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Intelligent Traffic Control

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ABSTRACT
Traffic Congestion is considered as one of the major dimensions of a smart city. With the rapid growth of population and urban mobility in metropolitan cities, traffic congestion is often seen on roads. In this paper we have made an attempt to Intelligent Traffic Control System (ITCS) is to achieve improvement in Safety less time the valuable human life delay as per the distance density. With the help of traffic control we can assign more time on the side where it's required and less time on the side where it's not required. This device can be fitted into Vehicles like Bus, Car etc.

Keywords : Traffic Surveillance system, RFID, Traffic Congestion, GPS, GRNN.

I. INTRODUCTION

The indirect effect of vehicles ownership produces traffic congestion. So the traffic management at road is difficult to reduce waiting and traveling time. The goal of Intelligent Traffic Control System (ITCS) is to achieve improvement in Safety less time delay as per the distance density. With the help of traffic control we can assign more time on the side where it's required and less time on the side where it's not required. Ethically with the help of camera we can detect criminal vehicles or other vehicles. We will set the alarm on signals so if anyone violating traffic rules by stepping ahead the zebra crossing the buzzer will turn on and details will be automatically sent to the RTO office so that they can take future actions in term of fine. Social Relevance and addressing the existing problem are the in case of emergency such as an ambulance is traveling all the signals on that road will be turned green so that ambulance will reach the destination in time without any obstacles. To provide Intelligent Traffic Management at not only in urban areas but also in rural areas where cameras and other sensor networks are hard to implement. The conventional traffic system works on fixed time allotted to each side of junction. Some latest traffic systems are designed to govern traffic at road networks, sensing through sensors, surveillance cameras, and RFIDs which are embedded on roadsides.

II. LITERATURE SURVEY

Several researchers have been introduced in the same field of research as the ITCS system. Some of them are as follows.

The authors in [1] used Arduino microcontroller with IR sensor placed in a lane in several distances which sends sensed data to microcontroller and microcontroller changes timing of traffic signal automatically. The system also uses solar panels to charge the circuits.

In [2] the system takes road traffic congestion as an input from surveillance cameras and IOT sensors, then manages traffic signals using Artificial Intelligence Algorithms. RFID tags are also used to

detect the emergency vehicles such as ambulances and fire brigade vehicles during a traffic jam. The main limitation of above two systems is that it cannot be implemented in rural areas where cameras and sensors are hard to use.

In the [3] Traffic images are pre-processed to set up a proper training dataset for Artificial Neural Network. In order to detect traffic density, a network structure is proposed. The network is then transferred to the traffic application and re-trained with self-established training dataset to generate the Traffic Net. The accuracy of Traffic Net to classify congested and uncongested road states reaches 90% for the validation dataset and 98% for the testing dataset. In the 4] the authors have made an attempt to develop a car accident detection and communication which will inform the relatives, hospital system.

In the [4] the system proposed a novel approach for managing traffic density using intelligent agents. These intelligent agents will collect, store and process the road traffic information to predict the forthcoming traffic flow. The limitation of this system is that the implementation cannot be done in rural areas because of cameras and it will be too costly.

III. EXISTING SYSTEM

The conventional traffic system works on fixed time allotted to each side of junction.

Some latest traffic systems are designed to govern traffic at road networks, sensing through sensors, surveillance cameras, and RFIDs which are embedded on roadsides.

IV. PROPOSED SYSTEM

In this proposed system we are going to implement an Intelligent Traffic Control System. Our system will use Google Maps' real time data to manage Traffic Signals. It is best suitable in RURAL AREAS where managing cameras and sensors are challenging. Also, existence of Surveillance Cameras will be great for the system.

Materials:

1. GPS and GSM.
2. Raspberry Pie.
3. Traffic Lights
4. Surveillance Camera

Figure 1 describes the working of system using surveillance cameras, it captures real time image of particular lane and counts the number of vehicles in respective lanes, and then the intelligent agent decides the amount of time to give to particular traffic signal. The user interface displays the video captured by the cameras and also it shows the number of vehicles detected.

Figure 2 describes the working of system using Google Maps' real time traffic data, it takes traffic density input from web and by using that data intelligent agent manages the traffic lights.

V. SYSTEM ARCHITECTURE

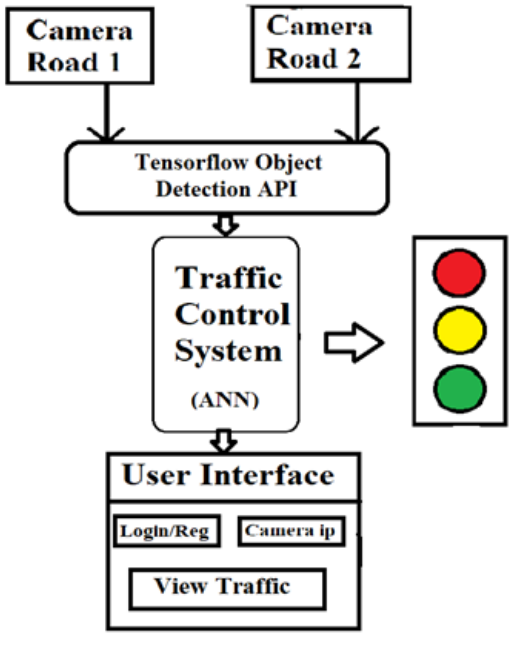

Figure 1.Signal Module

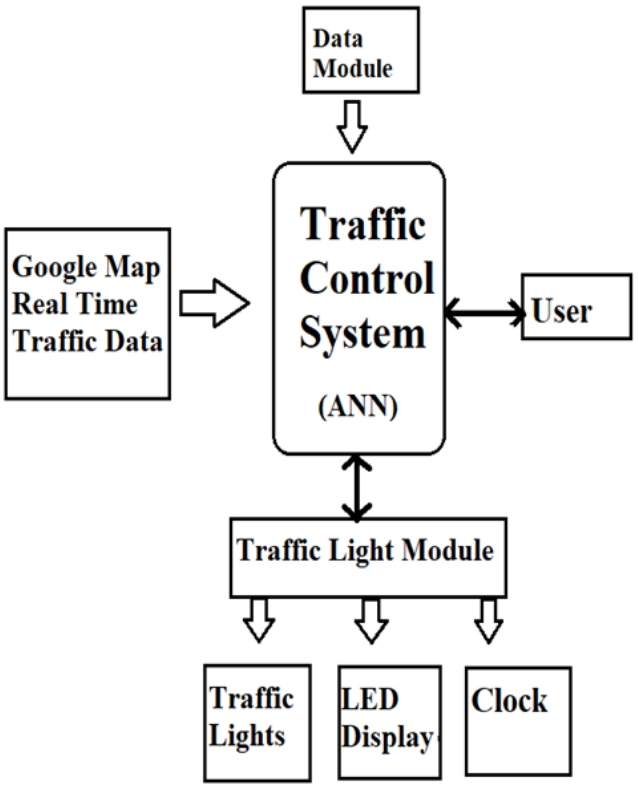

Figure 2. Traffic Control Module

VI. METHODS AND MATERIAL

In today's automation era, every information is being processed by the machine with artificial intelligence and used in many sophisticated applications. Even though many agencies have developed such system to manage road traffic smartly, the limited use of such advanced system in rural areas are problematic. Hence government is more serious and motivated to improve traffic flow and congestions.

a) Intelligent Agents

The efficiency management of the road traffic is appropriate intelligent agents that will be deployed in monitor to the current traffic situation and predict the speed of the road as an indicator of the traffic congestion using environment sensor inputs.

b) Prediction Model

The main challenge of the intelligent agent is that the agent has to process large amounts of data in a short period of time to control traffic signal efficiently. Based on these requirements, a General Regression Neural Network (GRNN) is considered as more appropriate for this process. GRNN is a one-pass neural network used for estimating continuous variables. Its main advantages are the fast learning ability and the convergence to the optimal surface. In short, assuming that the input data consist of pairs of (x, y), where x is a vector random variable and y a scalar random variable, the resulting estimation is given by

$$\hat{Y}(\boldsymbol{X}) = \frac{\sum_{i=1}^{n} Y^i \exp\left(-\frac{D_i^2}{2\sigma^2}\right)}{\sum_{i=1}^{n} \exp\left(-\frac{D_i^2}{2\sigma^2}\right)}$$

$$D_i^2 = (\boldsymbol{X} - \boldsymbol{X}^i)^T (\boldsymbol{X} - \boldsymbol{X}^i)$$

VII. DISCUSSION

Object detection is considered to be much complex than image classification because of these five challenges: dual priorities, speed, multiple scales, limited data, and class imbalance. Researchers have taken much effort to overcome these challenges.

i.Dual priorities: object classification and localization

There are two issues regarding object detection are: To classify image objects and another is to determine the position of object, which is referred to as the object localization. Localization means to find out position, location of objects.

ii.Speed for real-time detection

Speed is major concept while detecting object. Object detection algorithms required to not only accurate classification and localization important objects but also need to be process fast at prediction time to meet the real-time demands of video processing.

iii.Multiple spatial scales and aspect ratios

In the many applications of object detection, wide range of sizes and aspect ratios of interested items are found. Practitioners uses several methods to ensure

detection algorithms are able to capture objects at several scales or views.

iv.Class imbalance

Class imbalance creates classification problems, and object detection is no exception. Class imbalance is observed when a class is over represented, having more examples than others in the dataset. In object detection class imbalance is occurred commonly.

Challenges in implementing neural network are:

1) Bad input selection

Selection of proper input data is major task in designing neural network application. In unsupervised case one can use relevant data on which neural network able to find the patterns. In the supervised case, requirement of map output to the input so we need to select only exact input variables.

2) Unsuitable structure

Selecting proper structure for neural network is also one of the important task. Since many times it is ignored. There is no rule for number of units to neural network have. If the general error is low enough then one can assume structure is suitable. There are two methodologies: constructive and other is pruning or destructive.

VIII. CONCLUSION

This paper presented an ITCS system-an automated system we have designed an algorithm with the use of sensing devices and microcontroller. According to that we got results are as follows:

The captured sensor signals are processed and various parameters are calculated to estimate the density of vehicle traffic in all four directions.

With the use of Google Maps' Real Time Data, there will be no problem if the other sensor networks are not present for a particular area.

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