reduces corruption rates as the tax is linked to the bank account and supervised by various heads rather than a few police officers. In case the E-Challan has not been paid even after several warnings or the amount due has exceeded a set limit, the license could be suspended for a particular time period. The drone can automatically control the signal during low traffic periods, but if the traffic is high, there is a risk of glitch/failure in the system as it may get confused. Since this is a matter of lives, during the peak times the drone will only make suggestions to the controlling device operated by the officer, who will be supervising the traffic and will approve of the decision made. Moreover, since the camera has a high visual range, it can detect car motion long before it reaches the junction. This allows the camera to detect ambulances, fire brigades and police cars long before they are manually spotted, and can clear the road for the high-priority vehicles in the case of emergencies. The high visual range could also alert the police if any suspicious criminal activity is detected, rather than having the police spot suspicious activity and stop the cars. The reaction time of the police as well as the drivers could affect this, and criminals might get away. If the police are alerted well in advance, it could really help find criminals trying to escape as the drone also measures speed and prediction of lane change. These factors could be used to predict the probability of an accident/criminal running away, and allow the traffic police to stop all the vehicles at the junction, making it easier for police to chase them. Public transportation like buses could be given second priority so that they stick to their schedules since more than 60% of Indians use public transportation as a way to commute [6]. A system that was recently tried in Thane [7] could be adopted and added to the proposed traffic system wherein the duration of the red light increases if the noise pollution at the junction exceeds a particular range. This will



encourage the citizens to honk less, since all the metropolitan cities almost always violate the noise pollution standards. In case this plan succeeds in the 5 years, smaller but significant changes and additions could be made such as using LDRs and logic gate systems to turn on street lights when it gets darker.

Google Maps currently relies on historical traffic data or manual updates to display the traffic levels. To increase the accuracy, the system could be connected to Google Maps or car GPS systems to give a live update on traffic. It could also detect potholes and update the officials in charge.

### DISCUSSION

There are various challenges when it comes to implementing such a complex system in a developing country. Using AI could cause a lot of people to lose jobs, which is not beneficial for India's development. The hybrid system ensures that the jobs are intact, and development is happening simultaneously. Extreme weather conditions such as wind could really affect the functioning of the drone, so the composition of the material will be planned accordingly. Even though a drone system may seem extremely expensive (considering the cost of developers, the drone itself and multiple cameras), it is relatively cheaper in the long run as it only requires an installation cost and has all in one features, unlike the current system where there is a different system for each requirement. The road tax could also be increased by 1-2% in case the funds provided are not enough.

### CONCLUSION

The proposed plan consisting of 2 parts combines various systems used in the functioning of traffic into one, and provides efficient solutions to various problems such as traffic congestion, noise pollution, corruption, prioritizing safety, saving fuels (since India mainly relies on petrol and diesel and the rate at which the fossil fuels are being used up is at an all-time high).

### Acknowledgements

I would like to thank my physics teacher Ms. Shanta Chowdhury for constantly supporting me and helping me.

### REFERENCES

1. "How do traffic signals work?" Traffic Signal Design <https://www.traffic-signal-design.com/how-do-traffic-signals-work.htm#:~:text=The%20traffic%20demands%20are%20registered,controller%20and%20cannot%20be%20violated>. (accessed June. 6, 2022)
2. M. Sood. "Mumbai was India's most congested city in 2021, finds study" Hindustan Times <https://www.hindustantimes.com/cities/mumbai-news/mumbai-was-india-s-most-congested-city-in-2021-101644471450502.html> (accessed June. 6, 2022)
3. R. Florida. "The Great Reset" Toronto, Canada, 2010 4.
4. G. Sharma "Types of Traffic Cameras, and How E-Challan Works in India", "how e-challan get issued?" Gadgets to use <https://gadgetstouse.com/blog/2021/10/17/types-of-traffic-cameras-e-challan-in-india/> (accessed June. 6, 2022)



5. K. Gandharv “IIT-Bombay gets not for R&D, testing of drones from civil aviation ministry” Analytics India Mag <https://analyticsindiamag.com/iit-bombay-gets-nod-for-rd-testing-of-drones-from-civil-aviation-ministry/> (accessed June. 7, 2022)
6. Jitendra “Indians spend most on public transport, communication” Down to Earth <https://www.downtoearth.org.in/news/economy/public-transport-communication-services-are-major-expenditure-heads-for-rural-and-urban-india-54651#:~:text=13%20per%20cent.-,More%20than%2060%20per%20cent%20of%20rural%20and%20urban%20households,India%20use%20the%20auto%20rickshaw.> (accessed June.7, 2022)
7. R. Sullivan and E. Mitra “Mumbai tests traffic lights that stay red if you honk your horn” CNN <https://edition.cnn.com/2020/02/05/india/mumbai-traffic-lights-tests-scli-intl/index.html> (accessed June. 7, 2022)