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IOT Based Intelligent Traffic Control System

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Abstract*: *In this paper a new approach for controlling Traffic System is designed. The proposed system uses a concept of Internet Of Things. An intelligent traffic controller is designed with components like Raspberry Pi, Pi-Camera, RFID, IR sensors. Raspberry Pi is the main component which is used to control all, it acts like a controller. Density of the traffic will be decided with the help of IR sensors. And in order to give Green path (Zero traffic) for emergency vehicles RFID technology is used. Along with this RFID is used to trail stolen automobiles too. The paper proposes control of system in 2 modes i.e. 'automatic' without any human introversion and 'manual' with human introversion. The model was tested and the outcome of model is as expected.

Keywords— IOT, Raspberry Pi, IR sensor, RFID, Pi-Camera, Congestion of traffic, Stolen automobile.

I. INTRODUCTION

IOT is an innovation which uses internet to control the physical items. Using IOT we can obtain outcome which is more precise, quick and exact. In IOT all database will be stored in computer. This storage is done through internet. Later this database is used accordingly to their requirements and applications. Components can be accessed from far place by using IOT, hence it reduces human work or involvement. This makes investment of system less. All different protocols can be used accordingly to respective domain in IOT.

We all know that India is the second largest populated country in world. India faces a problem in traffic congestion, it needs a solution for this problem. If we design a control system for traffic in proper way this congestion problem would be solved. Hence by using IOT concept this can be solved. If traffic lights work's depending upon the vehicle number in a lane/road, then time management for traffic lights can be done and congestion could be reduced in great way.

Providing Green signal to emergency vehicles is very important task to save patient life. And if the automobile is lost or theft, in present days it is a long procedure of filing case in police station and then searching for it. Tracking has to be done as soon as possible. This both can be cleared by using RFID near field communication.

II. LITERATURE SURVEY

Traffic Congestion is a major issue. Because of this congestion problem, time taken for travelling will be increased. A design was developed using wireless technology with PIC microcontroller, IR sensor and XBEE. IR sensor was used to decided traffic density and timing for the traffic light. XBee was used to provide Green path for emergency vehicle. But this design was implemented only for automatic mode of operation [1].

An algorithm was also designed so that more number of vehicles are passed in signal. Priority number would be given to different category of vehicles. Emergency vehicles like ambulance, fire trucks etc. would have first priority. Next priority is given to VIP's. Next to ordinary Vehicles. Priority was also given depending upon vehicle density in one side of road in traffic junction. The road which had higher vehicle number would get highest priority [2].

RFID is mainly used to track the objects. RFID readers and tags are used in showrooms so that no one takes off any object or material without paying the bill. This RFID is also used to track the lost vehicles. When the unique ID of RFID tag of lost vehicle is detected then it's location where it is found is obtained [3].

Green path for emergency vehicles was also designed before which use to provide Green signal to all sides of signal in traffic junction so that ambulance will get path to move [4]. But the disadvantage of this was all vehicles from all side will starting moving which will create even more traffic jam for ambulance.

III. PROPOSED METHODOLOGY

From present situation, an efficient solution to the problem is not yet obtained. Hence in order to provide effective solution this prototype is designed. The block diagram of the system is as shown below.

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In this proposed methodology we will provide solution to congestion, traffic clearance to ambulance and other emergency vehicles and tracking of stolen vehicles is also done. And one major plus point of the system is we have designed the system in automatic mode and manual mode. In automatic mode depending upon sensors output the decision is taken. But in manual mode we can have control on traffic, this is done by authorized person in control room.

The Raspberry Pi is used in system takes controls on all. IR sensors are used to identify the density of traffic. And to identify the entry of ambulance and lost automobiles RFID is used. Camera used in system takes still pics of traffic. By seeing this pic authorized person in control room will take decision in manual mode of operation.

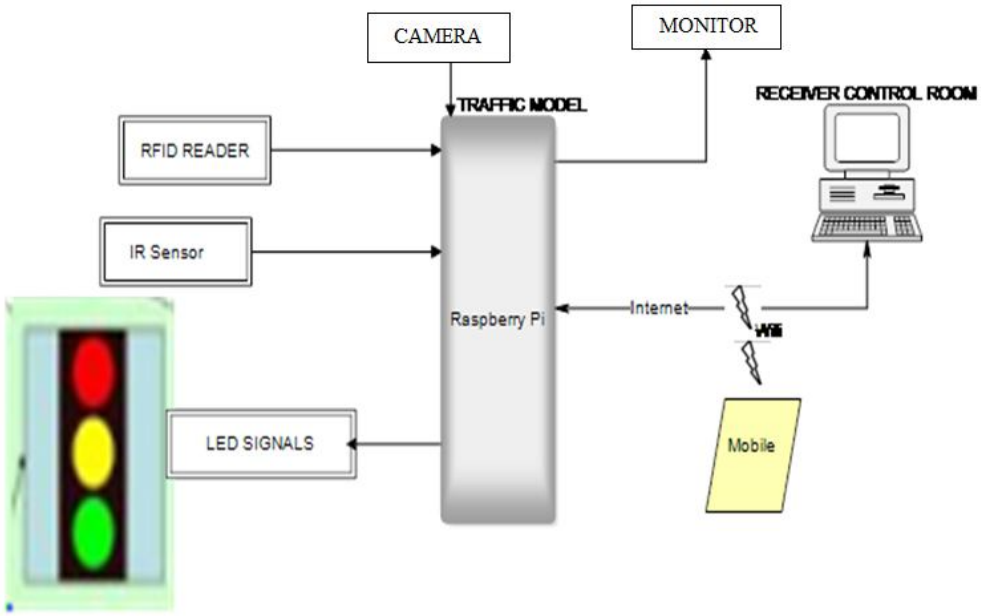


Fig 1: Block Diagram

A. Raspberry Pi

UK was first to develop Raspberry Pi. It is a series of small single board computer. There are three generations in Raspberry Pi i.e. Raspberry Pi 1, 2 and 3. In this generation we can also find different models like model A, B. The basic Raspberry Pi did not have Wi-Fi and Bluetooth in it, later it was added. Raspberry Pi 3 is used in our proposed system. It has Broadcom SOC and GPU. CPU's speed is 700M Hz – 1.2G Hz. RAM has 256MB – 1GB memory. SD card store OS in it. There are 4 USB slots. For camera to interface it has CSI. USB cable is used to power the raspberry pi. Raspberry Pi also have video or audio jack. And it has 40 GPIO pins. For monitor connection it has HDMI port.

B. RFID

RFID is a technology in which data will be transferred without any external connection of components. In RFID we have RFID Reader and RFID tag. A unique number is allotted for every tags. RFID tags are of 2 types, Active and Passive. In our proposed system we have used passive tags. Passive tag will not have power supply whereas active will have. When RFID tag come close to reader i.e. when tag is within range, because of mutual inductance the RFID tag will get powered up from reader which has power supply. Hence the unique number present in that tag memory will be transferred to the reader. Tag can only store ID number it has no more memory space.

C. IR Sensor

Infra-red rays are invisible to human eyes. IR sensor will have transmitter and receiver in it. Transmitter will always emit IR rays. The IR rays transmitted will strike the object, if object is present in front of sensor. The ray strickled will get reflected and this will be sensed by IR receiver. So by this we can identify how far the object is. And presence of object can be identified. Operating voltage is 5 Volts.

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D. Pi Camera

Pi Camera will take high definition pictures and video. It has flat cable which is used for connectivity. It is connected to CSI port of Raspberry Pi. Camera is of 5 Mega Pixel. Usually cameras are used for surveillance purpose.

E. LED Lights

LED lights are used as traffic lights. It is a diode. When the p-n junction is forward biased, it emits light in the form of photon. We can get different colours; this colour is determined by gap in the energy band.

IV. APPLICATIONS

A. Traffic Control

In this application we will place IR senor at certain distance. Starting from signal light of that road first sensor is kept at 'x' metre distance. Second sensor at (x+5) metre and third sensor at (x+10) metre distance. When traffic too high all these sensors will give high output which signifies 'traffic is high', then for 60 sec green light will be ON. If 2nd and 3rd sensors are high it states that 'traffic is medium', then for 45 sec green light will turn ON. If only first sensor output is high the 'traffic is low' so only for 30 sec green light is turn ON.

B. Emergency vehicle

All emergency vehicle will be embedded with RFID cards and its number will be saved in control room system. RFID reader will be kept at certain distance approximately near sensor 3. When emergency vehicle arrives, RFID reader will read RFID card. The number obtained from card will be compared with number present in control room system. If same then automatically green light will be turned ON.

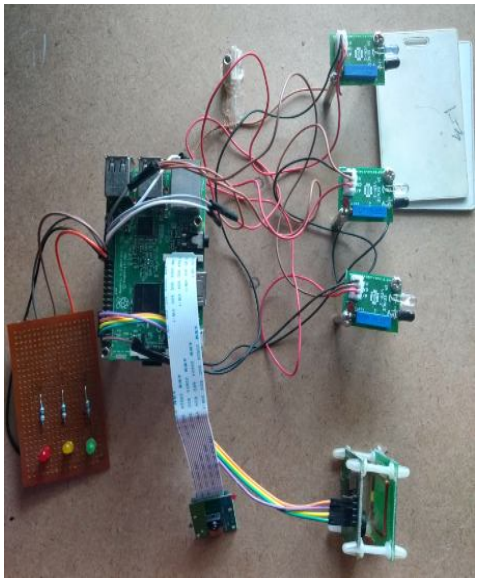
C. Tracking of stolen automobile

RFID cards will also be embedded in all vehicles. The ID of card must be known by all owner. As the automobile is lost, the owner of automobile will give this ID to police and to control room. RFID reader placed in road signal when it encounters the vehicle with this number then email is dropped to owner and police station present near that locality.

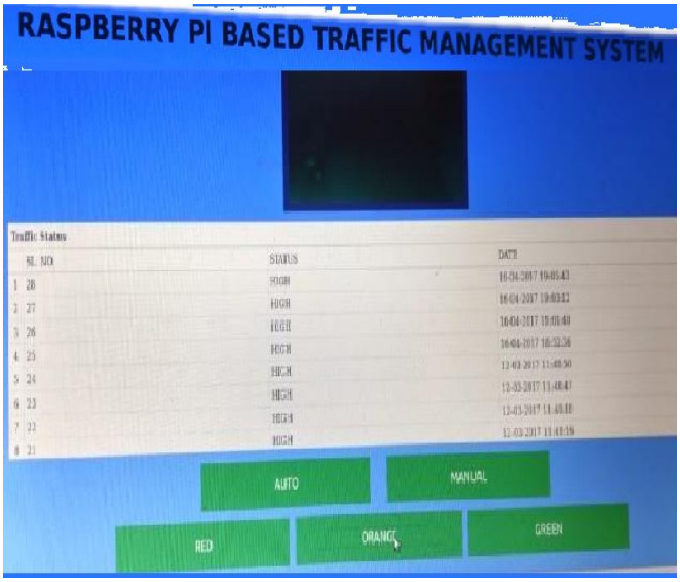
D. Manual operation

This is done by authorized person in control room. Person in control room will see the traffic present through the pi-camera output. Depending on that output or depending on situation we can overwrite the automatic operation output. Depending on the button pressed in control room that particular colour traffic light will be turned ON.

V. RESULTS



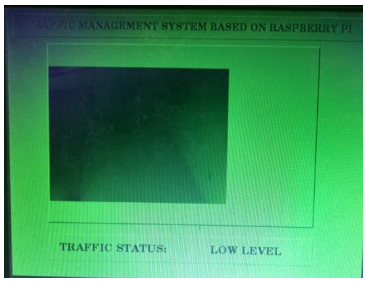
(a)



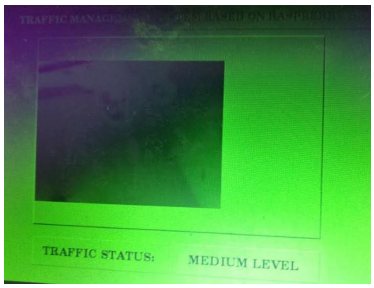
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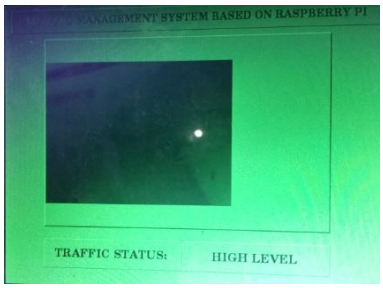
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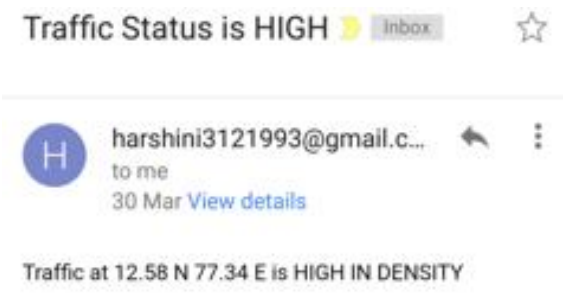
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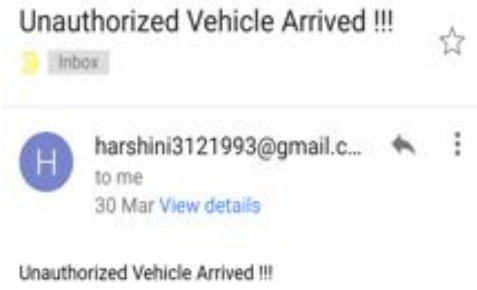
(e)



(f)



(g)



(h)

Fig (a): overall system, (b): automatic and manual mode, (c) (d) (e): automatic mode result display, (f) (g) (h): mail alert

VI. CONCLUSION AND ENHANCEMENTS

The proposed system results is as we expected. By this proposed system time management for signal lights is done which will reduce the traffic congestion problem. And the system has automatic and manual operation. When lost vehicle is identified a email will be dropped. Tracking of stolen automobile is done successfully and is fast. Clearance of traffic for emergency automobile is successfully implemented. Hence, many precious life would be saved.

Further the same prototype can be added with accident message alert. And at present we have implemented the design for only one road of junction. This can be extended to more number of junctions. An 'app' can be designed which uses traffic status at different location from the control station database to display so that it helps normal people.

VII. ACKNOWLEDGMENT

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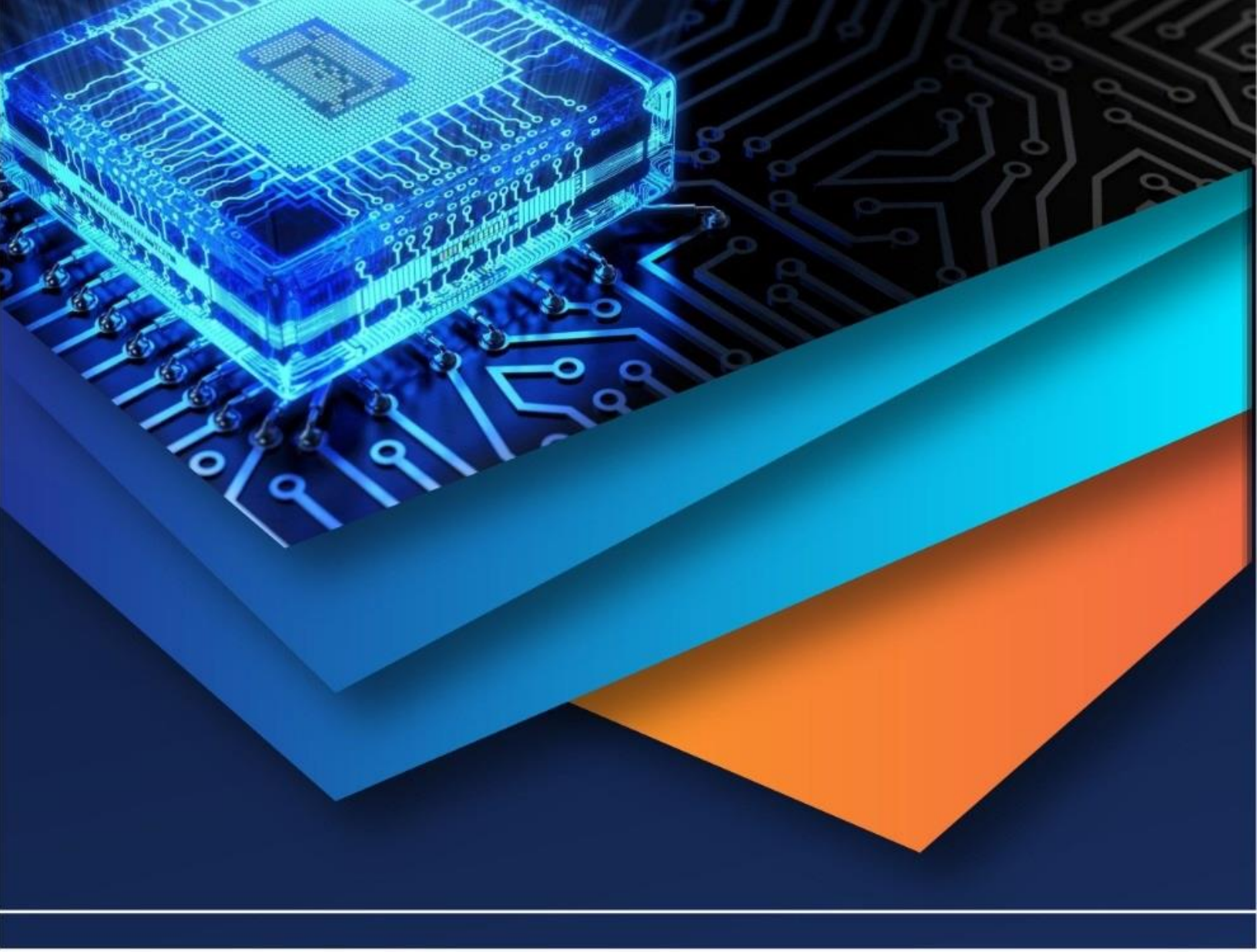
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