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Hi-Tech Traffic Signal System

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Abstract: According to Traffic Density the proper changes in the Signal the system is done and traffic is maintained and well manage through this system. Switching from one lane to another, first, it checks for High Density of traffic for remaining lanes, if there is high density, then Green signal shifted to that lane having a high density for few seconds to bring that lane to the normal traffic and after that signal came back to the lane from which signal is switched. When Any Emergency Vehicle suddenly appears on the lane, then it will be detected 300-400 meter before the signal station and on that lane green signal is activated. After the passing of Emergency Vehicle form signal station then only the green signal of that lane turn ON and after that signal came back to the lane from which signal is switched. If any jumps the signal or Signal Violation occurs, in that case, the vehicle no. and other owner information is detected immediately and send to the traffic control room through the web portal automatically and next action will be taken by the RTO. By sending the message to this vehicle owner. Full accuracy is maintained in this system.

Keywords: Surveys and overviews, Scanners, Sensors and actuators, Hardware-software codesign, Board- and system-level test, Sensor networks

I. INTRODUCTION

Living in 21st Century we all have latest technologies which are useful in every field but we did not have any fully automatic technology at traffic signal which will reduce the traffic, open a route for Emergency vehicles like Ambulance and collect the number of vehicle which crosses red signal. Now-a-days controlling traffic is very difficult due to increasing number of vehicles. 20 % of emergency patient deaths are blamed on Traffic Jam Delays. Sometime there is traffic on only one lane due to insufficient timing of traffic signal.

So we developed a Hi-Tech traffic signal system based on I.O.T technology which will give the solutions for all problems mentioned above. To reduce high density traffic to normal traffic from any lane using IR sensors. We are using RFID reader and RFID Tag to detect Ambulance or any kind of emergency vehicle to make a way for them before they arrive at a traffic signal. We are using RFID Reader to scan the RFID tag of a particular vehicle to detect a number of vehicle and then RFID Reader sends the information of vehicle to the traffic control system. Some of Objectives are :

1) To control the lane which has maximum number of vehicles by giving green signal as per priority.
2) Control and remove the traffic from the lane if any emergency vehicle is detected.
3) Send the information of vehicle which jumps the red signal to the Department of R.T.O .

II. LITERATURE SURVEY

For our project, we collected some important information from various research papers. This research papers contains information about microcontroller board like traditional traffic signal system, IR and Ultrasonic sensors, RFID reader and RFID tag, arduino, raspberry pie, etc. We also get an idea about how to develop a system using Arduino software. So we mentioned some important papers from which we can able to develop our system.

A. Strategies for Traffic Signal Control in Indian Cities.

Published year : 2015.

Intelligent Transportation System Workshop, COMSNETS. Author Gitakrishnan Ramadurai has proposed that Most Indian cities face oversaturated flow conditions during peak periods. In this, researcher revisit the traffic signal control to improve urban network performance. Three novel strategies that address congested heterogeneous traffic flow are presented. The first two strategies - keeping intersection signal cycle times shorter and bottleneck metering - are derived from field observed data while the third - exclusive lanes and storage area near intersections for two wheelers - is supported based on a micro-simulation model. Potential improvements are presented based on the strategies. While most recent studies have focused on area wide / network signal control improvements this paper shows potential for significant improvement even at the level of an isolated signal[1].

B.   IoT-based Visitor Detection System.

Published year : 2016.

2016 International SoC Design Conference (ISOCC)

Authors Hyoung-Ro Lee et al. proposed an IoT-based visitor detection system. It uses an IR sensor to detect human body and two ultrasonic sensors to locate visitor servo motor under the position. When a visitor is detected it drives camera module to locate the visitor. Recoded video and sensor data are stored in the Database.It can track the visitor moving route and minimize the blind spots of the camera. And sensor data and recoded video are checked internet possible all remote location[2].

C.   An Introduction to RFID Technology.

Published year: 2006.

IEEE Pervasive Computing

Author Roy Want has proposed that the RFID enables identification from a distance, and unlike earlier bar-code technology, it does so without requiring a line of sight. In this paper, the author introduces the principles of RFID, discusses its primary technologies and applications, and reviews the challenges organizations will face in deploying this technology[3].

D.   Ultrasonic and Infrared Sensors Performance in a Wireless Obstacle Detection System.

Published year : 2017

First International Conference on Artificial Intelligence, Modelling & Simulation

Authors Baharuddin Mustapha et al. proposed that an Ultrasonic (US) and infrared (IR) sensors are broadly used in mobile applications for distance measurements. In this system of researchers, an obstacle detection system is built based on these two types of sensors. The system is intended for use by the elderly and people with vision impairment. The prototype developed has been tested to detect obstacles and shows accuracies of 95% to 99% for distance measurements if the sensor circuits are calibrated properly and their output linearized. The system also demonstrates good detection for different obstacle materials (e.g., wood, plastic, mirror, plywood and concretes) and colors. The minimum size of an obstacle that the system can detect is 5 cm x 5 cm[4].

E.   IoT Based Automated Traffic Control System With Real-time Update Capability.

Published year : 2017.

8th International Conference on Computing, Communication and Networking Technologies (ICCCNT)

Authors Mehal Zaman Talukder et al. developed an automated microcontroller based traffic control system using sensors along with live web updates can be a helpful step in optimizing the traffic flow pattern in busy intersections. This intuitive design of the transport infrastructure can help alleviate the traffic congestion problem in crowded cities. The current condition of the intersection is updated on a user accessible website. This integration of traffic systems in an Internet of Things (IoT) fashion enables the addition of smart security and road safety devices[5].

F.   The working principle of an Arduino.

Published year : 2014.

11th International Conference on Electronics,Computer and Computation (ICECCO)

Author Yusuf Abdullahi Badamasi has proposed the analyzing of working principle of an arduino. These days many people try to use the arduino because it makes things easier due to the simplified version of C++ and the already made Arduino microcontroller that we can programme, erase and reprogrammed at any given time .In this paper we will discuss the hardware components used in the arduino board, the software used to programme it (Arduino board) with the guide on how to write and construct your own projects, and a couple of examples of an arduino project, This will give the overall view of an arduino Uno, that after reading this paper you will get the basic concept and use of an arduino Uno[6].

G.   An Ultrasonic Sensor For Distance Measurement In Automotive Applications

Published tear : 2001

IEEE Sensors Journal

Authors A.Carullo et al. proposed the description of an ultrasonic sensor that is able to measure the distance from the ground of selected points of a motor vehicle. The sensor is based on the measurement of the time of flight of an ultrasonic pulse, which is reflected by the ground. A constrained optimization technique is employed to obtain reflected pulses that are easily detectable by

means of a threshold comparator. Such a technique, which takes the frequency response of the ultrasonic transducers into account, allows a sub-wavelength detection to be obtained. Experimental tests, performed with a 40 kHz piezoelectric-transducer based sensor, showed a standard uncertainty of 1mm at rest or at low speeds; the sensor still works at speeds of up to 30 m/s, although at higher uncertainty. The sensor is composed of only low cost components, thus being apt for first car equipment in many cases, and is able to self-adapt to different conditions in order to give the best results[7].

H. Security And Monitoring System By Using Rfid Tags And Multiple Sensors

Published tear : 2017

IEEE International Conference on Electrical, Instrumentation and Communication Engineering (ICEICE)

Authors M Sowmiya et al. proposed that the goal of them from this system is to perceive and detect gas leakage, gas cylinder drop level, food count and library book history of the student by using gas sensor, weight sensor and RFID (Radio Frequency Identification) approach and to provide complete information and usefulness needed. Industries have been a key part in the swelling of the nation's economy. The swelling in industries has also lead to the swelling of tragedies in the past decades, out of which majority caused by omission or human errors. The initiate method is discussed a menace board system to detect perilous gas leaks, Gas cylinder drop level, hostel food count and library book count from the set value using raspberry pi, gas sensor, weight sensor and RFID reader. The alert notification sends to the cell phone, with respect to the situation to minimize the menace[8].

I. Passive Rfid Technology for the Internet of Things. Published tear : 2010

International Conference for Internet Technology and Secured Transactions

Authors Sandra Dominikus et al. proposed that an RFID tags can no longer be treated as pure bar-code substitutes as their functional capabilities increase rapidly. Many of them are able to store and compute data, or hold sensors. The data flow in the EPC global network, which was created for "traditional" low-cost tags, does work one-way: from tags to a couple of servers where data for the tags is stored and can be accessed by other readers or servers. To draw advantage from the increased functionality of the tags it will become important to have a two-way end-to-end communication between servers and tags, e.g. to remotely change data on the tags. In this paper researchers are showing how to modify RFID readers and low-cost tags to make them suitable for a remote two-way communication. They consider the required capabilities of readers and tags and show how communication can be done via mobile IPv6. Security considerations round the description before we can conclude, that also passive low-cost RFID tags are able to become part of the future Internet of Things[9].

III. PROPOSED SYSTEM

We are using IR sensors for detection of High density traffic and then convert it to normal density traffic. IR sensors are mounted on the road facing toward upside to collect reading of vehicles. If IR sensors get the continuous reading of vehicles for 20 seconds on a particular lane then that lane switched to green signal for 10 seconds and remaining lanes switched to red signal. Due to this the high density traffic at that lane reduced to normal density. After the completion of 10 seconds, regular execution of signal is resumed.

For Emergency vehicle detection we are using 2 RFID readers, one is mounted at the traffic signal and another is mounted at some distance from the signal to detect Emergency vehicle's arrival. There is a RFID Tag with unique ID attached to every Emergency vehicle and this ID is stored in database.
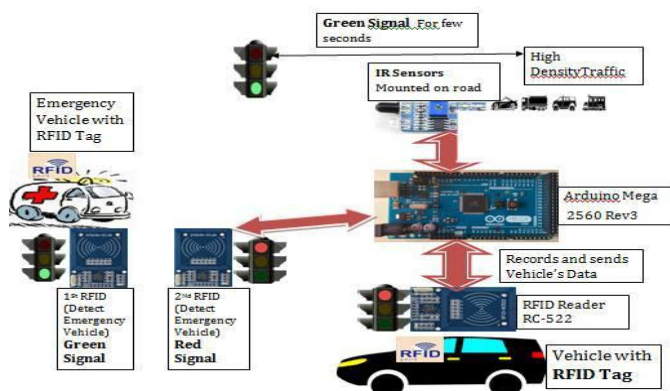
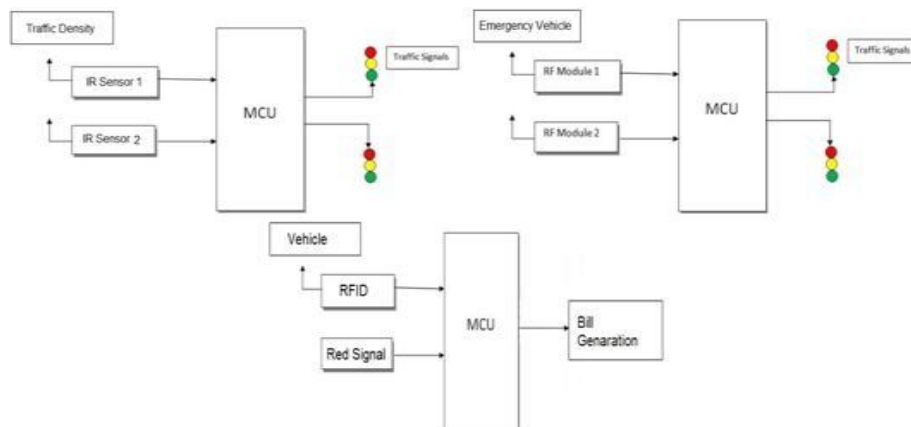

Figure 1. System Architecture.

Figure 2. Block Diagram.

When any Emergency vehicle is arrived at particular lane then RFID reader will detect the RFID tag and it will matched the data stored in that RFID tag. If data is matched with stored data then the signal for that lane is switched to green and other lanes get red signal. Because of this the traffic at the signal is removed before the arrival of Emergency vehicle. After that, the Emergency vehicle crosses the signal rapidly and safely. Emergency vehicle is again detected by RFID reader which is mounted at signal and after that detection regular execution of traffic signal is resumed.

One RFID Reader is mounted at the signal to detect any vehicle which is crossing the red signal. The RFID tag of every vehicle contains information of vehicle including vehicle number. When RFID reader detect the RFID tag of particular vehicle crossing red signal, it sends the information of vehicle to the traffic control system and then respective action will be taken by Department of R.T.O. This system will work on microcontroller board like arduino, raspberry pi, etc. The programming for overall system is developed with the help of Arduino software which is based on C/C++ language.

IV. MATHEMATICAL MODEL

Input : Collecting input from sensors and RFID reader.

Output : Execution of appropriate signal.

Functins : Verification of collected data with the help of database.

S = (I,O,F)

Where S : System

I = {D} are set of Input

Where, D : Data from sensors and RFID

F = {MD, UD} are set of functions

MD : Matching Data

UD : Unmatched Data

O = {GS, NC} are set of output

GS : Green signal

NC : No Change

V. VENN DIAGRAM

VI. CONCLUSIONS

Thus we conclude that, this system will give full accuracy and system is fully automatic also. So to overcome the manual work of traffic police (sometimes Traffic Police handles traffic by switching off the signal) and make smart traffic signal system. Emergency vehicle like ambulance will get the route and we can reduce the time wasted in traffic also. Because of this system no one can dare to cross the red signal.

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