Smart Transportation System Using IoT

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***Abstract*: This study examines an IoT system used to create an ITS (intelligent transportation system). IoT-based smart transportation is typically designed to support a smart metropolis vision that employs superior and powerful communication technologies to effectively administer the city and serve its residents. As part of the Internet of Things (IoT), physical devices are able to communicate with digital devices, when they have on or off switches. In this world, living beings and bodily devices interact with digital information and environments. As a large quantity of devices are operated through the internet, a large amount of information is generated. Hence, this huge amount of data has to be managed and turned into useful facts in order to expand efficient systems. Main aim of this paper is to focus on how an intelligent transportation system is helpful in changing the whole society and how it is reducing the transportation issues in a society.**

Keywords: IOT, ITS, NFC, WSN

I. INTRODUCTION

The main intention of this paper is to develop an intelligent transportation system which will be helpful for the future transportation issues and it will be reducing the continuous accidents. Compared to the current road system, future roads will be able to manage traffic congestions using this system provided by IoT. According to projections, the present transportation system will be altered in the next 20 to 30 years to allow automobiles to communicate with one another. This will decrease human contact and make travel more convenient. This will reduce the human interaction and makes the travel easier. A sensor will be fitted in the cars and these cars will be placed on the roads. These sensors will monitor the traffic and send the details directly to a main traffic system called central traffic control system. If there is a huge traffic found the central traffic control system will be told over Wi-Fi, so that to reduce the imposing speed limits happens to the vehicles in the congested area. This smart transportation system will reduce the amount of money spent on traffic congestion that is currently spent every year. Additional benefits are also added in this system, it contains parking guidance, rather than driving around whole area, drivers will be told over WIFI about the free spaces available near to his/her location. The system could even alert the driver if there are many children crossing the street near a school, and suggest an alternate route to take.

II. EXISITING SYSTEM

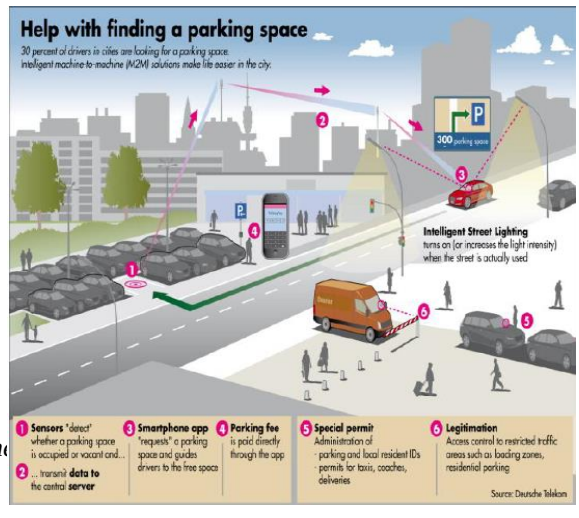
In existing system, the current traffic system is based on human contact with automobiles. This system may contain lack of quality and safe public transportation, road safety concerns, poor traffic management. Most cities lack the integrated transportation plans leading to huge demand-supply gap and poor transportation network. Traffic jams can occur in a high manner. There will be high chances of accidental deaths due to the traffic congestions happening in a certain congested area.

III. PROPOSED SYSTEM

The major goal of executing this paper is to establish an intelligent transportation system that will help with all of the transportation challenges that people are now facing. A sensor will be fitted in the cars and these cars will be placed on the roads. Already said about parking system in the introduction, hence the cars entering and leaving the parking slots will be taken into the count with the help of sensors. Two types of sensors are used in this system parking sensors and roadway sensors. As a result, sensors will capture all data and send it to sensor management systems. The sensor management system sends the gathered data to the central data management system, which processes it. By the usage of this system, there will be orderly way of parking in which sensors will identify the free spaces available near the vehicle. Payment process is also done at the same time directly through the application. Another system is included in this package, which offers intelligent street lighting. When the street is being utilized by cars, the lights will be turned on; otherwise, the lights will be turned off to save power.

Below shown is the diagram that shows the parking assistance using following steps:

- Sensors detect whether a parking space is occupied or not.
- Smart phone app requests for a parking space and guides the driver to that space.
- Parking fee is also paid through the smart phone app.
- Access to loading zones and residential parking zones are restricted.



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Application layer	Intelligent Traffic Management	Intelligent Driver Management	information collecting
Network layer	Internet	WiFi, 3G/4G	WiMax
Acquisition layer	RFID	RFID reader	WSN

Fig 2. Intelligent Traffic Management

Intelligent traffic IoT is divided into 3 layers such as Application layer, Acquisition layer and Network layer.

- Application layer is responsible for intelligent traffic management, intelligent driver management.
- Network Layer Makes use of WIFI, 3g/4g and GPRS.
- Acquisition layer employs RFID, RFID reader, WSN, Intelligent terminals.

Wireless sensors are used by the system to acquire real-time traffic data, such as traffic conditions on each route, the number of cars on the road, and the average speed. Because of their low power consumption and inexpensive cost, wireless sensors are an excellent choice. The system employs a wireless cluster sensor network to produce a large-scale network configuration.

Some modern cars come equipped with GPS and sensors that can receive and send driving information. This information is sent via satellite to the monitoring and control centre. The GPS system is linked to wireless sensor networks that may be used to track driving speed and direction.

The traditional traffic monitoring system based on image-processing technology has many limitations.
Vehicle plate number, vehicle type, vehicle speed, license number, and travel location of the automobile are all watched and saved. This comprehension of information from each vehicle assists in establishing the number of vehicles on the road, average vehicle speed, and vehicle density.

IV. Implementation

In this system we are trying to analyze the congestion rate of a particular traffic area. Firstly, analyzing the congestion rate of every month in a year and then predicts how much congestion will be there in the upcoming months. LSTM algorithm is used here to predict the congestion rate.

V. Analyzing Dataset

Export dataset in the form of csv from Thingspeak and with the help of Google Colab, an online python editor we can predict the congestion rate of upcoming months using the LSTM and Seasonal LSTM.

```
[ ]  import pandas as pd
     import numpy as np
     import matplotlib.pyplot as plt
     import keras
```

Fig 3. Import Modules and Dataset

```
df.head()
```

Date	Traffic Congestion Rate
2017-01-01	628
2017-02-01	618
2017-03-01	688
2017-04-01	705
2017-05-01	770

```
df.tail()
```

Date	Traffic Congestion Rate
2021-08-01	740
2021-09-01	701
2021-10-01	706
2021-11-01	677
2021-12-01	711

Fig 4. Dataframe head and tail

We have imported the dataset to df variable. df.head will return first 5 values and df.tail will return last 5 values of the dataset.

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```
df.plot(figsize=(12,6)) #plotting the figure size and general trend increasing with the time period
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fa94bfca710>
```

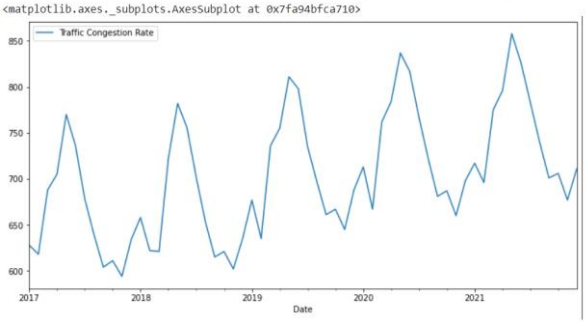

Fig 5. Plotting the figure Size

Plotting the figure size of the dataset.

```
test_predictions = []

first_eval_batch = scaled_train[-n_input:]
current_batch = first_eval_batch.reshape((1, n_input, n_features))

for i in range(len(test)):

    # get the prediction value for the first batch
    current_pred = model.predict(current_batch)[0]

    # append the prediction into the array
    test_predictions.append(current_pred)

    # use the prediction to update the batch and remove the first value
    current_batch = np.append(current_batch[:,1:,:],[[current_pred]],axis=1)
```

```
test_predictions
```

```
[array([0.553577], dtype=float32),
 array([0.7693689], dtype=float32),
 array([0.98960876], dtype=float32),
 array([1.1900159], dtype=float32),
 array([1.1238495], dtype=float32),
 array([0.9002841], dtype=float32),
 array([0.67240894], dtype=float32),
 array([0.5292759], dtype=float32),
 array([0.49121597], dtype=float32),
 array([0.46679595], dtype=float32),
 array([0.51675534], dtype=float32)]
```

Fig 6. Prediction code

Predicting congestion rate of upcoming months

```
test.head()
```

Date	Traffic Congestion Rate	Predictions
2021-02-01	696	728.519212
2021-03-01	775	780.956640
2021-04-01	796	834.474930
2021-05-01	858	883.173867
2021-06-01	826	867.095431

Fig 7. Prediction output

Predicting congestion rate of upcoming months output is shown.

```
test.plot(figsize=(14,5))
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f616241ebd0>
```

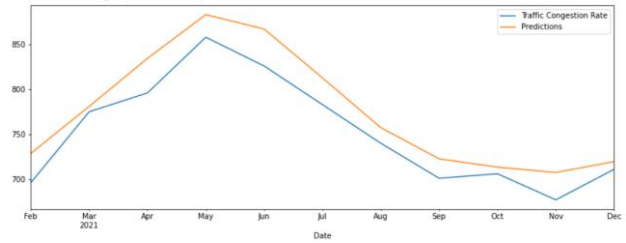

Fig 7. Prediction output graph

Predicting congestion rate of upcoming months in the form of a graph

VI. Conclusion

This paper describes a real-time traffic monitoring system designed to address the issue of real-time traffic control and monitoring. The suggested system provides a novel method of traffic control by making better use of resources. The traffic administration department can employ real-time traffic monitoring data to detect unsafe circumstances on the road and, as a result, respond by enforcing prompt actions. Overall, IoT will play a significant role in traffic monitoring by increasing the efficiency of traffic safety and lowering travel expenses. This paper also describes about predicting congestion rate of upcoming months using the LSTM algorithm, predicting all seasonal changes happening in a particular dataset.

VII. Future Work

In this paper we had analyzed the change in the transportation system by the introduction of IoT. IoT-based smart transportation is typically designed to support a smart metropolis vision that employs superior and powerful communication technologies to effectively administer the city and serve its residents. Smart transportation is already widely used, and smarter cities throughout the globe are using IT solutions to address concerns such as auto navigation, traffic light management systems, real-time traffic monitoring, and smart parking. There should be more AI technology implemented in the vehicle technology, so that there will be not much interaction with the human. This will make easy interaction between the vehicles. This type of system is good and but it should handle more technologies as comparing because there must be more vehicles in the coming future, there should be new and upgraded system to handle more vehicles in the transportation system. In the future, it will be very helpful if central traffic control system analyses the sensor data and predicts if there is an emergency situation

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happening in a particular area by calculating the speed of a particular vehicle.

VIII. REFERENCE

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