

Intelligent Traffic Management with Internet of Things (IoT) and Big Data

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Abstract – Congestion is a big menace. The integration of big data and Internet of things cloud platform, with a network of interconnected cars and sensors, means that traffic management is getting smarter and more efficient. The concept of big data and IoT means that the quantity of traffic which should be allowed to roll out at a particular time can be regulated. Information can be collected in real time with the use of sensors, cameras, wearable gadgets and smart devices. With the rapid surge of connected vehicles, agencies and startups are using data analytics and mobile networks to help cities manage traffic more efficiently. To manage traffic flow real time traffic density management using IOT is used. It helps in optimization of traffic switching; controls traffic flow and prevent congestion's. These aspects are been made available on website to displays the traffic status, so that people will get early update and can avoid traffic jam and have alternative path. At time of Emergency vehicle can get early access to reach their destination. The smart-traffic decision support system is born under the institution of big data analytics. It breaks down information into chunks and helps to share this information across multiple systems and departments. The solution collects all forms of traffic information using sensors to facilitate real-time traffic monitoring and control. Additionally, the solutions feature the ability to predict traffic trends based on realistic simulations and mathematical model. The aim of all this system is to assist decision-makers via reliable and scientific information.

Keywords: Intelligent Transportation Systems, Internet of Things, Big Data, Traffic Management

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LITERATURE REVIEW

With the rapid development of society, transport industry is also facing unprecedented challenges, if big data is implemented in this area, the advantage is obvious, it can solve the problems of traditional system of traffic management. In this article author proposes architecture of intelligent transport system based on big data platform. It informs about key technology in ITS: calculation of traffic flow bayonet, calculating the average speed of a road, consultation of the path of travel of a vehicle, checking and control of counterfeit vehicles. Author discusses about the current challenges facing the transportation industry, and advantages of Big Data in transportation system. This article focuses on the design of intelligent transport systems in the construction of smart city. Gaining insights from the wisdom of traffic building programs, the paper gives the overall design of intelligent transportation process based on the location of large volumes of data

INTRODUCTION

The rapid advancement in technology and conjunction of wireless communication, digital electronics, and new technologies have resulted in the emergence of Internet of Things (IoT). According to the Cisco report,

the number of objects connected to the Internet has exceeded the number of human beings in the world.. From desktop computers, smartphones, wearable gadgets and wifi enabled sensors which are all connected through internet collectively form the internet of things(IoT). Artificial intelligence, the Internet of Things(IoT), and Big Data are rapidly growing and bringing revolutionary changes in almost everything in the world. Some of the reports has also shown that internet connected devices are expected to be 50 billion by 2020 which is twice the number of the year 2017.

Major Issues with Transport Industry in India

- √ Traffic jams in metro cities of india are big menace. and travelling time is increased
- √ Traffic congestion can lead to drivers becoming frustrated and engaging in road rage. In traffic environment, Traffic Signals are used to regulate traffic condition in the roads. These signaling systems are still dependent on human for controlling it based on density of traffic.

- ✓ Traffic congestion costs 1.47 lakh crore per annum for India according a study in 2018 by Boston Consulting Group (BCG).
- ✓ One major problem on the Indian roads is the mixing of traffic. Same road is used by high speed cars, trucks, two wheelers, tractors, animal driven carts, cyclists and even by animals. Even highways are not free from this malady. This increases traffic time, congestion and pollution and road accidents.

IOT IN TRANSPORTATION INDUSTRY

The adoption of IoT within the transportation industry has led to the incorporation of assorted tools & services that facilitate better transport management through-

- ✓ Traffic congestion control system
- ✓ Automotive telematics
- ✓ Reservation System
- ✓ Toll & ticketing systems
- ✓ Security and surveillance system
- ✓ Remote observance & others

With the advent of today's mobile technologies and the Internet of Things(IoT), enterprises can accelerate, productivity profitability and operations with solutions designed specifically for their processes. With the right IoT solution in place, enterprises can connect all devices across a centralized cloud network, and capture and share their mission-critical data, allowing them to gain real-time visibility of their operations.

HOW INTERNET OF THING WORKS IN REAL TIME

In IOT all database will be stored in computer. This storage is done through cloud computing and internet. Later this database is used accordingly to their requirements and applications. Components can be accessed from far place by using IOT, hence it reduces human work or involvement. All different protocols can be used accordingly to respective. So many researches has been conducted before using technology to regulate the traffic. Density Based Intelligent Traffic Signal System Using **PIC Microcontroller** and **infrared Sensors**. infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye. **IR Sensor** in prioritizing the vehicles pertaining to emergency vehicle where microcontroller used to give red signal to all side of road except the

one with emergency vehicle. Also research carried out using same IR sensor by employing fuzzy logic in defining the direction of emergency vehicle too. But there are flaws in the all existing systems and most of the system uses IR sensors which can detect the presence of vehicles in the close proximity. but with the introduction of **IoT** and **Big Data** there is a big change in traffic management systems.

IoT Based Traffic Signaling System:

IoT based traffic signaling system uses **Density based traffic signals** .and in density based controlling of traffic lights will check the density of the traffic on both sides and will decide which light should on. Density based traffic light controller using **Arduino**. Arduino is the main part of this project and it will be used to read from ultrasonic sensor HC-SR04 and calculate the distance. This distance will tell us if any vehicle is near the signal or not and according to that the traffic signals will be controlled. The main task was to avoid use of delay because we have to continuously read from the ultrasonic sensors and also at the same time, we have to control signals which requires the use of delay function The data on traffic density and traffic signaling control are sent wirelessly to Raspberry Pi3

Working of Density Based Traffic Light Controller Using Arduino

The working of the project is divided into three steps

- ✓ If there is traffic at all the signals, then the system will work normally by controlling the signals one by one.
- ✓ If there is no traffic near a signal, then the system will skip this signal and will move on to the next one. For example, if there is no vehicle at signal 2, 3 and currently the system is allowing vehicles at signal 1 to pass. Then after signal 1, the system will move on to signal 4 skipping signal 2 and 3.
- ✓ If there is no traffic at all the 4 signals, system will stop at the current signal and will only move on the next signal if there will be traffic at any other signal.
- ✓ The data on traffic density and traffic signaling control are sent wirelessly to Raspberry Pi3 where analysis made as Heavy traffic and Normal Traffic with date and time. This information is finally updated on Cloud webpage which can be used for further planning and analysis by Traffic department.
- ✓ The system design of IoT based Traffic signalling system is shown in Figure 1 where Ultrasonic sensor is placed on sides of road every 50 meters. The sensor here would capture the data for counting the density of that particular side and corresponding signal

will be provided by Arduino Microcontroller based on heavy and normal traffic.

✓ The density traffic information with appropriate signaling along with date and time of each road sent to Pi3 where analysis done as heavy and normal traffic. This traffic analysis sent to Cloud webpage for further analysis in future.

Ultrasonic Sensors:

Smart traffic signal based on the microcontroller & ultrasonic sensor, in which ultrasonic sensors are placed at one side of road in such a way so as to cover particular necessary area of road from where the vehicles are restricted to pass. If the signal is red and any vehicle is breaks the signal then ultrasonic sensor detect it and microcontroller take immediately action to buzzer alarm along with camera capture the image of that vehicle. It also make record of when, where, which vehicle breaking signal by saving image in particular folder as name of current date and time. Ultrasonic sensors are a well-accepted technology for distance sensing applications, because of the inexpensive and easy-to-adopt nature, and reliable and stable measurement performance within their measuring range. Figure 1 shows that a vehicle is driving in the passing lane while three other cars are driving on the carriageway. Ultrasonic sensors have been widely used in ITS and VANET area applications such as vehicle tracking and classification.

How is the Raspberry Pi 3 different from its predecessors?

The quad-core Raspberry Pi 3 is both faster and more capable than its predecessor, the Raspberry Pi 2. For those interested in benchmarks, the Pi 3's CPU--the board's main processor--has roughly 50-60 percent better performance in 32-bit more than that of the Pi 2, and is 10x faster than the original single-core Raspberry Pi (based on a multi-threaded CPU benchmark in SysBench). Compared to the original Pi, real-world applications will see a performance increase of between 2.5x--for single-threaded applications--and more than 20x--when video playback is accelerated by the chip's NEON engine. Unlike its predecessor, the new board is capable of playing 1080p MP4 video at 60 frames per second (with a bit rate of about 5400Kbps), boosting the Pi's media center credentials. That's not to say, however, that all video will playback this smoothly, with performance dependent on the source video, the player used and bitrate. The Pi 3 also supports wireless internet out of the box, with built-in Wi-Fi and Bluetooth.

CONCLUSION:

The role of intelligent traffic Management System is to play an important part in securing the future of mobility against increasing economic, environmental and societal pressures, this system can play a major role. Higher priority will be placed on policies for the prevention and avoidance of congestion, which include

measures such as access control and road charging. It will enable connected vehicle-infrastructure communication systems to deliver real-time and context-sensitive information to enhance safety and improve the efficiency of road usage so as to reduce environmental impact. New generations of traffic management systems will integrate data from vehicles, to provide dynamic control of traffic flow. A dynamic methodology has been proposed in this system to handle the issue of vehicle crash and location by utilizing the idea of Internet of Things in most effective way. IoT based smart Internet of Vehicle system finds solution for vehicle safety and ease the work for automobile forensic studies by providing vital data. This research is intended to suggest a much efficient way of traffic management and in making safety while travelling for everybody.

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