Traffic control system for vehicles on Indian roads using raspberry Pi

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Abstract: In India at the roads the vehicles were growing because of the increase of population and controlling of traffic is one of the tough duties for the individuals who control the traffic. The everyday traffic congestion at crucial junctions becomes more issues for the emergency automobiles and ought to wait for until inexperienced signal. This results the growth in pollution ranges and wastage of time, pollutants stages may boom to a huge scale. Previously the traffic control strategies used like magnetic loop detectors, induction loop detectors are buried on the street aspect provide the constrained visitors information and necessitate separate tracking structures for site traffic counting and for traffic surveillance. Right here the undertaking proposes to enforce a synthetic density traffic manipulate gadget using photo processing and Raspberry pi.

Keywords: Microcontroller, Traffic control, Raspberry-pi, Photo Processing, RFID

1. Introduction

The main hassle for the general public on the road is heavy traffic, because of massive site visitors on the roads it's miles tough to control by using the visitor’s people. This hassle requires separate systems like magnetic detectors, radio frequency identification for vehicles and surveillance cameras at the roads. The magnetic detectors provide a charge-powerful end result, although problem closer to failure, with the assist of Infrared sensors and video shooting cameras and can't be used for effective surveillance. In assessment, video-based structures provide many possibilities when in comparison to conventional strategies [1]. They provide extra information this gadget integrate the site visitors controlling technologies and surveillance together, without any set up issues[19]. On this paper we attempted to offer the traffic controlling technologies for the large visitors at the roads and on the
junctions the use of Raspberry Pi [2]. Also high-precedence is given to the emergency automobiles. The detection of emergency motors is finished primarily based on RFID-Radio-Frequency identification, based totally on RFID Tags the emergency automobiles are detected and the automobiles are given excessive precedence at the junctions. For the detection on emergency cars an extra hardware is needed at the junctions and additionally an RFID tag should be located at the emergency vehicles [3]. To implement this system dynamic color changer algorithm is used, vehicles will follow the traffic rules based on the dynamic color changer.

2. Literature review

IoT gadgets are associated with the Internet and send data about themselves or about their environmental factors (for example data detected by the associated sensors) over an organization (to different gadgets or workers/stockpiling) or permit incitation upon the physical elements/condition around them distantly [3]. Raspberry Pi is an ease little PC with the physical size of a Visa; Raspberry Pi runs different flavors of Linux and can perform practically all assignments that a typical personal computer can do. Raspberry Pi likewise permits interfacing sensors and actuators through the broadly useful I/O pins. Since Raspberry Pi runs Linux working framework, it underpins Python "out of the case". Raspberry Pi comprises of camera module is utilized for taking pictures of photos. It does now not incorporate a fabricated in tough plate or stable-country power, Raspberry Pi utilizes SD Card Slot for booting and storage. The programming dialects like python, C and Perl utilizes as programming languages for Raspberry Pi [4]. Raspberry Pi Model-B with two USB ports and a ten/a hundred Ethernet controller. Though the Raspberry Pi Model-A doesn't have a 8P8C (RJ45) Ethernet port, it can attach with an organization with Wi-Fi adapter or outside Ethernet. Raspberry Pi Model-B has an implicit USB Ethernet connector. As is ordinary of current PC frameworks, common USB keyboards and mice are appropriate with the Raspberry Pi. The Operating System ought to be stacked on the Raspberry Pi by utilizing SD Card. After biking through a few proposals on account that just sooner than the equipment become first made accessible, the Raspberry Pi Foundation made the New out Of Box System (NOOBS) installer, and as of July2013 shows utilizing it to place in the Debi a determined Rasping. [17]The Foundation expects to create an application shop web webpage for an individual to change programs. Rasping is a Debi a based completely loosened working device optimized for the Raspberry Pi equipment. It is the cutting-edge suggested framework, and become officially launched in July 2012, in spite of the fact that it keeps on being in development. It is free programming system and maintained independently of the Raspberry Pi Foundation. It presents some accessible programming bundles, precompiled software program packs [6]. A base size of two GBSD card is required for Rasping, however a 4 GB SD card or above is generally suggested. Using dynamic color changer algorithm the led’s dynamically changes its color when an emergency vehicle comes on the road[18].
Figure 1. Smart traffic control system using dynamic color changer algorithm

3. Necessities to develop the system

3.1 Software
- MATLAB
- Python Programming

3.2 Hardware
- Raspberry pi-model B+
- Personal Computer with I7 Processor
- Webcam
- RFID

4. (RFID) Radio Frequency Identification:
Radio Frequency Identification (RFID) use radio frequency to capture and read the data or information stored on a tag attaches to object [2]. The RFID tag can able read the data up to some feet’s. It Uses Radio Waves, Next Field Communication (NFC) Protocol, and IC (Integrated Circuit) Cards. The Structure of RFID is divided into two parts as shown in the below figure.
4.1 RFID Reader:
The Radio Frequency Signal Generator generates radio waves which are transmitted through the antenna. Signal detector receives the signals coming from the object, to process these signals microcontroller is used [16] [3].

4.2 RFID Tags:
Transponder receives signals from reader and sends back feedback to the reader. The Passive Tags use the rectifier circuit to store the energy coming from the radio waves. This energy is used as the supply for the controller and the memory element [3]. Passive Tags rely on radio waves for source of energy since do not have their own power supply. Semi Passive Tag has their own power supply, but for transmitting back they rely on signals coming from RFID Reader. Active Tag uses their own power supply for both transmitting and receiving [20-22].
5. Implementation:
Here we considered four roads with a center, for each road time bound is fixed for 60 seconds delay, Road3 is green, red is on for other three roads i.e Road1, Road2, Road4, if Road2 is green, red is on for other three roads i.e Road1, Road3, Road4, if Road4 is green, red is on for other three roads i.e Road1, Road2, Road3 and if Road1 is green, red is on for other three roads i.e Road2, Road3, Road4 [5], [6].

The below diagram shows the blinking of LED’s on the roads, based on the LED’s Color the traffic is controlled for the vehicles on four roads. Here to implement the traffic control system on the roads we used the dynamic color changer algorithm.
6. The design system for emergency vehicles
This system describes when an Emergency vehicle comes on Road1, Priority given for the Road1, when an Emergency vehicle comes on Road2, Priority given for the Road2, when an Emergency vehicle comes on Road3, Priority given for the Road3 and when an Emergency vehicle comes on Road4, Priority given for the Road4.

![Diagram](image)

**Figure 6.** LED’s color for traffic control system on four roads.

### Table 1.

| Roads | LED on Road |
|-------|-------------|
| Road 1 | Orange      |
| Road 2 | Red         |
| Road 3 | Red         |
| Road 4 | Red         |

6.1 Priority for Road1:

**Table 1.** When an emergency vehicle comes on Road1, priority given for the Road1
6.2 Priority for Road2:

Table 2. When an emergency vehicle comes on Road2, priority given for the Road2

| Roads | LED on Road |
|-------|-------------|
| Road 1 | Red         |
| Road 2 | Orange      |
| Road 3 | Red         |
| Road 4 | Red         |

6.3 Priority for Road3:

Table 3. When an emergency vehicle comes on Road3, priority given for the Road3

| Roads | LED on Road |
|-------|-------------|
| Road 1 | Red         |
| Road 2 | Red         |
| Road 3 | Orange      |
| Road 4 | Red         |

6.4 Priority for Road4:

Table 4. When an emergency vehicle comes on Road4, priority given for the Road4

| Roads | LED on Road |
|-------|-------------|
| Road 1 | Red         |
| Road 2 | Red         |
| Road 3 | Red         |
| Road 4 | Orange      |

7. Results:
From the results, we noticed that the LED’s are blinking based on the time stamps and if an object (an emergency vehicle with RFID) is detected, orange color LED blinking.
8. Conclusion
In this paper we implemented a system which controls the traffic on the Indian roads when an emergency vehicle comes on the corresponding road priority is given for that road, here emergency vehicles are specified the utmost priority, in future we can use only single traffic light for changing colors.

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