A New Approach for Intelligent Traffic Control System using Raspberry pi

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***Abstract*- This paper proposes an intelligent traffic control system to guarantee smooth flow of traffic. Vehicle is equipped with special Radio Frequency Identification (RFID) tag, placed such that it is intolerable to remove or destroy.We use RFID reader, system-on-chip to read the RFID tags attached to the vehicle by , and Raspberry-pi. It counts number of vehicles that passes on a specific path during a specified duration. It also regulates the network congestion, and hence the green light duration for that path.Density of the traffic will bedecided with the help of IR sensors. And in order to give Green path (Zero traffic) for emergency vehicles RFID technology isused. 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 ofmodel is as expected.**

***Index Terms*- Embedded Technologies, RFID, congestion control, traffic junction, ambulance vehicle.**

I. INTRODUCTION

India is the second most populous country in the world and is a fast growing economy.Because of more population the growth in the number of vehicles is increasing exponentiallyday by day. But the infrastructure growth is slow due to space and cost constraints [1]. As aresult, India is facing terrible road congestion problems in its cities. Also, Indian traffic isnon-lane based and disordered. There are many issues related to increasing traffic such asaccidents, numerous types of pollutions, time wastage and health related problems.The major reasons for traffic problems are increase in the number of vehicles, violationin the traffic rules, various construction works and increase in the number of accidents. Thisis turn has an adverse effect on the economy of the country as well as the loss of lives due toambulances getting stuck in traffic jams. Due to all these problems the increase in thecongestion level, especially at peak hours is one of the challenging works for thetransportation specialists. But the existing methods for traffic management are not efficient interms of the performance, cost and the effort needed for maintenance and support. To solveall the traffic related problems there is a need for efficient traffic management system. If asystem for intelligent management of traffic flows is developed, the negative impact of trafficcan be reduced to great extent. This includes technologies like ZigBee, RFID and GSM asthey provide cost effective solutions. RFID is an emerging wireless technology that usesradio frequency electromagnetic energy to identify objects from a distance without requiringdirect line of sight. A GSM modem is a highly flexible plug and play modem, which acceptsa SIM card and operates just like a mobile phone controlled via AT commands. ZigBee is atransceiver module which operates at low-power to transmit and receive data from anystandard CMOS/TTL source

This paper proposes a smart and fully automatic traffic control system that will detectand control the congestion in real time, detect a stolen vehicle and also passes emergencyvehicles smoothly with the use of passive RFID devices.

II. BACKGROUND WORK

Traffic congestion is a major problem in cities of developing countries like India.Growth in urban population and the middle-class segment contribute significantly to therising number of vehicles in the cities [2]. In [3], priority based traffic lights controller usingwireless sensor networks was discussed which was used to provide clearance to anyemergency vehicle by turning all the red lights to green in the path of the emergency vehicledepending on the priority assigned to them The advantage of the

system is that it cancontrol the traffic over multiple intersections but it has few drawbacks. Firstly, havingsensors on all the roads is very costly especially when we are taking intoconsideration an economically poor country like India. Secondly, communication inwireless sensor network is still a research field and the data exchange between sensorsis not reliable. Finally, the sensors need to be robust in order to survive in Indianweather.

In [4], traffic light control using image processing was proposed. This system usedimages to detect the vehicles. The image sequence captured by the camera is analyzed usingdigital image processing for vehicle detection, and according to traffic conditions on the roadtraffic light is controlled. This system showed that image processing is a better technique tocontrol the state change of the traffic light and it is also more consistent in detecting thepresence of the vehicle as it uses actual traffic images than those systems that used sensors.But there are many drawbacks such as installation problems and cost. Secondly, detectingcongestion requires intelligent image processing techniques which in turn requires skilled personnel with adequate software background. And more importantly during badweather conditions due to wind, rain, fog etc. the images captured by the camera is distortedby noise and it becomes difficult for the system to identify the vehicles. Hence, it can'tprovide 24X7X365 days surveillance.

In [5], it proposed a RFID and GPS based automatic lane clearance system forambulance. The main focus of this paper was to clear the lane in which the ambulance istravelling by communicating wirelessly with the nearest traffic signal, so that the green lightis turned ON and hence the traffic is cleared. The communication between the ambulance andthe traffic light controller is done using transceivers and GPS. Here, the use of RFID in theambulances distinguishes between the emergency and non-emergency cases. The system isfully automated and can be implemented for the ambulances in service of hospitals but it hasa drawback that it can't be implemented for Government ambulances because the systemneeds all the information about the starting point and the end point of the travel. But theGovernment ambulances don't have a particular place from which they regularly leave topick up the patients. And also, the system may not work if in case the ambulance needs totake another route due to some reasons.

III. PROPOSED CONTROL SCHEME

The system consists of ARM11 Raspberry Pi device, RFID (RFID Reader and RFID Tag), IR Sensors and a Converter. RFID is connected to Raspberry Pi through USB module. Each vehicle is equipped with an RFID Tag and when the ambulance and stolen vehicle will come to the junction, where the reader will read and gives Green and Red light signal. IR Sensors are connected directly to the Raspberry Pi and are used when there is heavy traffic density.

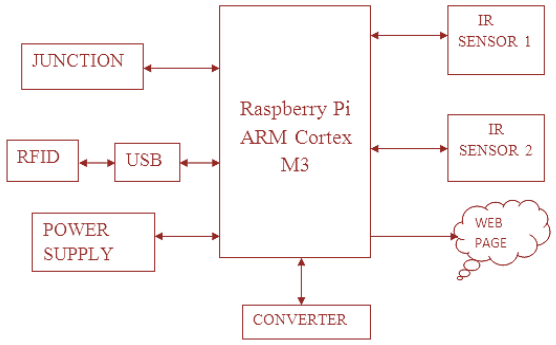


Fig.1 proposed system overview

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 40GPIOpins. For monitor connection it has HDMI port.

IR Sensor : Infrared Sensor is an electronic instrument which emits and/or detects Infrared radiations to sense its surroundings. The main areas are Sensing and Remote controls. In the electromagnetic spectrum, the infrared portion is divided into three regions.An IR sensor comprises of an emitter, indicator and related hardware. The circuit required to make an IR sensor comprises of two sections; the emitter circuit and the collector circuit.

An infrared sensor (IR sensor) is an electronic sensor that measures infrared (IR) light transmitting from items in its field of view. They are frequently utilized as a part of PIR-based movement detectors.IR Sensors work by utilizing a particular light sensor to identify a select light wavelength in the Infra-Red (IR) range. By utilizing a LED which creates light at an indistinguishable wavelength from what the sensor is searching for, you can take a gander at the force of the got light. At the point when a protest is near the sensor, the light from the LED ricochets off the question and into the light sensor. This outcomes in a substantial bounce in the force, which we definitely know can be distinguished utilizing a limit.

Details:

•Operating voltage - +5v DC regulated
•Obstacle recognition: - Indicated by dynamic high yield
•Logic yield:- 1 or 0.
•Sensitivity:- up to 30cm customizable.

LCD 16 * 2 specification:LCD remains for Liquid Crystal Display. LCD isfinding far reaching use supplanting LEDs (sevenportion LEDs or other multi fragment LEDs) onaccount of the accompanying reasons of the decliningcosts of LCDs, The capacity to show numbers,characters and illustrations. This is as opposed toLEDs, which are constrained to numbers and a couplecharacters, Fuse of an invigorating controller into theLCD, along these lines soothing the CPU of theundertaking of reviving the LCD. Conversely, the LEDmust be invigorated by the CPU to continue showingthe information and Simplicity of programming forcharacters and design.

Details
Show :- 16 Char* 2 Lines
Controller:- LSI HD44780 IN BUILT
Control Supply :- + 5v Dc
Show Color :- Gray
Weight :- 35g

RFID tag:A radio-frequency identification framework utilizeslabels, or names joined to the items to be recognized.Two-way radio transmitter-beneficiaries called crossexaminers or readers send a signal to the tag and readits reaction. RFID labels can be active, passive orbattery-assisted passive. An active tag has an on-boardbattery and occasionally transmits its ID flag. Abattery-assisted passive (BAP) has a little battery onboard and is initiated when within the sight of a RFIDreader. An inactive tag is less expensive and littler inlight of the fact that it has no battery; rather, the labelutilizes the radio vitality transmitted by the reader. Bethat as it may, to work an inactive label, it must beenlightened with a power level around a thousandtimes more grounded than for signal transmission.That has any kind of effect in obstruction and inpresentation to radiation.

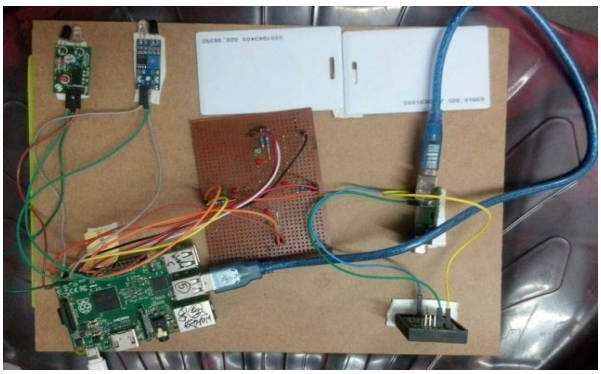
RFID reader:RFID frameworks can be arranged by the sort of tagand reader. A Passive Reader Active Tag (PRAT)framework has a detached reader which just gets radiosigns from active tags (battery worked, transmit as it. The gathering scope of a PRAT framework reader canbe balanced from 1–2,000 feet (0–600 m), permittingadaptability in applications, for example, resourcesecurity and supervision. An Active Reader PassiveTag (ARPT) framework has a active reader, whichtransmits investigative specialist signals furthermoregets validation answers from uninvolved labels. AnActive Reader Active Tag (ARAT) framework utilizesactive tags awoken with an investigator motion fromthe active reader.

A variety of this framework couldlikewise utilize a Battery-Assisted Passive (BAP) labelwhich acts like a latent tag yet has a little battery tocontrol the label's arrival reporting signal. Repairedreaders are set to make a particular cross examinationzone which can be firmly controlled. This permits anexceedingly characterized perusing territory for whenlabels go all through the cross examination zone.Versatile readers might be hand-held or mounted ontrucks or vehicles.

Detail

•Operating Voltage - 5v
•Current-<50mA
•Read separate- 10cm
•Operating frequency- 125khz

IV. SIMULATION RESULTS



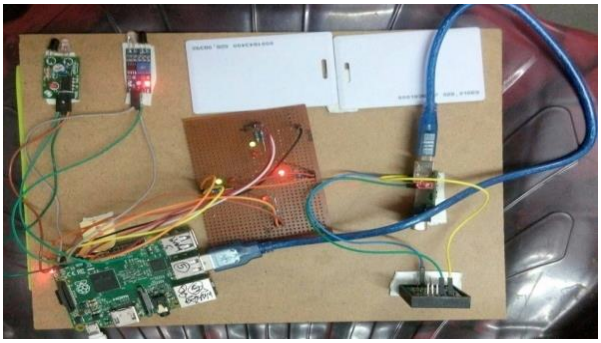


Fig.2 Kit without and with all connections and power supply

The above pictures show the working of the project kit. The adapter is connected to Raspberry Pi and LAN cable is connected to Ethernet port. After switching the power supply, all the LEDs will glow. The output pictures of the three functions are given below-

- When the Ambulance comes at Junction

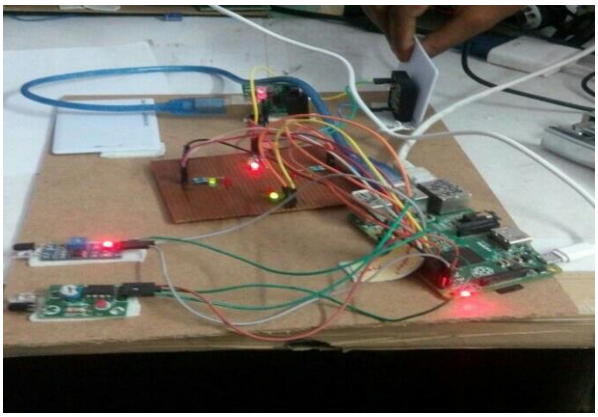


Fig .3 Ambulance comes at Junction

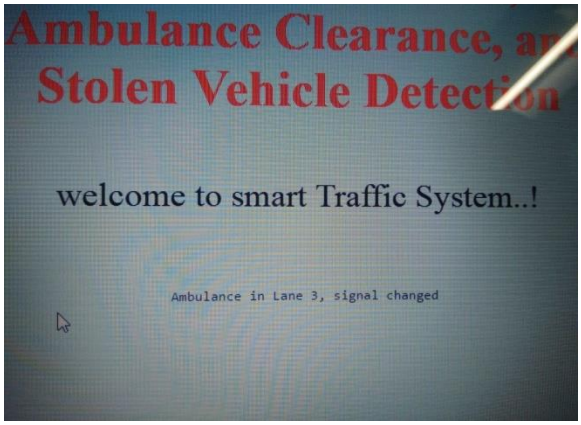


Fig .4 Change in Signals when Ambulance enters

When the Stolen Vehicle comes at the Junction :

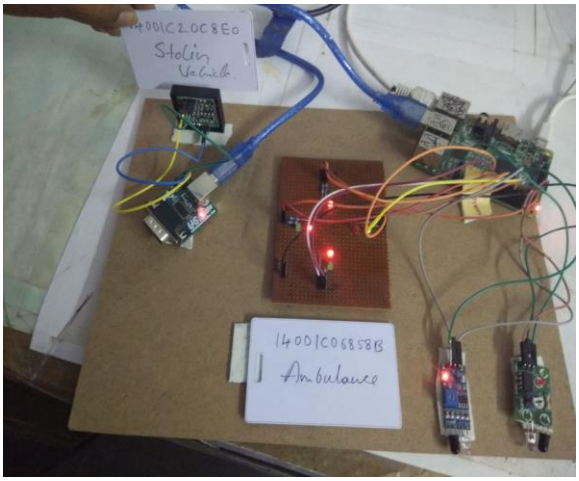


Fig. 5 Stolen Vehicle comes at Junction

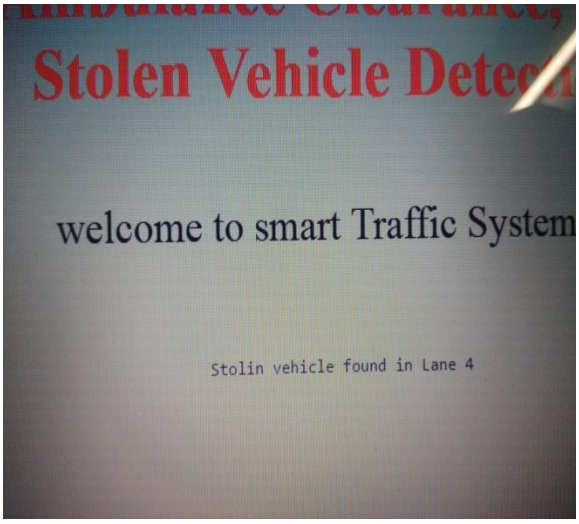


Fig.6 Stolen Vehicle founded

When there is Heavy Traffic Density :

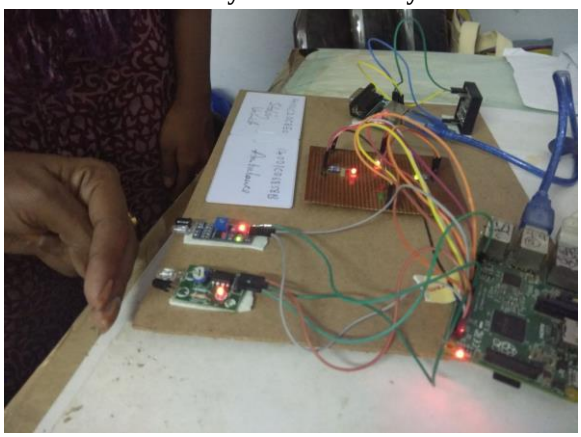


Fig.7 Vehicles at Junction

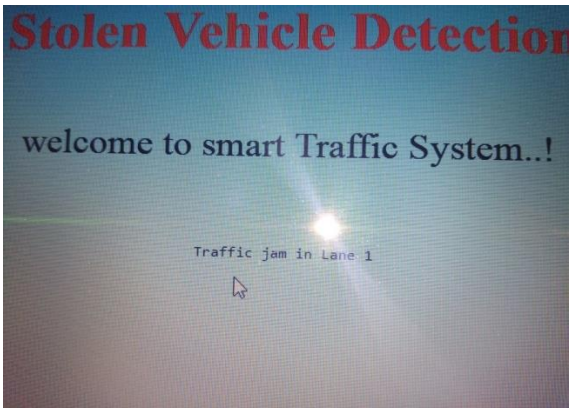


Fig.8 Traffic Jam in Lane-1

V. CONCLUSION

With the implementation of this system the manual effort and the time on the part ofthe traffic policeman is saved. As the whole system works automatically, it requires very lesshuman intervention.The entire system is automated so the involvement of human is very less. If Ambulance will spend a lot of time in traffic jams and if there is the high density of traffic then the traffic signal will turn to Green. The signal turns to Red only after the clearance of traffic density and ambulance. If the stolen vehicle will pass through the signal, then the signal turns to Red. It is implemented by considering only one road of the traffic junction.This system is further can be implemented with the number plate recognition to reduce the implementation cost and also gets more accurate information about the vehicle.

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BIO-DATA

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