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IoT Based Traffic Management System

Sowmya M [1], Anusha P S [2], Ashwin S Murthy[3], Joy Steffi Jones[4], Lynette W Pinto[5]

Assistant Professor, Department of Computer Science and Engineering, Global Academy of Technology, RR.Nagar, Bangalore, India[1]

U.G. Student, Department of Computer Science and Engineering, Global Academy of Technology, RR.Nagar, Bangalore, India[2]

U.G. Student, Department of Computer Science and Engineering, Global Academy of Technology, RR.Nagar, Bangalore, India[3]

U.G. Student, Department of Computer Science and Engineering, Global Academy of Technology, RR.Nagar, Bangalore, India[4]

U.G. Student, Department of Computer Science and Engineering, Global Academy of Technology, RR.Nagar, Bangalore, India[5]

ABSTRACT: Traffic congestion is a major problem facing all metropolitan cities. Normal cities can be transformed into "smart cities" by exploiting the information and communication technologies (ICT). The paradigm of Internet of Things (IoT) can play an important role in realization of smart cities. This paper proposes an IoT based traffic management system for smart cities where traffic flow can be dynamically controlled by onsite traffic officers through their smart phones or can be centrally monitored or controlled through Internet. The cities where the traffic behavior changes dynamically are being considered as an example. Such cities require special traffic controlling algorithms other than the prevailing traffic control systems. However the scheme proposed is general and can be used in any Metropolitan city without the loss of generality.

KEYWORDS: Internet of Things(IOT), Traffic congestion.

I. INTRODUCTION

The Internet of things (IoT) is the inter-networking of physical devices, vehicles, buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data. The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

The main purpose of IoT based traffic management system is to monitor and manage traffic remotely through the internet. The proposed algorithm collects traffic data from an API and controls the traffic signal timer. Based on the intensity of the traffic timer varies.

II. RELATED WORK

In [1], authors used dynamic cycle Traffic Light Signal(TLS) for traffic congestion control. However, collecting real-time traffic flow data for each road bound by traffic officer on the spot and alteration of Green Light Phase Time (GLPT) manually afterwards are major challenges for local authority. In the worst case, traffic police are assigned to each road intersection, and the TLS is turned off for manual traffic flow control. In order to address these issues, a network of sensors is installed on road intersection to monitor real-time traffic flow and alters these traffic lights automatically. In [2], a central server called STCCS (Smart Traffic Congestion Control System) which will keep track

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of the data of the traffic density of various roads in the city. The vehicle will make a request to the STCCS for the best route The vehicle will make a request to the STCCS for the best route available to a particular destination. Upon receiving the data, the central server analyses the best possible routes the car can take to reach its destination and sends back the best possible route as a recommendation along with other routes with data of each of their traffic density. The algorithm is implemented to a path only if the traffic is low

III. PROPOSED ALGORITHM

A. *System Architecture:*

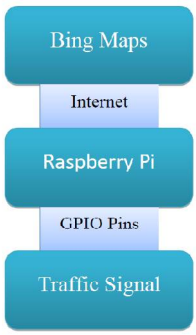

Fig: System Architecture

All the components included in the project are connected to each other as shown in the Fig 5.1.The Bing Map API is connected to the Raspberry Pi via the internet. The Raspberry Pi sends a request to retrieve the traffic density from the Bing API via the internet.The Raspberry Pi and the Traffic signal is connected via the GPIO pins(General Purpose Input Output Pins).The updated timer settings are displayed on the LCD Screen of the traffic signal using the GPIO pins.

B. *System Modules*

The system has the following modules:

Data/request retriever

It's used to retrieve data from the Maps API. Once we send a request from the raspberry pi to the Bing API i.e requesting for traffic density then, the data request/retriever is used for the same.

JSON Parser

This module is used to read the traffic data from the JSON object returned. The Bing API send the requested data in the form of a JSON object and this JSON parser is used to convert this object into a string.

LED Controller

This is used to control the LED connected to the board. Based on the timer values and the traffic density values the LED are turned on.

LCD Display

Based on the traffic data obtained from the Bing API the timer values are set and these timing values are displayed on the LCD screen.

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IV. RESULTS

The results show the variation in traffic signal timer based on the data received from the Bing API and implemented on a Raspberry PI kit. Fig.1. shows the timer values when traffic density is high The red signal timer is set to 10 seconds and the red LED is turned on. The green signal timer is set to 60 seconds, thus reducing congestion for a particular road by allowing increased vehicle flow. The green LED remains on for the specified duration. Fig.2. shows the timer values when traffic density is medium. The red signal timer is set to 20 seconds and the red LED is turned on. The green signal timer is set to 50 seconds. Fig.3. shows the timer values when traffic density is mild. The red signal timer is set to 40 seconds and the red LED is turned on. The green signal timer is set to 30 seconds. Fig.4. shows the timer values when there are no vehicles. The red signal timer is set to 60 seconds and the red LED is turned on. The green signal timer is set to 20 seconds.

Fig.1. Timer values when traffic density is high

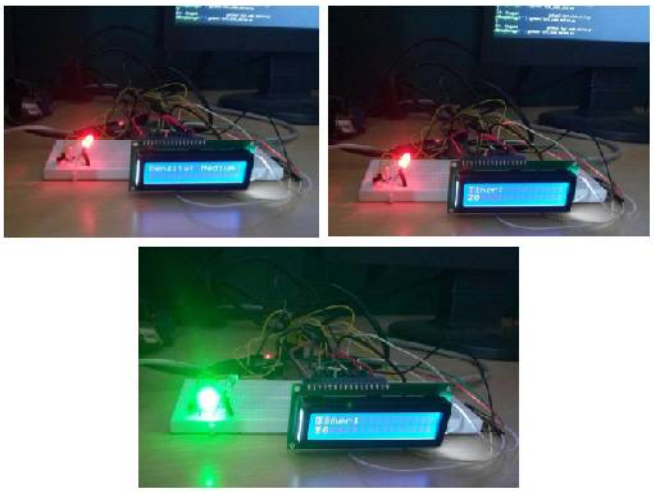

Fig.2. Timer values when traffic density is medium

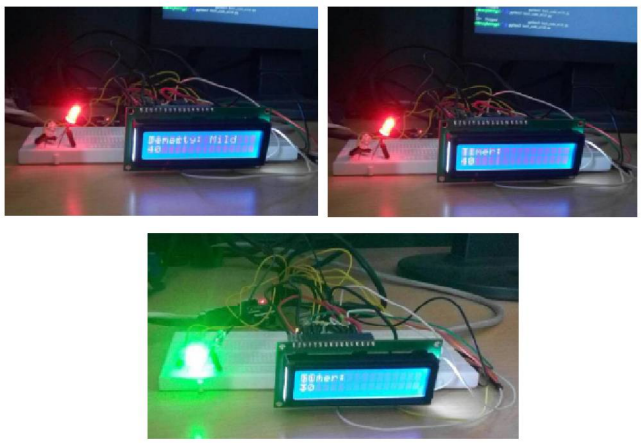

Fig. 3. Timer values when traffic density is mild

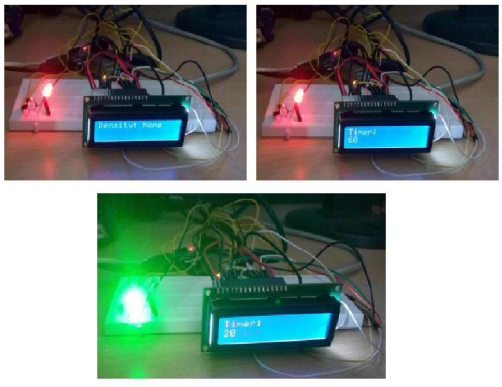

Fig 4. Timer values when traffic density is none

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V. CONCLUSION AND FUTURE WORK

The main aim was to develop a system of controlling traffic signal in accordance with the prevailing traffic density. The system is based on Internet of things, implemented on a Raspberry pi which will control the traffic signal based on traffic density at a certain range. The system is dynamic, which could give dependable performance in harsh traffic environment. The system successfully updates the traffic signal timer values based on the current traffic density. Traffic signals can be controlled based on the traffic density at any particular point of time. Traffic congestion can be controlled with minimal human intervention. In accordance with the traffic management for a certain set of co-ordinates, network of traffic signals can be developed such that the system compares the traffic density of the entire network and controls the timer of the traffic signal without any human intervention.

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