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AI-Based Routing System for Traffic Management

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ABSTRACT: Traffic congestion is one of the main problems in India. The city most affected is Bangalore, the second-biggest metropolis in the world and the largest in the country. The misuse of traffic lights is one of the main factors contributing to traffic jams. This study provides an artificial intelligence-based routing system to handle traffic-related difficulties. This system is totally controlled by artificial intelligence and image processing techniques. Image processing enables the detection of vehicle density, while artificial intelligence enables precise time-by-time synchronisation of traffic light timing. These processes are automated, and the traffic police may continually monitor them from the traffic control centre using a computer.

KEYWORDS: component, formatting, style, styling, and insert.

I. INTRODUCTION

In the simplest words imaginable, we may say that any work performed by a person that calls for intelligence is referred to as human intelligence, and any task performed by a machine that calls for intellect is referred to as artificial intelligence.

AI is a really powerful tool, but only if humans are able to utilise it effectively. Learn how AI characteristics may be used to monitor items that are challenging to evaluate due to human error. When it comes to monitoring and keeping track of things, humans are often uninspired, inattentive, and not very good at multitasking. AI, on the other hand, overcomes all of these drawbacks and has the advantage of never becoming weary. Systems that use AI to power traffic and vehicle monitoring include a number of technologies that might be used to start the project. To do this task on a modest scale, the majority of the technology needed already exists. Both developed and developing countries now experience substantial real-time transportation concerns related to road congestion. To evaluate and handle this issue, effective intelligent transportation systems must be used. These systems have recently been created and have proven to be somewhat useful [1]. Transportation is vital for humans. The road infrastructure in major cities has recently been under stress due to the population growth rate and the significant migration of people from rural to urban regions [2]. Artificial intelligence (AI) and intelligent traffic management (ITMS) may be used to address and solve a variety of issues connected to traffic law enforcement. It may improve the efficient movement of traffic on the roadways, making travel for commuters simpler, more convenient, and safer. Such a gadget can be used by law enforcement as a deterrent as well as a weapon to punish offenders. A computer system called the Intelligent Traffic Management System (ITMS) uses artificial intelligence (AI) and is monitored by cameras. Junctions provide the Central Command Centre the capacity to find and notify drivers of vehicles who are breaking traffic regulations in real-time. In accordance with local law, it is permitted to automatically send challans to infringers and even send them online. [3] ATCS is predicted to cut signal wait times in half once fully installed. The Traffic Command and Control Centre also provides traffic authorities with a degree of understanding of regional circumstances and patterns that has never been possible before, allowing them to prepare and take preemptive action. Another objective of a smart town is to encourage sustainable environmental practises in addition to improving traffic conditions. In order to enhance traffic behaviour in a city and lessen congestion,

Systematic number plate reading, red light and speed violation detection, triple riding and helmet detection, free left turn obstruction, wrong-way driving, not wearing a seatbelt and using a phone while driving, hot-listed vehicle detection, traffic flow and congestion detection, among other traffic-related issues, can all be addressed by traffic management and enforcement systems. [3]



II. LITERATURE REVIEW

In 1956, John McCarthy spoke at a conference at Dartmouth College in New Hampshire on the topic of artificial intelligence. Numerous AI systems were unable to deliver on their promises because the original goals were too ambitious.

A couple of these early failures led AI researchers to start setting more specific goals for themselves.

Artificial intelligence (AI) is the most important technology of our time. AI has advanced significantly since its inception fifty years ago, especially in the areas of data mining, computer vision, robotics, expert systems, machine learning, natural language processing, and related applications. Machine learning is the branch of AI that enjoys the most popularity. Other subcategories of AI include deep learning, probabilistic models, artificial neural network systems, and game theory. These programmes are developed and used across a wide range of diverse sectors. Particularly for anticipating traffic congestion, it has recently become the most active field of study in transportation engineering. When authorities can anticipate traffic jams, they have enough time to distribute resources in a way that will Make passenger travel as simple as comfortable as you can. [4]

A project called artificial intelligence traffic control aims to provide state-of-the-art services related to various forms of traffic management and transportation. It also aims to assist users in using shipping and traffic networks in a safer, more efficient, and "smarter" manner. [5] One of these technologies is the employment of cameras to enforce traffic regulations, which is one of these emergency services, or indications and symptoms that signal changes in speed restrictions dependent on the situation.

The technologies used in intelligent traffic control systems range from simple management systems, such as control systems, vehicle navigation systems, traffic signal management systems, automatic number plate recognition speed cameras, or monitor applications, such as security systems, to more complex CCTV applications that integrate real-time data and feedback from a variety of other sources, such as parking guidance and information, weather information systems, bridge systems, and so Prediction techniques are also being developed to offer sophisticated modelling and baseline data comparison. [6]

III. METHODOLOGY

The system automatically transmits and encrypts the violation data to the central server in the traffic control room. The system can convey photo and video evidence to offenders' mobile phones through SMS and supports e-challan technology. The following requirements must be met by the CCTV and software in order to detect traffic offences. The camera has to be a 2-megapixel IP-based camera with excellent resolution and Ethernet power. It should only have a small range of 60 degrees because it should only need to track vehicles travelling in a single lane. Specialised frame rate cameras are used for speed detection. Data on violations is automatically encrypted and sent to a central server in the traffic control region by the system. Additionally, thanks to technology, e-challans and photo/video proof may be created and transmitted to violators' mobile phones through SMS. The system might be left on indefinitely. When a red light violation occurs, our system's overview camera will record a zoomed-out image of the whole region. The licence plate of the offending vehicle will be scanned by the ANPR and stored in the database.

BLOCK DIAGRAM

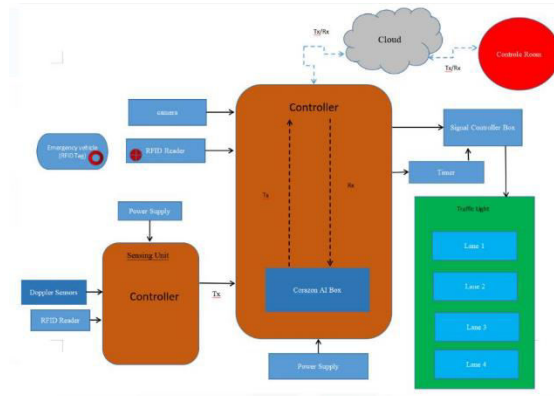


Fig.1

IV. FLOW DIAGRAM

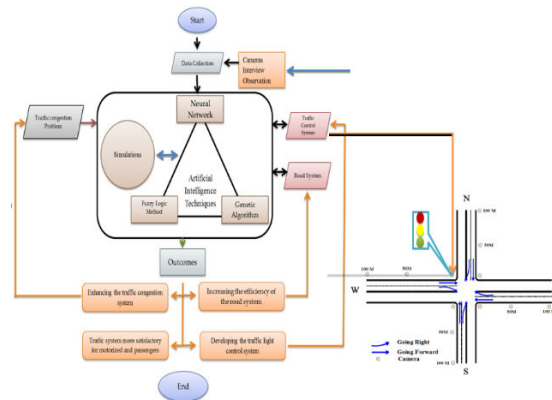


Fig.2

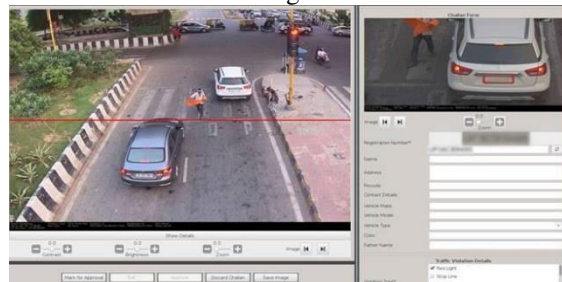


Fig.3

The Smart City project is rolling out the new technologies across the country. If someone runs a red light, it will automatically detect the violation and issue an e-challan. Using the Red-Light Violation Detection System, traffic police will be able to track down violators and issue them with an e-challan. For improved identification of traffic offences, the gadget could have sensors attached to cameras that send data to the traffic department's central control station.

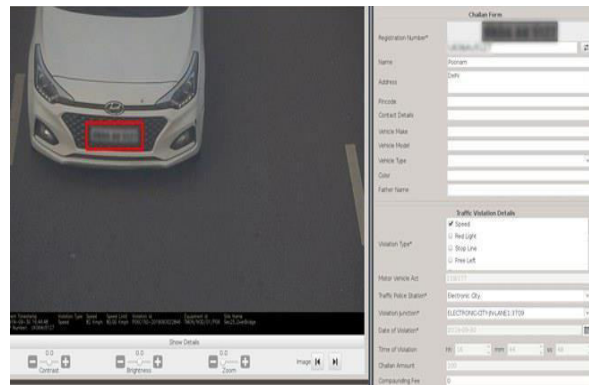


Fig.4

The traffic control rooms are connected to the system, which is continuously monitored. Additionally, it aids law enforcement in locating and accusing those who speed, triple-ride, cross the centre line, operate a mobile phone while driving, and commit other offences. A surveillance system's effectiveness is dependent on how well it is maintained. Generally speaking, it's a good idea to pay attention to how the camera operates. DE seven concepts CCTV cameras are quite high quality, yet they can still make mistakes that could make the system less effective. The weather is one of the major variables that affects how well traffic is monitored. The pole, cantilever, and gantry's exterior equipment is all IP 66 certified, assuring that employing rain and dust as tools. The gadget is appropriate for all climatic conditions because it can function in temperatures between -5 and 55 degrees. Some equipment featured built-in heating and cooling in places like Ladakh and other highland areas. How can AI eliminate traffic? The metro in Bengaluru, India, is always clogged with slow-moving traffic; during rush hours, the average speed is barely 4 km/h (2.5 mph). Siemens Mobility has developed a prototype for an AI traffic camera monitoring system. Autonomous vehicle identification (AVI)-enabled traffic cameras send data to a central control centre, where algorithms estimate the amount of traffic on the roadways. The technology then alerts the traffic lights based on the level of traffic congestion in the area. However, to answer in this manner, a lot of information is required. Thankfully, there is no lack of this. Drivers have access to a multitude of information from traffic monitoring systems, road infrastructure, automobiles, and other sources through their mobile phones. Traffic cameras help by providing more information about the movement of traffic as cars pass. [6] How does AI speed up travel? The device uses cameras and video feeds to automatically count all sorts of vehicles, including those driven by pedestrians, at a crossroads. The AI programme uses this data to calculate the best route across the crossroads every second, altering the traffic lights as necessary to keep things moving. To assist individuals anticipate what is coming their way, automatic choices may be made and relayed to adjacent crossroads. As automobiles become more connected owing to mobile phones and other wireless devices, they will aid in providing even more information into a system like this. Vehicles that are connected in the future will be able to share their speed, information about the motorist, including neighbouring accidents or issues. [7]



Fig.5

FLIR AI cameras for predictive traffic Management



Fig.6

FLIR Systems has introduced smart visitor device cameras with artificial intelligence (AI) to help cars operate better on roadways and at crossings. The FLIR Thermic AI* thermal imaging and FLIR Tricam AI visible camera may be used in conjunction with the FLIR Acyclic cloud platform to anticipate traffic, reduce congestion and the likelihood of accidents, and enhance road security for drivers, cyclists, and pedestrians around-the-clock. Thermic Am AI's thermal sensor and Tricam AI's visible low-light, high-definition sensor provide continuous monitoring of traffic signals in cities in all weather situations, even through smoke for tunnel surveillance. The cameras may also be operated wirelessly to calculate journey times and for a number of origin-to-destination applications. In the future, the cameras may be equipped with 5G mobile antennae. to enhance vehicle-to-everything connectivity and road safety.

DOPPLER SENSOR(TM-007)

A key part of the system that manages traffic lights is played by detectors. To manage the steadily increasing road traffic, these systems must be enhanced to reduce traffic, energy use, and CO2 emissions. Doppler sensors are frequently employed to determine speed and detect motion. Thanks to symbols, they can now count the number of vehicles that cross the stop line and recognise stopped vehicles at traffic signals. Relay outputs are included with the versatile TM-007 Doppler sensor. It is designed for uses including smart lighting, speed warning, and vehicle recognition at intersections. When the speed threshold is reached or dropped, it senses it.



Fig.7

APPLICATION

- Maximising traffic flow is one's goal.
- reduction of negative environmental effects and traffic congestion
- Additionally, it will be equipped with high-definition CCTV cameras to document motorists and commuters breaking the law and automated number plate recognition cameras (ANPR) to send the challan (fine slip) directly to the homes of offenders.



- Artificial intelligence can free up crowded roads for a longer length of time, enabling more traffic to clear and lowering congestion by employing traffic signals based on volume.

ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Automatic Detection of Speed Limit Violations.
- Decrease the Number of Road Accidents.
- Detection and Management of Traffic Congestion
- To increase Fuel efficient & and reduce fuel wastage
- Improve Overall Traffic Efficiency.

DISADVANTAGES:

- High installation and maintenance cost
- Skilled and only license holders can operate.

V. MARKETING SURVEY

INTRODUCTION TO MARKET SURVEY

The traffic management market is predicted to develop slowly but steadily over the next ten years. The global market for advanced traffic management is expected to be worth more than \$1.1 billion in 2019, according to Navigate Research. By 2028, yearly sales are predicted to reach over \$3.8 billion, reflecting a 14.2 per cent compound annual growth rate.

As cities prioritize lowering traffic congestion and pollution, improving safety and liability, and integrating AI-based traffic management systems with other smart city projects such as smart street lighting, this rise is expected. Increased penetration of linked vehicles is also likely to boost adoption. Cities around the world differ in their level of sophistication when it comes to innovative traffic control systems. Collecting traffic and vehicle detection data is often the initial step toward advanced traffic management, followed by in-depth traffic analytics that allows traffic managers to design mitigation measures and improve existing traffic signal timing systems' operating efficiency.[8]

BUSINESS PLAN FOR AI-BASED TRAFFIC MANAGEMENT SYSTEM

If you do it right, starting an Advanced traffic control management services company can put you on the road to a stable financial future. We reveal a few keys to running a small business successfully. A business plan for a traffic control management services company can become the trigger for an actionable business strategy if it incorporates hard numbers. Because lenders and investors will use your plan to assess risk, it must include industry-specific benchmarks as well as a comprehensive marketing strategy.[9]

Look Into the Competition

- It's critical to assess the strength of the competition before beginning an advanced traffic control management services firm in your city.

Locate Helpful Remote Business Advice

- After you've completed evaluating the competition, it's critical that you speak with someone who works in the industry. It's extremely unlikely that your local competitors will engage you. It would be insane for them to try to educate you on how to run a business.
- However, if you don't compete with them in their area, an entrepreneur who owns an advanced traffic control management services business outside of your city may be ready to share their entrepreneurial wisdom with you. In that situation, the proprietor of the business may be more than willing to talk about the industry with you. In my experience, you may need to call 10 different business owners before finding one who is eager to share his knowledge with you.[9]

MARKET STRATEGY OF AI

- An in-depth look at Artificial Intelligence in the traffic management market, including overall growth, drivers, restraints, opportunities, and technology breakthroughs.



- Analysis of the evolving market trends in addition to an extensive study of the existing Artificial Intelligence in traffic management market segments.
- The Adaptive Traffic Control Systems has now virtually opened a huge market for vehicle detection systems, communication equipment, video-walls, and various application software. 2.4 SURVEY / RESEARCH ON REPORT
- Traffic signal control is an important and challenging real-world problem, which aims to limit the tour time of motors coordinating their moves on the road intersections.
- This survey gives diverse tactics for sensible site visitor systems. The potential studies fields wherein Intelligent Traffic System emerges as a critical software area Are highlighted and diverse troubles were recognized which want to be treated while developing such a system For city area, wherein anagen visitors control has ended up the want of the hour.
- We hope this survey can foster interdisciplinary research on this important topic. 3.

VI. CONCLUSION

In accordance with our strategy, there should be fewer accidents and less congestion on the roads. Here, the solution to the issue of regular traffic and fatal accidents was demonstrated. The notion is that using AI-based traffic management will improve traffic efficiency overall and make our roads a safer place to drive.

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