SMART CITY TRAFFIC MANAGEMENT SYSTEM ENHANCED WITH MACHINE LEARNING TECHNOLOGY

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***Abstract* - The proposed system provides a comprehensive solution for traffic management that utilizes advanced technologies like cloud computing, data analytics, and machine learning. By leveraging these technologies, the system can predict the best routes for vehicles based on traffic patterns, weather conditions, and accidents, thus reducing travel time and costs while minimizing pollution levels. Additionally, the system also introduces the Green corridor idea that would let emergency services to reach their destination quickly and efficiently without any hindrance from traffic congestion. Overall, this intelligent traffic management system represents a significant step towards achieving more efficient and sustainable urban transportation systems in the era of smart cities.**

***Keyword* -** *machine learning, traffic management system, traffic congestion, smart cities.*

I. INTRODUCTION

Traffic management is a critical issue in modern urban cities, as the number of vehicles on the roads continues to increase. Governments around the world are exploring the use of ICT technologies, such as wireless sensor networks and low-cost sensors, to develop intelligent traffic systems of management that can ease congestion and increase traffic flow.The recent development of wireless sensor networks (WSN) with inexpensive, low-power sensors have strengthened the a process for developing a smart traffic management system[2]. Artificial intelligence and machine learning are also being utilized to automate transportation systems and better utilize existing infrastructure. The city of Bengaluru in India has been identified as the most traffic-congested city in the world, with peak time commuters spending an extra 10 Every year, three days and three hours are wasted in traffic. the application of machine learning and data analytics algorithms could help address this issue by predicting traffic patterns and suggesting alternative routes to commuters. By leveraging technology, we can create more efficient and sustainable transportation systems that can improve the quality of life for citizens in urban areas.

II. PROBLEM STATEMENT

Efficient traffic management systems can help alleviate the traffic congestion problem in urban areas. Such systems can make use of various technologies like wireless sensor networks, low-cost sensors, machine learning and artificial intelligence to predict traffic patterns and optimize routes for vehicles.By using these technologies, the system can analyze real-time data from various sources such as traffic cameras, GPS sensors and weather stations to predict traffic volume and congestion on different routes. This information can then be used to provide drivers with alternate routes to avoid congested areas and reduce travel time.Moreover, these systems can also provide real-time information to drivers about road conditions, traffic congestion, accidents and other hazards, allowing them to take necessary precautions and make informed decisions.Efficient traffic management systems not only help in reducing traffic congestion but also result in other benefits such as reduction in fuel consumption, air pollution, and time wastage. They can also enhance road safety by reducing the probability of accidents and collisions.

III. OBJECTIVES

The aim of the project is to develop an optimal route for transportation that is free from congestion, accidents, and has a lesser number of vehicles. This would help people to reach their destinations faster without facing any delay or traffic. To achieve this, the project may use various techniques such as machine learning algorithms, data analytics, and real-time traffic monitoring. The system can analyze various factors such as traffic patterns, road conditions, and weather forecasts to predict the most efficient route. The goal is to minimize travel time and reduce the number of vehicles on the road, thereby improving traffic flow and reducing accidents. Overall, the project aims to enhance transportation efficiency and convenience for the public.

IV. MOTIVATION

This system can be used to obtain vehicle statistics while controlling traffic. The project involves developing a prototype traffic architecture and performing simulations to test its effectiveness. The results of the simulation are compared with real-time video of a traffic scene to determine the accuracy of the system. The simulation outcomes indicate the viability of the suggested scheme, suggesting that the system can successfully detect the presence or absence of vehicles on the road. Overall, the project aims to enhance traffic control and management by providing accurate vehicle statistics in real-time.

V. LITERATURE SURVEY

[1] Authors: Y. Agarwal, K. Jain and O. Karabasoglu

“Cloud computing in vehicular Ad Hoc Networks for smart vehicle monitoring and assistance”, Int Journal of Transportation Science and Technology.A fast expanding area for study and development of diverse real-time applications is connected vehicle networks.

[2] Authors: A. Celesti Member, A. Galletta, L. Carnevale, M. Fazio, A. L. Ekuakille, M. Villari

“An IoT Cloud System Based on Mobile Sensor Data Processing for Traffic Monitoring and Avoidance of Vehicle Accidents" This study investigates a potential coping mechanism with such a problem, taking into account mobile traffic sensors put directly in volunteer cars and private and/or public transportation.

[3] Authors : S.Latif, H. Afzaal and N.A. Zafar,

"Smart City: Intelligent Traffic Monitoring and Guidance System"International Conference on Engineering and Mathematical Technologies for Computing Almost all facets of life now use IoT, which is an expansion of wireless sensor networks (WSNs).

[4] Authors :J. Lu, L. Huang, X. Sun, J. Liu, and J. Jiang

"A machine learning-based intelligent traffic management system” was presented at the 2017 IEEE Conference on Conference on Robotics, Automation, and Mechatronics (RAM) and the International Conference on Cybernetics and Intelligent Systems (CIS), This issue has an impact on a number of facets of contemporary life, such as time consumption, traffic accidents, increased greenhouse gas emissions, and economic growth

VI. BLOCK DIAGRAM

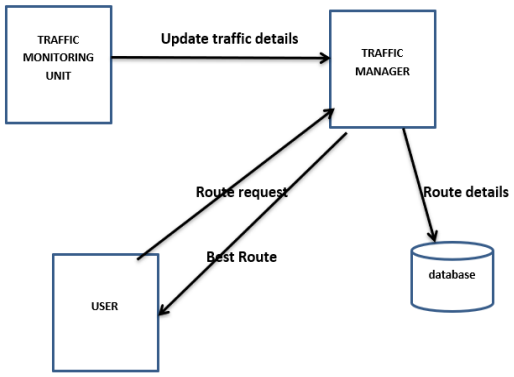

Fig 1: Intelligent Traffic Management System Architecture

The above figure 1 that depicts the intelligent traffic management system architecture diagram.

IMPLEMENTATION

This project is implemented using python 3.9 and corresponding libraries. User interface is designed using Tkinter library in python. Mysql is used as backend for storing data. And python socket programming is used for network connection.

This project consists of below-mentioned modules:

1. TRAFFIC MONITORING UNIT

Traffic monitoring unit is responsible to collect current traffic details from a particular traffic junction and

update it to traffic manager. It contains below-mentioned modules:

A. *GET LOCATIONS*

In this module, a request is sent to traffic manager to get all the locations available in traffic manager. Traffic management unit can update traffic details for these locations.

B. CAPTURE VIDEO

In this module we use CNN based deep learning object detection model called as Mobile Net SSD which is a pretrained model, it can be used for object detection. We capture live data from our laptop camera and feed it to this model to get various detected objects and will get count of car and bus. This count will be updated in traffic manager which can be further used for finding best route.

C. *UPDATE DATA*

In this module, we can update in traffic manager weather there is an accident or pollution in the current location.

2. TRAFFIC MANAGER

Traffic Manager acts like a centralized server which collects traffic details from various traffic monitoring units present in different locations. It gets query from user for possible routes and sends reply to it. It contains below-mentioned modules.

A. DBCONNECTION

Traffic manager is connected to mysql database which will be used as backend for storing route details. For connecting to database we use dbconnection module.

B. MANAGERTHREAD

Manager thread is a thread program which runs in background. We use socket programming to establish connection between manager and monitoring unit and users. All request sent by them is handled in this module.

C. ADD ROUTE

In this module we can enter different source, destination and routes and update them in database. These routes will be displayed to user.

3. USER

This module provide a graphical user interface for users to find routes. It contains below-mentioned modules:

A. GET SOURCE

When user clicks get source button, a request is sent to traffic manager to return all the source available in manager. These source are displayed to user. When user selects a source, we get possible destination for selected source from traffic manager.

B. *FIND ROUTES*

This module is used to get all possible routes from traffic manager for selected source and destination along with vehicle count, pollution details and accident details.

C. DISPLAY RESULT

When all possible routes are received from manager, we find best route based on vehicle count, pollution and accident details and display to user. If a route doesn't have any accident problem or pollution and has less vehicle count, it is considered as best route.

VII. HARDWARE REQUIREMENTS

RAM	:	4GB MINIMUM
CAMERA	:	SYSTEM WEB CAM
PROCESSOR	:	INTEL I3 MINIMUM

VIII. SOFTWARE REQUIREMENTS

LANGUAGE	:	PYTHON
OPERATING SYSTEM:		ANY
WIINDOWS FAMILY		
IDE	:	PYTHON 3.9/3.10
GUI DESIGN	:	TKINTER

IX. DOMAIN OVERVIEW

A. MACHINE LEARNING

A kind of artificial intelligence called "machine learning" enables computers to learn from data patterns and anticipate the future. A subset of machine learning is supervised learning where input and output variables are given, and the algorithm learns to map the input to the output. Examples of supervised learning techniques include logistic regression, decision trees, and support vector machines. Classification models attempt to draw conclusions from observed data and predict outcomes, which can be numerical or categorical.

B. ARTIFICIAL INTELLIGENCE:

The development of computer systems that are capable of carrying out complex tasks is known as "artificial intelligence" (AI) operations that ordinarily require human intelligence, such as speech recognition, computer vision, decision-making, and language translation. AI employs a variety of techniques, such as Artificial neural networks, formal logic, statistical, probabilistic, and economic approaches, as well as search and mathematical optimisation. In present days, the field of artificial intelligence (AI) has seen waves of optimism, followed by disappointment and a lack of funding, and then renewed enthusiasm and success.A long-term objective of the field is to develop general intelligence, or the capacity to solve any problem.

X. ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- User will get a prior notice if any accident or traffic jam occurs in a route to destination.
- In case of multiple routes, user can select an optimal route by knowing number of vehicles in each route using AI techniques.
- User also gets updated about pollution details in route using traffic monitoring unit.

DISADVANTAGES

- Travel time will increase if traffic management is not done properly.
- Due to traffic people can miss their important meetings, flights.
- Traffic problem may also lead to air pollution.

XI. APPLICATIONS

- A traffic control system equipped with sensors and peripherals can detect and identify traffic congestion in real-time.
- The system can then make decisions and take actions to alleviate the congestion and improve traffic flow.
- By reducing congestion, people can save fuel and reduce emissions, which ultimately leads to a reduction in pollution.
- An effective traffic control system can help to create a more sustainable and efficient transportation network.

XII. RESULTS

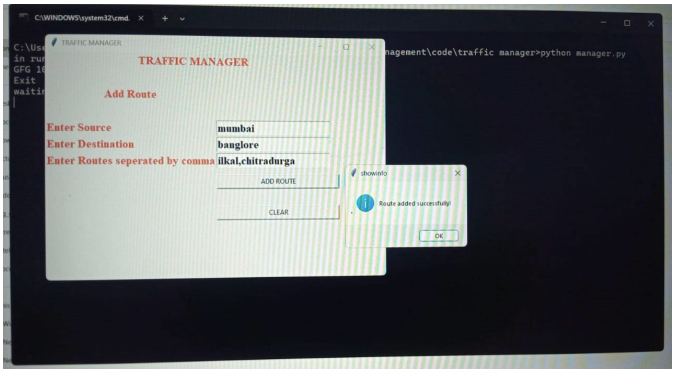

Fig 2: Pop Up Window Of The Traffic Manager

The above figure 2 represents pop up window of the traffic manager. In this window, we can add the source, destination, and optimal routes. It is connected to a MySQL database, which will be used as the backend for storing route details. For connecting to databases, we use the dbconnection module.

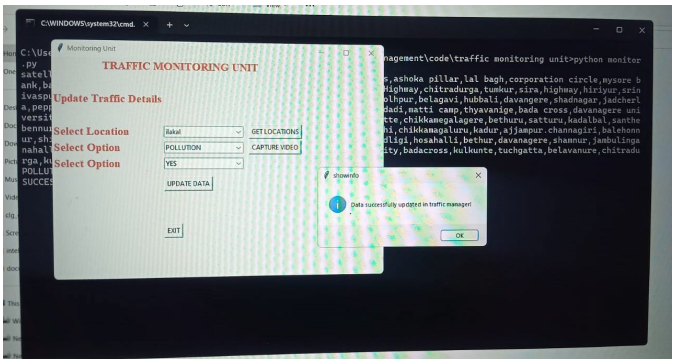

Fig 3: Pop Up Window Of The Traffic Monitoring Unit

The above figure 3 represents pop up window of the traffic monitoring unit. It contains the select location and select option. Selecting this option analyses accident

and pollution details. It can also capture the video of traffic and update it in the traffic manager.

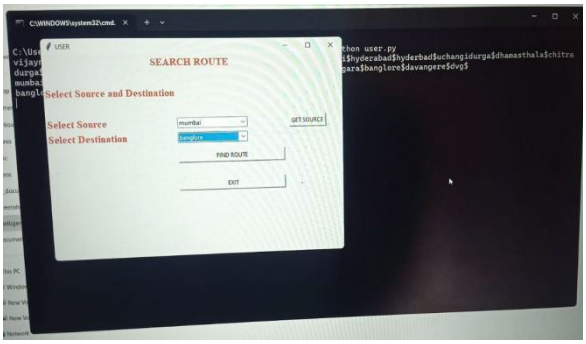

Fig 4: Pop Up Window Of The User

The above figure 4 represents pop up window of the user. It contains the selected source and destination and will find the best route for the users.

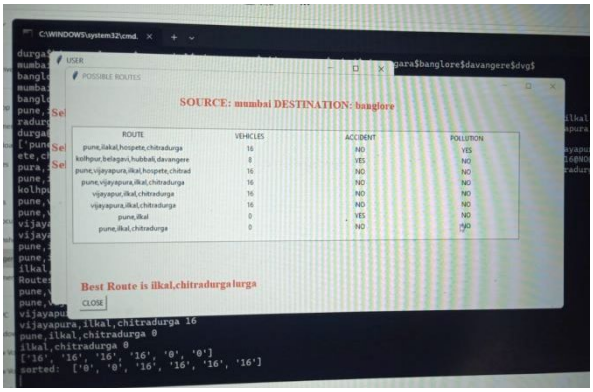

Fig 5: Pop Up Window Of The Output

The above figure 5 represents pop up window of the final output. Here we get the best routes,accident occurrences, and pollution levels of traffic for the entered source and destination.

XIII. CONCLUSION

The Traffic Management System is a domain of Smart Cities that addresses current problems related to traffic management. This system can suggest an optimum route to the user, which is often more beneficial than the shortest route in terms of fuel cost and travel time. The system can also predict traffic congestion levels, take into account accidents and precipitation levels, and even consider the concept of a green corridor.

To further improve the system, future research may include the introduction of vehicle-to-vehicle communication and studying the impact of speed breakers on traffic flow and congestion. The use of machine learning algorithms is also a novel feature of the system, which can help improve the accuracy of traffic predictions and route suggestions.

XIV. REFERENCES

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