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Vision and Qr Pattern Based Autonomous Vehicle Parking and Regulation System

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Abstract*:In recent years vision based applications has been widely adopted in many areas. In areas such as those at mega shopping malls or stadiums, drivers always have difficulty to find vacant car park lots especially during peak periods or when the parking lots are almost full. A solution to reduce the drivers' searching time for vacant car-park lots will greatly save time, reduce cost and improve the traffic flow in the car park areas. In this paper, a research project which was developed to acquire car-park occupancy information using integrated approach of image processing algorithms is presented. Motivation for developing this system came from the fact that minimum cost is involved along with some sensor-based techniques to send GSM based auto notifications. Security surveillance cameras which are readily available in most car parks can be used to acquire the QR patterns to ensure the data forwarding regime. This solution is much cost effective than installing sensor alone models on each parking lot. This project is called as QR driven GSM enabled vehicle Information System, and image processing driven Car-Park Occupancy Information System it was tested using simulation model and also in real-case scenarios.*

I. Introduction

1.1 Objective

The main objective of the design of Smart Transportation System is to detect the unusual traffic occurrence on the highway. Which also intimates the status of traffic to travellers. This minimize the severity of congestion and also avoids road accidents. The Smart Parking System design is cost efficient compatible vehicle parking control system. By enabling obstacle sensor to send interrupt signals about vehicle parking followed by SMS will be forwarded through GSM about parking slot allotted & time session.

1.2 Motivation

Traffic congestion on Delhi roads costs around $10 billion or about Rs 60,000 crore annually. This is on account of fuel wasted due to the idling of vehicles, productivity loss, air pollution and road crashes, according to a study done by IIT, Madras. Another study by a global automobile major in 2015 had shown that congestion was the main reason for anxiety for at least six out of every 10 Indian drivers on the roads.

II. Existing System

The traditional traffic monitoring system based on image-processing technology has many limitations. In existing system, Vehicular Ad Hoc Networks (VANETs) are formed by applying the principles of mobile ad hoc networks (MANETs) which are the spontaneous creation of a wireless network for data exchange. They are a key component of intelligent transportation systems. VANETs support a wide range of applications from one hop information dissemination to multihop dissemination. Most of the concerns of interest in mobile ad hoc networks (MANETs) are of interest in Vehicular ad hoc networks, but their details may differ. Rather than moving at random, vehicles tend to move in some organized fashion. However, most of the related works assume that the incorporated techniques have sufficiently small delivery delay for realtime collection of the information. As vehicular ad hoc networks rely on short-range communications, the transmission delay cannot be neglected in some scenarios.

The Smart Parking System(SPS) is a cost efficient compatible vehicle parking control system. A few existing parking system which uses sensors to collect the information but using sensors like video sensors in a parking system are expensive. Thus the aim is to develop a system with less cost with more performance.

III. Proposed System

Smart Transportation System contains IR setup. When the vehicle passes through the IR setup which consists of IR LED and PHOTODIODE, the analog voltage difference from the photodiode is amplified using voltage amplifier. The analog voltage is then converted to digital using ADC (Analog to Digital Converter) and the digital value is fed into the Arduino controller which processes the digital value and sends the corresponding status regarding traffic to the Raspberry pi kit. Raspberry pi is commonly known as SOC (System On single Chip) which acts as a server to update the information regarding traffic on the HTML webpage.

Smart Parking System(SPS) includes a controller unit which controls the sensor and other units connected with it. User provides login, password along with mobile number for registering a parking slot.Obstacle sensor is used to detect the presence of vechicle and the notifiaction is sent to the user mobile through SMS using GSM.This sensor switches off only when the user provides the correct information as provided during the registration of the slot.In case the system finds the mismatch on the user entered input it immediately sends theft alert message to the registered mobile number of the user and buzzer switches ON.The buzzer switches OFF only the authenticated input is provided by the user.

IV. Block Diagram

(A) Smart Transportation System
(B) Smart Parking System

Working

This Smart Transportation System setup consists of IR LED's that can be placed on the surface of the road and photodiodes were placed along with the display on the top. When any vehicle passes through this setup, an analog voltage difference is induced as an output from the photodiode. This analog voltage is then amplified using voltage amplifier and converted into digital voltage by using ADC which was present on the Arduino controller. Then the corresponding digital value is processed using an embedded program which was programmed within the controller to identify the status of traffic. Based on the level of the value that we got, the traffic status is determined as Low (no traffic), Medium or High. This status is displayed on the display placed at all the points to avoid further congestion. The travellers may take different path to reach their desired destination once if the congestion is detected.

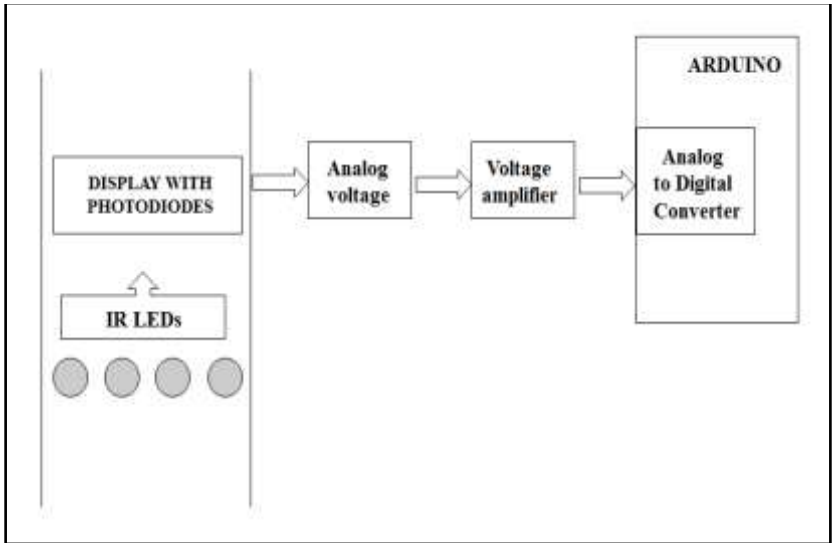


Fig 4.2 Setup used on each points

Travellers may also check the status of the traffic on the specific highway before starting the journey through the webpage. This webpage was designed inorder to provide the informations regarding current traffic status on the specific highway. Raspberry pi is used as a web server, which was connected to the Arduino controller inorder to display or host the corresponding traffic status on the webpage.

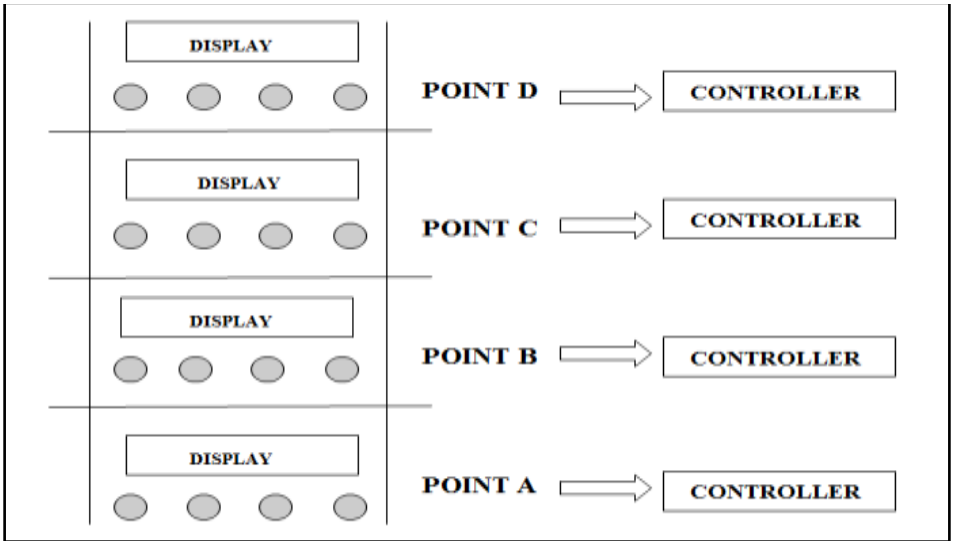
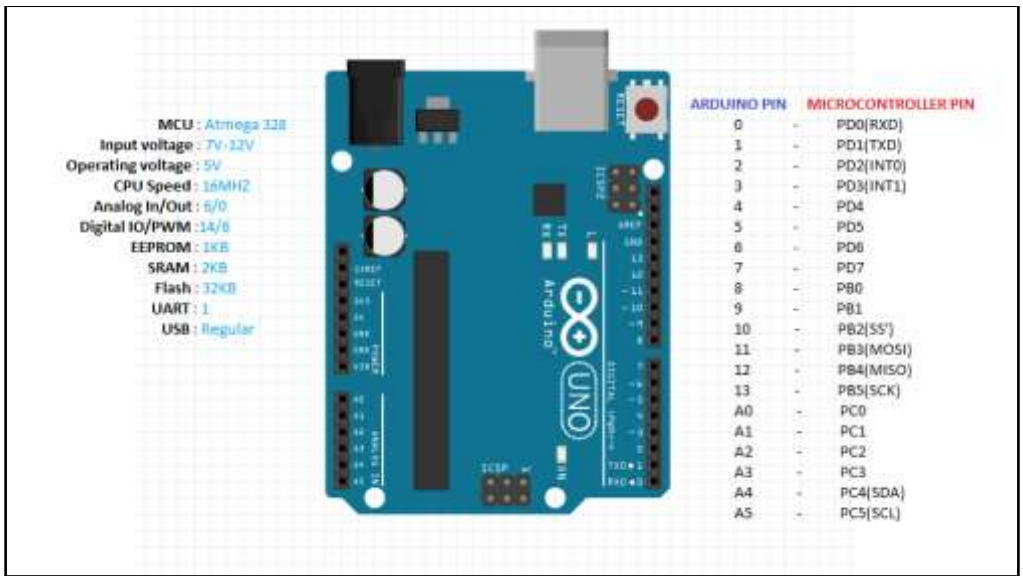


Fig 4.3 Displaying status on each point

Smart Parking System(SPS) includes a controller unit which controls the sensor and other units connected with it. User provides login, password along with mobile number for registering a parking slot.Obstacle sensor is used to detect the presence of vechicle and the notifiaction is sent to the user mobile through SMS using GSM.This sensor switches off only when the user provides the correct information as provided during the registration of the slot.

In case the system finds the mismatch on the user entered input it immediately sends theft alert message to the registered mobile number of the user and buzzer switches ON.The buzzer switches OFF only the authenticated input is provided by the user.

The algorithm given below shows the working of Smart Parking System.



V. Opamp Used

LM741 IC is the most commonly known opamp but it has a current output rating of nearly 40mA which in most cases will not be registered with a MCU as MCUs have a current input limitation of 20-40mA.
Hence we use LM358/Lm324 ICs.

- LM358 is a dual opamp IC (2 opamps in 1 IC)
- LM 324 is a quad opamp IC (4 opamps in 1 IC)

A 2 IR Sensor based circuit is widely used for object detection. We can opt for the following changes:

- 1 Preset for all IR Rx (Most unstable)
- 1 Preset for individual IR Rx (Stable but difficult to calibrate)
- 1 Preset for individual IR Rx and 1 Preset for individual IR Tx in series with 100 ohm (My preference)
- A 4-sensor based IR Sensor circuit is shown below using single preset for all IR Rx.

Advantages:
- Low power requirements: therefore ideal for laptops, telephones, PDAs
- Low coding/decoding, simple circuitry.
- Beam directionality ensures data leakage during transmission.
- Few international regulatory constraints.
- Relatively high noise immunity.

Disadvantages:
- Line of sight requirement.
- Blocked by common objects
- Short range
- Direct sunlight, rain, fog, dust, pollution can affect transmission
- Lower data rate

Vehicle detectors are used to detect the movement of object around the allowed premises. Hence, the passive Infrared sensors could be used as a motion detector and the signal could be triggered if there is some movement around the restricted premises.

The passive Infrared sensor manufactured by Panasonic is used as a motion detector in the system. The 5V power supply is given to the sensor through the board and the output of the sensor is connected to the digital input of the arduino board.

The digital output timing chart of the infrared sensor is given as follows,

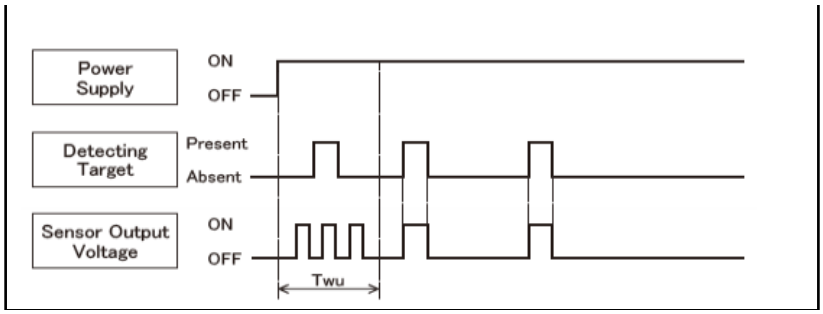
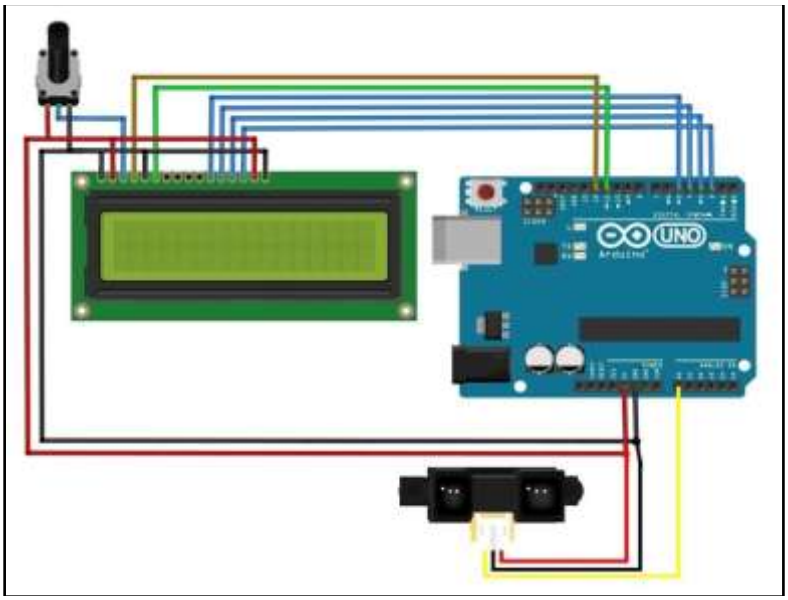


Fig 5.5 Microcontroller wave interface

5.1.4 LCD

An LCD properly prepared before the character need, has to be displayed. For this a number of commands have to be provided to the LCD before inputting the required data.LCD doesn't know about the content (data or commands) supplied to its data bus. It is the user who has to specify whether the content in data pins are data or commands. For this, if a command is inputted then a particular combination of 0s and 1s has to be applied to the Control lines so as to specify it is a Command, on the other hand if a data is inputted at the data lines then an another combination of 0s and 1s has to be applied to the control lines to specify it is Data.

Each pixel of an LCD typically consists of a layer of molecules aligned between two transparent electrodes, and two polarizing filters (parallel and perpendicular), the axes of transmission of which are (in most of the cases) perpendicular to each other. Without the liquid crystal between the polarizing filters, light passing through the first filter would be blocked by the second (crossed) polarizer. Before an electric field is applied, the orientation of the liquid-crystal molecules is determined by the alignment at the surfaces of electrodes. In a twisted nematic (TN) device, the surface alignment directions at the two electrodes are perpendicular to each other, and so the molecules arrange themselves in a helical structure, or twist. This induces the rotation of the polarization of the incident light, and the device appears gray.



VI. Conclusion :

In this paper, we have provided solution to avoid parking slot collection by autonomous parking system this is based on the camera vision this method is low cost with high performance ridge detector and kalman filter it provide accuracy and consistence the overall control scheme will make that there is no collision in parking slots

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