A Cloud Based Smart Parking System Using Image Processing And IoT Technology

CH Satya Sai

B.Tech - CSE

15113065

HITS

N.N.S.S. Sujith

B.Tech - CSE

15113195

HITS

Faheem Ahmad

B.Tech - CSE

15113120

HITS

Dr. Rajeshwari Mukesh Ph.D

HOD – CSE

HITS

ABSTRACT - This paper focuses on the concept of car parking detection mechanism using the IR sensor, in combination with the use of Internet of Things i.e. sending the status of the parking slot to the Internet. Through that the user at anywhere within the world will see that parking slot is empty and wherever to park.

Keywords - IoT, IR Sensor, RFID, OCR, Cloud based storage, Image Processing

I. INTRODUCTION

In this age of technology, we are working in a way to reduce our effort in every possible way and the introduction of the Arduino and IoT platforms have further broadened the scope of this possibility in our everyday lives. One of the major problems that we are facing in today's over-populated society is finding available parking spots in various public places like hospitals, office shopping malls, cinema halls, courts, schools and colleges.

The statistics show that approximately 20% of all the congestion in the city is caused by frustrated drivers driving around the block searching for parking spaces.

This paper hence discusses a working model which uses IoT and image processing to solve the above mentioned issues.

II. LITERATURE SURVEY

A. BLUETOOTH

This system uses a Bluetooth communication technique which is used for verifying the driver's identity and also to book a slot by identifying the vacant spaces. Zigbee sensors are used to detect the vehicle. Internet usage is not necessary but Bluetooth range is limited, installation and maintenance is difficult, connection gets disconnected if the car is parked wrongly

B. RADIO FREQUENCY IDENTIFICATION

This system uses RFID to match the vehicle's unique RFID tag with the value in the database when it is read by the RFID reader in the parking lot entrance. This is a fast method of identification but cost is more. If the RFID tags are damaged or more than one tags are read at a time, the system fails to work accurately.

III. EXISTING SYSTEM

Various parking sensors are already installed in some of the public spaces in developed countries which use infrared sensors (hereinafter called as IR Sensors) in combination with ultrasonic sensors to detect the presence of a car in a particular spot.
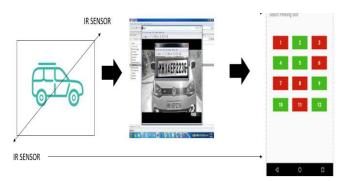
The motivation that drives the result is the pursuit of an alternative solution for the problem that is instead of using IR Sensors, it would be more efficient to switch to Ultrasonic Sensor which is not affected by variations in the light intensity in a particular environment. Also, instead of using the Ethernet shield or connecting it through LAN cable, a Wi-Fi module is used. As a result, the cost of cable reduces and thus increases efficiency.

IV. PROPOSED SYSTEM

The following segment describes the way in which the mentioned problem is being solved using the proposed system. This proposed system has the following steps;

- IR sensor technique is used to detect the vehicle is car or not.

- Pi cam will take a picture of vehicle and number plate will be updated on the cloud.

- A separate interface is used for user and admin to check the vacancy of slots.

- The login id for users will be their number plate which will be allocated after the process of OCR

- User need to login into application to check the slot availability to park the car.

- After car parked in the allocated slot the status of the slot in the application is changed and color changes to red using IR sensor.

V. BLOCK DIAGRAM

VI. ALGORITHM

A. IMAGE CAPTURE

This is the very basic step which initiates the process of the proposed system. Herein, the camera starts the process by capturing the images and hence passes it on for further processing in the defined system.

Fig I. IMAGE CAPTURE

B. LICENSE PLATE SIZING

The camera is placed in such a way that it is perpendicular the floor. The captured image has the resolution of 640*480. For clear resolution, the configuration of camera is important when it comes to image resolution and pixel depth.

The system will work properly under different or non uniform conditions when a color space transformation is first applied to each captured image to convert RGB value to gray value i.e. 0 and 1. The differentiation between marker and supporting plate can easily identified through simple comparison with upper and lower threshold value of RGB. Comparison takes place in the binary format.

The elimination of unwanted signal and preservation of only pixels corresponding to the actual markers is done by applying erosion to the binary image. Next the co-ordinates of marker are found out by the pixels of the shape with threshold columns values. Vertices are the intersection of marker with rectangle for which nonzero pixels exist. Only few amount of data needs to be transmitted for the pose estimation, resulting in low network traffic.

Fig II. LINCENSE PLATE SIZING

C. NORMALIZATION

The process of changing the intensity value of the pixel to the range of [0, 1] is called normalization in image processing. The conversion of various dimension images into fixed dimensions is also called normalization.

Fig III. NORMALIZATION

D. CHARACTER SEGEMENTATION AND RECOGNISATION

All the characters on the number plate will be mapped out using character segmentation. Using CCA (connected component analysis) each character is converted into 20px by 20px.

Using supervised learning classifier model is trained using known data sets for testing and to see how accurate it is, then use the model for prediction

Fig 1V CHARACTER SEGMENTATION

Fig V CHARACTER RECOGNISATION

VII. FUTURE ENHANCEMENTS

The future work focuses on the commercialization of a business prototype and to make the website more reliable using much better version of the ESP module and RAPBERRY PI thus having a great business value as;

- A high-end raspberry pi is used for processing of data in less time.

- A mobile application which will run on both android, windows and IOS to be created.

- The camera can also be connected, and number plate detection mechanism can also be implemented to make the area safer in terms of security.

- High-end camera for capturing of number plate for more accuracy.

VIII.CONCLUSION

The status of the slot is shown with the help of the indicators and through IoT. The table I below shows the observation of the particular slot during the time of the day.

In the table, various car models are shown, and the output is checked, thus confirming that the research was done up to the mark and showing the output correctly both in hardware and in thingspeak, irrespective of the car model.

TIME DURATION	CAR MODEL	INDICATOR STATUS	STATUS
1000-1300 HRS	HYUNDAI	RED	PARKED
1330-1615 HRS	SWIFT DEZIRE	RED	PARKED
1630-1730 HRS	-	GREEN	VACANT

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