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A Survey on Challenges and Solutions of Traffic Surveillance Systems in IoT-Enabled Eco System

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Abstract - Computer vision is crucial in the development of numerous technologies for traffic safety. Here we present survey paper which focuses on the basic idea of Traffic Surveillance techniques used for its detection. Now days we can see that manually traffic monitoring becomes very critical task. Several research projects have been carried out to convert this manual system to fully automated. It will help us to easily track a vehicle. A computer network's availability and smooth functioning are the main goals of network traffic monitoring. In this work, we explore a variety of traffic monitoring approaches, including congestion detection, traffic light control algorithms, cloud computing design for vehicle data classification, and fog computing design for vehicle data classification.

Key Words: Internet-of-Things, Cloud computing, Fog computing, Smart traffic monitoring

I. INTRODUCTION

The Internet of Things (IoT) consists of items with distinctive features and connectivity to the Internet. The "things" in the IoT are IoT devices having unique identities and the capacity for remote sensing, actuation, and monitoring. Today, the Internet has almost reached every country in the globe, and its influence on how people live their lives is unimaginable. IoT applications go beyond merely linking items to the Internet. IoT enables these devices to exchange data while running crucial apps for the objectives of a normal user or machine.

The majority of IoT data is currently handled and stored on cloud servers. A highly scalable computing platform that can be set up in a pay-as-you-go configuration on demand is offered by the cloud. Reduce the amount of money needed to develop the necessary analytics application. The current data analysis methodology can handle processing huge data volumes kept in centralized cloud storage [7]. The cloud is used to store data. Edge computing, often known as fog computing, is a novel strategy that has been developed in response to the complexities and dynamic nature of the Internet of Things (IoT) [8].

The constraints of conventional cloud services for traffic monitoring systems are addressed in this survey paper's discussion of how to construct intelligent traffic monitoring systems on the basis of accommodating cloud computing and fog computing. In this system, the fog node is coupled with a vehicle detection sensor. Fog nodes can locally process data and send it to the cloud for additional analysis. comparison research Additionally, it is done to emphasize the advantages of fog networks over the cloud in terms of bandwidth and response time. The creation of automated systems is crucial for the development of various techniques. In this study, we'll talk about different traffic monitoring methods, including traffic signal control, congestion detection, cloud computing design for vehicle data classification, and fog computing design for vehicle data classification.

The remaining part of this paper is arranged as follows: Section II discuss about various traffic monitoring methods used for vehicle classification. Section III discusses literature survey of smart traffic monitoring methods. Section IV conclusion of the paper.

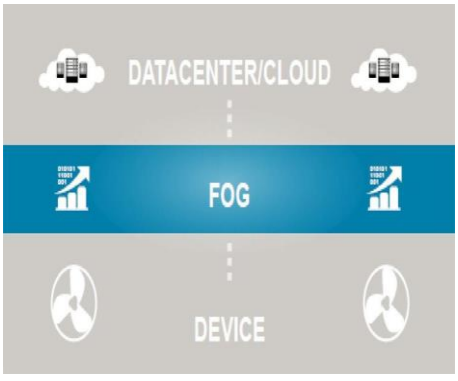

Fig 1. IoT Eco System[IoT & Applications Digital Notes.pdf (mrcet.com)]

Fig 2. The Network Edge [1]

II. TRAFFIC MONITORING METHODS

Here we will discuss few important methods of traffic monitoring and vehicle classification.

A. Vehicle data classification with cloud computing [1]

A Vehicle in terms of data, traffic data analysis in the cloud to identify vehicle congestion in traffic then Installing sensors on roads to detect traffic at a designated intersection and uploading raw data to the cloud to determine how many vehicles will approach the junction in a specific amount of time. Assessing the processed data in order to categorise vehicle congestion as LOW, MED, or HIGH based on the quantity of vehicles at the junction. depending on a predetermined threshold, classifying the congestion density as LOW, MED, or HIGH. In the event of HIGH congestion, the cloud platform will send a Tweet message (#TrafficDensityHIGH-CLOUD) as an alert. Predicting occurrences like car accidents, breakdowns, road repairs, etc. if the congestion is classified as HIGH.

B. Fog Computing Design for Classifying Vehicle Data [1]

As a component of this process vehicle and traffic data from the cloud Identify the output of data analysis—car congestion in the road firstly, follow the procedure Installing sensors on roadways to monitor traffic at a chosen crossroads, then uploading unprocessed data to the cloud to estimate the number of cars that will approach the intersection in a given period of time. and classifying vehicle congestion as LOW, MED, or HIGH based on the number of cars at the intersection using the processed data after analysis. employing a predetermined threshold to designate the designations for the congestion density HIGH, MEDIUM, or LOW. The cloud platform will tweet an alert with the hashtag #TrafficDensityHIGH-Cloud if HIGH congestion is detected. A neighbouring fog node (#TrafficDensityHIGH-Fog) receives the raw data and counts the number of vehicles before processing it. predicting events like car accidents, crashes, and road If the classification of the congestion is HIGH, repairs, etc.

C. Congestion detection [1]

As a Input in this method Traffic data from sensor Initially Check the vehicle Density and vehicle Density is Low then Increment vehicle Count for every incoming vehicle. If vehicle Count is High so vehicle Density is #Traffic Density HIGH) High Tweet (Traffic Density HIGH) Display. As a result of traffic data from sensor nodes, we were able to detect congestion.

D. Traffic light control [1]

As an Input in this system Traffic Signals information system. In initial stage check traffic signal, then traffic signal light is red so Vehicle Density is high and same as traffic signal light is green so, Vehicle Density is low and we got as an Output is the vehicle concession as a basis for traffic light.

III. LITERATURE SURVEY

In current section, we will present different research papers related to smart traffic monitoring and vehicle classification using Cloud and fog computing, research summary and future scope in this research.

In [1] works for traffic monitoring system, The goal of the current study is to investigate how the fog computing technique might enhance the performance of traditional technology for cloud computing. To show the benefits of a fog-based system over traditional cloud-based technologies in terms of response time and bandwidth for latency-sensitive applications, preliminary experiments are conducted. A traffic monitoring system is looked at as a case study. It is found that the response time and bandwidth of the fog network are around 258 times faster than those of the cloud network, while the bandwidth of the cloud network is almost 5 times smaller.

In paper [2] researchers developed to traffic control performance Adaptive traffic system includes multiple technologies such as loop detector, camera detector, infrared, radar, etc. To further improve traffic control performance, adaptive traffic system includes loop detector, camera detection Includes multiple technologies such as vessels, infrared, radar, etc.

In paper [3] In our test surveillance system, the drone serves as a bare camera sensor to keep an eye on the desired area. The ground controller receives the raw video stream, which is then shown on the surveillance screen. When a user of the application notices a suspicious vehicle, the target is blocked and a video frame is sent to the fog node for tracking and speed calculation in an intelligent traffic monitoring case study. The results and processed patches are sent back to the ground control station right away after the speed has been computed. Taking the HDvideo frame's size into account.

In paper [4] The system does data collecting, cleaning, clustering, time series comparison, data retrieval for visualisation, creation of charts and reports, and notification generation for mobile clients. The system employs a specific agent for remote picture video fixation to gather statistics and aid in decision-making. automated upload of data that is complex. The agent gathers and downloads information from several sensors

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relevant to traffic metrics, including images and frames from the video stream.

In paper [5] A fog machine that transmits images at a rate corresponding to the duration of the monitoring. I believed there was a violation every five minutes because the video had a 20-fps frame rate (this is the worst case). A total of 120,000 frames of the car in front are captured by the camera after 100 minutes of observation and 20 moving infractions.

In paper [6] Many of the cloud computing's original features are still maintained via fog computing. Additionally, users can continue to store files and information elsewhere and pay for not only offsite storage but also cloud upgrades and data security while still using a fog computing mode..

In the destiny work [7] We may design simulations on real city maps and gather more detailed real-time traffic data to provide an automobile generation model (taking rush hour into account). We can also upload intelligent smart automobiles that can dynamically determine their routes based on street information. This allows us to demonstrate the advantages of our system.

Table- I: Overall Summary of Literature Survey

Sr. No.	Paper Title	Author contribution	Result	Future Scope
1.	Internet of Things-based Fog and Cloud Computing Technology for Smart Traffic Monitoring [1].	A cloud and fog computing architecture is proposed to improve complicated surveillance systems in terms of reaction network capacity and time.	As an example, let's look at a traffic monitoring system. Even though the fog network's reaction time and bandwidth are 258 times quicker, the cloud's bandwidth is just roughly a sixth of the fog's.	create a car generation model, we will create simulations using real city maps and more real traffic data in the future (taking into account the attacker). To determine the benefits of our framework, we will also be well-informed about intelligent vehicles (dynamic route planning based on road information).
2.	Phase Timing Optimization for Smart Traffic Control Based on Fog Computing.[2].	Proposing a fog-based intelligent traffic signal system Traffic data is stored in a control architecture. Mostly from Edges rather than the middle of distant clouds, collected by different sensors..	In order to further enhance traffic management effectiveness, adaptive transportation systems use a variety of technologies, including B. Loop detector, cameras, infrared, and radar	In future work, we plan to design and implement software units that can support adaptable updates and upgrades to adapt to new control policies.
3.	Smart Urban Surveillance Using Fog Computing [3]	The drone is used as an empty camera sensor in their experimental surveillance system. The ground controller receives the video feed and displays it on a monitor back at the station's control centre.	The Ground Control Agency will get the findings and processed parts right away. Furthermore, HD video frames have a significant file size.	In the real world, due to limited computing power, tracking all vehicles and searching a long list of predefined patterns is impractical.
4.	Intelligent monitoring system for smart road environment [4]	Photo-video fixed remote inquiries Complex and automated data uploads are handled by a dedicated agent in the system Photos and frames from the video stream, and also sensor data pertaining to traffic factors.	Network results showed acceptable errors with an average of 13% prediction. These variations in the number of incidents and their influence on temperature regimes might be predicted using this model.	In future we have to try to implement web cam on road so this device give advance information about road traffic.
5.	Smart traffic control: Identifying driving-violations using fog devices with vehicular cameras in smart cities [5]	Each time the machine is activated, a certain number of photos are communicated. He assumed that the video has been created at a frame rate of 20 fps and that a violation occurred every five minutes.	Given the size and length of the video, the system efficiency statistics show a good throughput and a fast processing time	Vehicle detection mechanism using SSD and a lane detection algorithm using Hough transform at the initial stage
6.	Smart Fog Based Workflow for Traffic Control Networks [6]	A traffic management system based on fog-based intelligence Because of the computational paradigm and the dispersion gain method.	Optimization is the key. a network of interconnected automobiles and strategies for their rein forcement Leading developer of next-generation smart transportation technologies.	Design the simulation Gather more real traffic data on a real city map to create a generation vehicle

IV. CONCLUSION

As the technology going to transform the manual system to fully automated system, traffic surveillance system is also needs to change to fully-automated system to reduce the labor work. In this paper we review various techniques like Congestion detection and traffic light control techniques to detect vehicles from various datasets are part of the cloud computing and fog computing designs for vehicle data classification. These algorithms are faces some issues like a speed, limited time, limited vehicle detection, not work properly in traffic light etc. After study all these algorithms we plan to develop one proposed algorithm which one is able to solve all these problems.

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