Image Processing based Intelligent Traffic Control and Monitoring using IoT

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Abstract - *The tremendous change in vehicle fleet size and consequently in the volume of traffic is not followed by increase in the space of the road in all the time. This causes traffic congestion mostly in all the urban areas. So to avoid traffic jams, we need to find a solution. In previous decades many technologies were developed and designed solutions to make road ways safer. Some among these techniques were classic where as other are integrated. New designed systems are capable of informing drivers about the traffic conditions and possible hazards of the road way with the help of intelligent transportation system. This project proposes Internet concepts of Things-based approach that solve problems raised by traffic congestion this gives solution to raising traffic related pollution. This architecture is composed of two modules i.e., hardware module and software module. The system utilizes new technologies for real-time collection, organization and transmission which provide the information to estimate the accurate traffic density exploited by traffic-aware applications.*

Key Words: Matlab, Image-Processing, Arduino, IOT, Traffic density.

1. INTRODUCTION

In late decades traffic density in urban region has quickly expanded. Alleviating the movement blockage in urban street organize has been a urgent issue. A beneficial and reasonable solution may not obtain always by supplying new infrastructure. Hence, use of existing infrastructure via intelligent or smart traffic management seems to be more feasible and calls for implementation and development of improved traffic signal control techniques and method. Transportation of merchandise, work, modern items and hardware are the keys factors, which impact the modern what's more, natural improvement of any nation. Movement clog and fumble will bring about long holding up times, loss of fuel and cash. It is hence important to have a quick monetary and effective movement control system for national improvement. The observing and control of city activity is turning into a real issue in numerous nations. Due to regularly increase in number of vehicles on road till date the measures taken are development of new streets, flyovers amongst the city; constructions of a few rings, for example, inward ring street; external ring street and centre ring street; presenting monorails; restricting of expansive vehicle in city amid crest hours and furthermore improvement of advanced movement observing and control framework.

In present times the traffic problem is due to the raise in vehicle usage. Traffic flow determination can play a principle role in gathering information about them. This data is used to establish censorious flow time periods such as the effect of large vehicle, specific part on vehicular traffic flow and providing a factual record of traffic volume trends. This recorded information also useful for process the better traffic in terms of periodic time of traffic lights. There are many routes to count the number of vehicles passed in a particular time, and can give judgment of traffic flow. Now a day's camera-based systems are better choices for tracing d vehicles data. This project focuses on a firmware-based novel technique for vehicle detection. This approach detects the vehicles in the source image, and applies an existing identifier for each of the vehicle. Later it classifies each vehicle on its vehicle-type group and counts them all by individually. The developed approach was implemented in a firmware platform which results is better accuracy, high reliability and less errors.

1.1 OBJECTIVES

- Main objective behind implementing this system is to maintain traffic congestion on roads.

- To reduce large waiting time on signals by controlling traffic signal depending on traffic density on that particular direction.

- To implement a system to satisfy particular need of smart travel with smart technology.

1.2 NEED OF PROJECT

There is a tough need for the execution of a traffic signal monitoring and control system worldwide. Limited traffic signal controlling systems are accomplished of managing heavy traffic congestion. They are not able to provide significant early warning against these time wasting congestions. Currently typical conventional traffic controllers face various problems.

2. MOTIVATION

The tremendous change in vehicle fleet size and consequently in the volume of traffic is not followed by increase in the space of the road in all the time. This causes

traffic congestion mostly in all the urban areas. In order to avoid traffic jams, we need to find a solution. In previous decades many technologies were developed and designed solutions to make road ways safer. Some among these techniques were classic where as other are integrated. New designed systems are capable of informing drivers about the traffic conditions and possible hazards of the road way with the help of intelligent transportation system. This project proposes Internet concepts of Things-based approach that solve problems raised by traffic congestion this gives solution to raising traffic related pollution. This architecture is composed of two modules i.e., hardware module and software module.

3. LITERATURE REVIEW

[1]Travel time is important information for traffic management system, which can help people to plan their travel schedule and improve their work efficiency. The development of smart travel time information system for multiple moving vehicle detection and tracking on highway composed of an embedded Linux platform and an image sensor. A low cost system with high resources is needed to capture an image of the monitoring area, analyze it and perform the vehicle detection and tracking process of the image to estimate the speed and time taken of moving vehicle from one point to another point on the scene. So, this will review some of embedded board that been used with image processing to find out which kind of platform that is suitable and possible to measure and estimate the travel time. This project focuses on a firmware-based novel technique for vehicle detection. This approach detects the vehicles in the source image, and applies an existing identifier for each of the vehicle. Later it classifies each vehicle on its vehicle-type group and counts them all by individually. The developed approach was implemented in a firmware platform which results is better accuracy, high reliability and less errors.

[3]An urban traffic control system, which is design based on the real time traffic flow information and the design has combined with traffic control theory, application of single chip computer and ultrasonic technology, design and research of the traffic control system based on traffic. Compared with the traditional control system, the system has the following characteristics: the duration time of traffic signal can be smartly set according to the number of road vehicles; a priority of lane can be assigned according to the actual demand when a vehicle is rarely at night, etc.

[4] In this paper, we propose a novel decentralized traffic light control using wireless sensor network. The system architecture is classified into three layers; the wireless sensor network, the localized traffic flow model policy, and the higher level coordination of the traffic lights agents. The wireless sensors are deployed on the lanes going in and out the intersection. These sensors detect vehicles' number, speed, etc. and send their data to the nearest Intersection

Control Agent (ICA) which, determines the flow model of the inter-section depending on sensors' data (e.g., number of vehicles approaching a specific intersection). Coping with dynamic changes in the traffic volume is one of the biggest challenges in intelligent transportation system (ITS). Our main contribution is the real-time adaptive control of the traffic lights. Our aim is to maximize the flow of vehicles and reduce the waiting time while maintaining fairness among the other traffic lights. Each traffic light controlled intersection has an intersection control agent that collects information from the sensor nodes. An intersection control agent manages its intersection by controlling its traffic lights. Multiple intersection agents can exchange information among themselves to control a wider area.

[5] This paper presents an adaptive traffic light system based on wireless communication between vehicles and fixed controller nodes deployed in intersections. We present the integrated simulation environment we have developed in order to study the system. We argue that our system can significantly improve traffic fluency in intersections, and has clear advantages over other architectures regarding both cost and performance.

[6] In the densely populated urban area traffic control system is the main mechanism to control the flow of vehicular traffic at the intersection. Conventional traffic control system are not capable of handling dynamic vehicular flow. This dynamic vehicular flow creates traffic jams , congestion at the intersection. Vehicular Ad hoc Network (VANET) is a common part of Intelligent Transport System (ITS) which is directly involved in handling these problems and aims to make journey on road comfortable. The urban traffic flow depends on the driver behaviour, and also, it is influenced by traffic control and environmental factor. As the number of vehicles in urban area is increases, the traditional traffic system faces so many problems. This paper describes a working a VANET environment and then a brief study of dynamic traffic system based on radio propagation model. This traffic system uses a clustering algorithm at the intersection. Then we conclude the system working.

[7] Vehicular traffic is continuously increasing around the world, especially in large urban areas. The resulting congestion has become a major concern to transportation specialists and decision makers. The existing methods for traffic management, surveillance and control are not adequately efficient in terms of performance, cost, maintenance, and support. In this paper, the design of a system that utilizes and efficiently manages traffic light controllers is presented. In particular, we present an adaptive traffic control system based on a new traffic infrastructure using Wireless Sensor Network (WSN) and using new techniques for controlling the traffic flow sequences. These techniques are dynamically adaptive to traffic conditions on both single and multiple intersections. A WSN is used as a tool to instrument and control traffic

signals roadways, while an intelligent traffic controller is developed to control the operation of the traffic infrastructure supported by the WSN. The controller embodies traffic system communication algorithm (TSCA) and the traffic signals time manipulation algorithm (TSTMA). Both algorithms are able to provide the system with adaptive and efficient traffic estimation represented by the dynamic change in the traffic signals' flow sequence and traffic variation. Simulation results show the efficiency of the proposed scheme in solving traffic congestion in terms of the average waiting time and average queue length on the isolated (single) intersection and efficient global traffic flow control on multiple intersections. A test bed was also developed and deployed for real measurements. The paper concludes with some future highlights and useful remarks.

4. PROPOSED WORK

After reviewing literature and understanding the global need, the paper is modified and a new technique is built that gives best result like predicting the traffic flow on road of the junction and increasing the time delay for red light having heavy traffic flow. System will provide notifications of congestion on heavy traffic flow to the drivers via their android device on demand. This may help the drivers to make decisions on whether to opt that route or not. After signal conditioning these digital signals are forwarded to micro controllers, then micro controller have task to convert this digital data into user define format and send this data to server with the help of serial communication
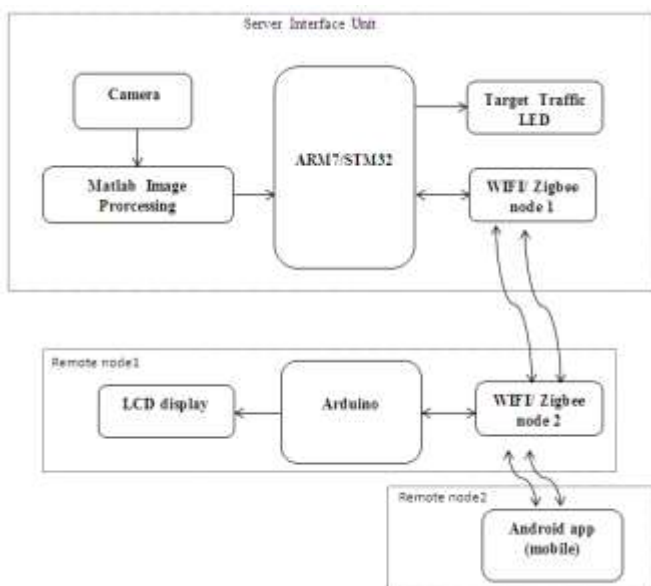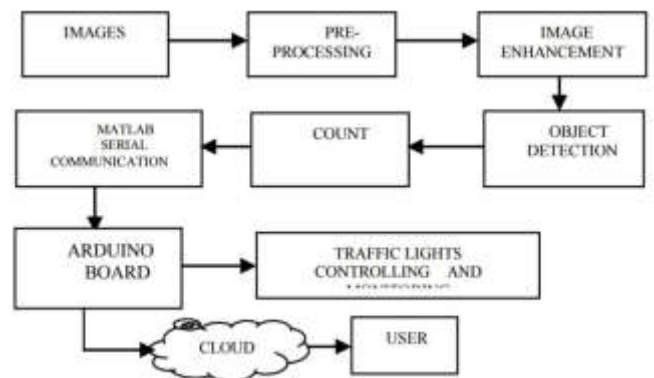

Figure1. System block diagram

Fig2. Work done by previous researchers

4.1 PRE-PROCESSING

Pre-processing is a technique used to convert RGB color to gray color image. It is done by using luminance converter shown in below equation. IS=0.2896*IR+0.5870*IG+0.1140*IB IS is the grey level image. IR, IG, IB are the luminance in red, luminance in green and luminance in blue.

4.2 IMAGE ENHANCEMENT

Better contrast and detailed image are provided by enhancing an image compare to a non enhanced one. Some of image enhancement techniques are power-law transformation, linear method and Logarithmic method. Among them, power law transformation method is best approach which has the basic formula as shown below: $V = K v\gamma$ Where V and v are I/O gray levels, γ & K is a positive constants (K=1). Therefore, deciding a accurate utility of γ can play a pretentious action in image heighten process. For attain a Gamma correction, the association between light input and output signals must be taken. This is done by the following equation S(0)=K.(e)(E) S(0)=K.(e)(E) is output gain and K is the exposure time that is related to intensity and linear vehicles.

4.3 OBJECT DETECTION

Edges of an image correspond to object boundaries. These edges are nothing but pixels where the change in brightness may occur and is calculated the behavior of image function in a neighboring pixel.

4.4 COUNT

In order to prevent the problem of traffic in particular destiny we have to know details about number of vehicles and situation. For that a algorithm search a connecting pixels is required to get traffic density.

4.5 SERIAL COMMUNICATION By using simple MATLAB m-files to communicate with microcontroller board.

4.6 TRAFFIC LIGHTS CONTROLLING AND MONITORING

As per the microcontroller program the traffic lights will run and the traffic density will be continuously monitored and also controllers density of the traffic on the road in specific direction.

4.7 USER

The user can attain information over particular area or junction by signing in to the cloud.

5. CONCLUSION

In this modern era as the population is increased rapidly the usage of vehicles has also increased tremendously. The cause of it is heavy traffic. In order to avoid this problem it is better that we flow new communication methods such as image processing based intelligent traffic controlling and monitoring system. By using this method we can get the details about information about vehicles in particular junctions through internet access. This is more beneficial for the emergency travelling.

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