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IOT Based Traffic Light Controller in Smart City

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ABSTRACT: Nowadays Traffic congestion has become major problem in rapidly expanding cities (in terms of population) of India which drastically increase air pollution, Fluid consumption as well as vehicular density. This necessitates to find a new way for controlling traffic system. This has been managed through real time traffic density management using IOT. An intelligent traffic management system has been designed to control traffic system which includes components consisting of raspberry pi, IR sensor, LCD display. Raspberry pi is the key component which is used to control all performance multitasking. IR sensor is used to monitor the density of traffic. The corresponding data are then made available on website in order to display the traffic status so that people will get early update and can avoid the traffic jams.

KEYWORDS: IOT, Raspberry pi, IR sensor, Real time, Traffic management

I.INTRODUCTION

IOT is the network which controls the physical devices through internet. This network provides precise, quick and exact outcome. IoT system is designed to store all database in computer. This storage is done mainly via internet. Further this database is used accordingly as per their requirements and applications. IoT system thus enables the components to be accessed from far distance which ultimately reduces human work or his interference. This makes it more economical system. Thus, various protocols can be used accordingly to respective domain in IOT. The major communication form on the internet is human-human, but in future there will be everything i.e. the object will have a unique identification number. The communication form will extend to from human-human to human-thing and also to thing-thing. This will enable through various sensors connected via internet. Fundamentally, IOT is connecting different application devices to each other through internet. This is possible because of sensors which aids to transmit a wide variety of data, location.

Traffic congestion has become critical problem in crowded cities of India because of its highly growing population. Thus there is a need to obtain a solution to this problem. Therefore, IOT concept has been used to solve this problem. If traffic lights work depending upon the vehicle number in a lane/road, then time management for traffic lights can be done and congestion could be reduced dramatically. The Raspberry Pi Zero has proven to be one of the most popular and demanding versions of the Raspberry Pi since it was released in November 2015. Although, in early days many people thought that it lacked one very important feature i.e. inbuilt wireless internet but today the Pi Zero has everything. Raspberry Pi Zero W is almost identical to the previous Raspberry Pi Zero v1.3 (the one that added the camera connector) importantly, all the chips and components are still only on the top side of the board.

Traffic Problems-

As we all know that traffic congestion is a major problem in many cities of India along with other countries. Because of traffic issues people cannot walk on road itself, if any patient is in car and gets fixed in traffic, and other signal having fifty seconds time, but no more vehicles going over them, in this case if we manage this time one patient will go early to doctor and have more chances to recover early. Failure of signals, poor law enforcement and bad traffic

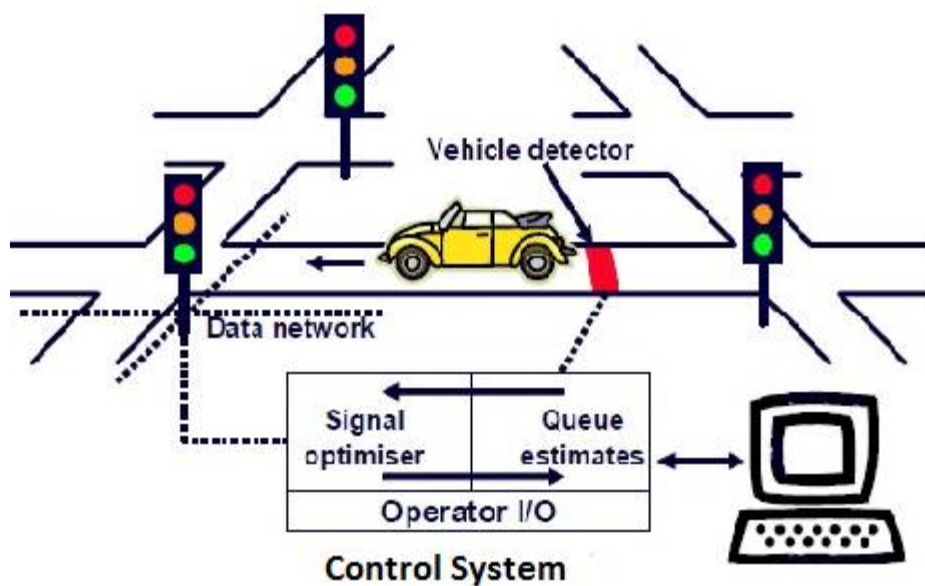
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management has lead to traffic congestion. One of the major problems with Indian cities is that the existing infrastructure cannot be expanded more, and thus the only option available is better management of the traffic. So with the help of this project we can surely manage traffic problems. Traffic congestion has a negative impact on economy, the environment and the overall quality of life. Hence it is high time to effectively manage the traffic congestion problem.



Traffic congestion on road networks is nothing but slower speeds, increased trip time and increased queuing of the vehicles. When the number of vehicles exceeds the capacity of the road, traffic congestion occurs. In the metropolitan cities of India traffic congestion is a major problem. Traffic congestion is caused when the demand exceeds the available road capacity, this is major problem in India. Individual incidents such as accidents or sudden braking of a car in a smooth flow of heavy traffic have rippling effects and cause traffic jams. Many metropolitan cities are facing problems related to population explosion. These have leads to increase in vehicular density, resulting into traffic congestion. Hence there is a need to manage traffic in a smart way as the management of traffic with the conventional way.

II.SYSTEM MODEL AND ASSUMPTIONS

System Development-

1. Module 1(get sensor data) -

In this module input is traffic density sense by the sensor and the output is digital data produced by the sensor data which is send to next module for further operations.

2. Module 2(perform analysis)-

The input for this module is digital data sensed by sensor and output is decision taken based on sensor data.

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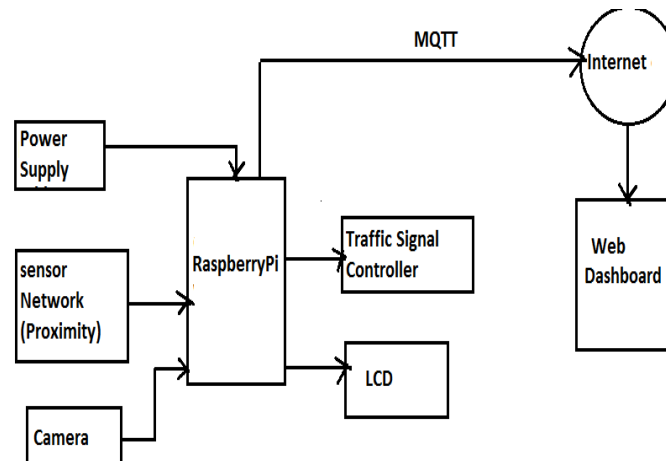


Fig. Block diagram of proposed system

3 Module 3 (control traffic signal and rerouting)-

The input for this module is data or decision data produced after analysis and output of this module is new value for signal's countdown.

4 Module 4(send data on cloud) –

In this module data will be send on cloud. Input is the data which will be sent on cloud and the output is data stored on cloud.

5 Module 5(display traffic data on web) -

In this module input is data stored on cloud and the output is charts, graph displayed on webpage.

III.FLOWCHART

The below flowchart shows, there are number of vehicles on the road which are sensed by the sensors. We have used sensor network here and the result of a sensor network is given to the road side unit. Road side unit contains raspberry pi. raspberry pi takes the input from the sensor network compares the density from different road. Congestion measurement is done through the raspberry pi. Then decision-making is takes place. In which road traffic congestion is more, traffic signal time will be adjusted on that road. Time of traffic light will be reduced for that road so that traffic congestion problem will be reduce. If there is no more congestion on the road then traffic light will be same. All the data is send on the cloud and that data is displayed on dashboard.

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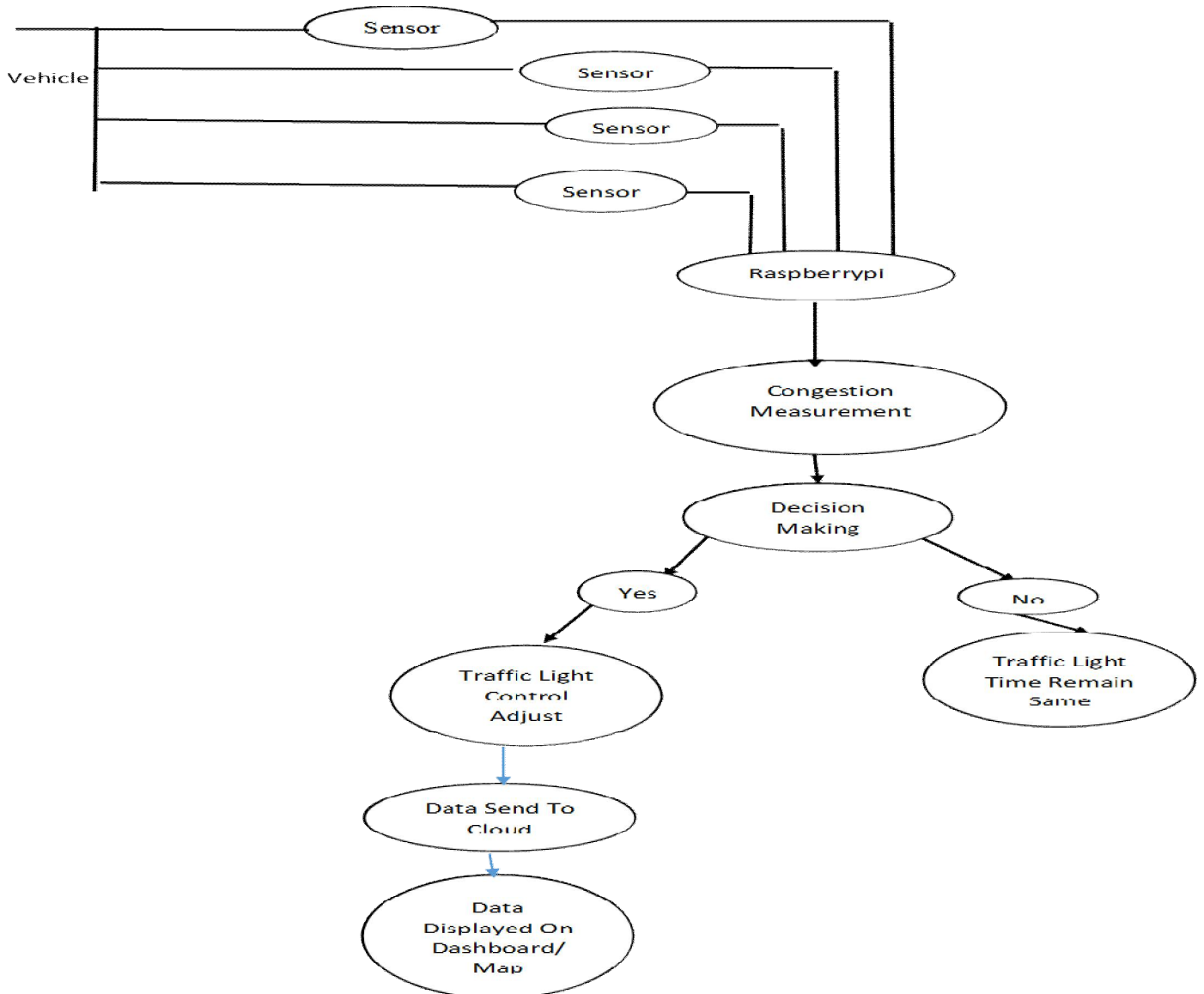


Fig. Flowchart of proposed system

Hardware Details-

1. Raspberry pi zero 0
2. IR Proximity Sensors
- 3 .LEDs (Traffic Lights)
- 4.5v 2amp Power Supply.

Software Details-

1. Raspbian OS
2. Python 2.7
3. Paho MQTT Library
4. MQTT Protocol
5. Web-HTML,css, JavaScript



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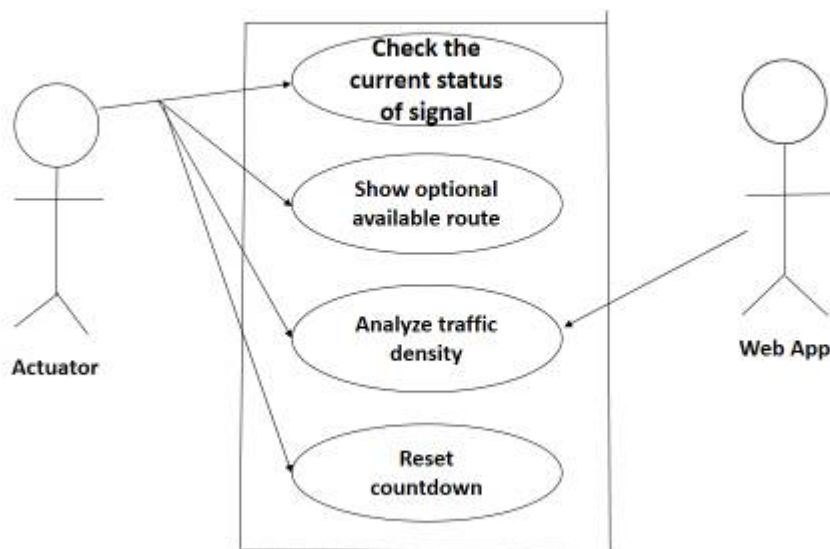
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6. MQTT Broker-Mosquitto

IV.EFFICIENT COMMUNICATION



V.SECURITY

The MQTT protocol uses a publish / subscribe communications model which allows for data to be sent and received asynchronously. A web service called a broker manages where the data is coming from and going to. It's similar to REST for HTTP communications but with several very important distinctions.

From security cameras to traffic lights, an increasing amount of appliances we interact with on a daily basis are internet connected. A device can be considered IoT-enabled when the functionality offered by its Embedded System is exposed through an internet connected API.

Internet-of-Things technologies inherit many attack vectors that appear in other internet connected devices, however the low-powered hardware-centric nature of embedded systems presents them with unique security threats. Engineers building Internet-of-Things devices must take additional precautions to ensure they do not implement security anti-patterns when addressing new problems, this blog post will investigate four such anti-patterns that have been used by real Internet-of-Things devices.

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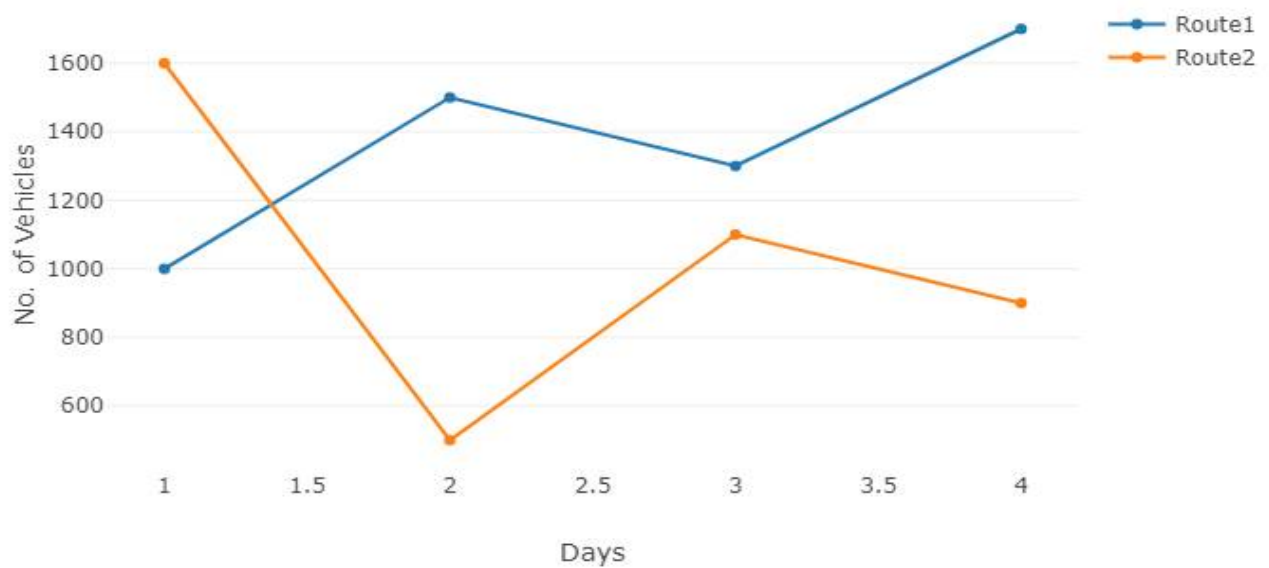
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VI. RESULT AND DISCUSSION



Route 1 vs Route 2





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VII.CONCLUSION

Existing system uses fixed amount of time which results in traffic jam as traffic signals are not efficient to control traffic. Our project overcomes the above limitations. The IoT based signals in our proposed system will help to control and manage the traffic considering different aspects such as high priority vehicles and density of traffic. This is a innovative idea which is effectively using IoT. Thus the proposed system helps to reduce pollution and fuel consumption as well.

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