

Automatic car parking system project Using Arduino

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Abstract- In the ongoing examination of metropolitan areas, the increment in population produces high vehicle density on roads. Consequently, this prompts irritating issue for the drivers to leave their vehicles as it is hard to discover a leaving space. This paper introduces web based automatic smart parking system for vehicles. In this paper we have proposed a system which can easily manage parking system through networks of different sensors. This system can easily find a parking space and check whether the user parked the vehicle or not. In addition, this system can create unlimited locations and add slots to these locations. This is multi-user parking system where a single application can work for multiple locations. This parking system will improve the probability of successful parking and minimizes the waiting time of user. Moreover, this parking management system will encourage users to track parking slots and make the parking process a hassle-free experience.

Contribution/Originality: This study contributes to the existing IoT literature that uses devices to provide a better parking system. This study investigated IoT with web-based applications and finds the slots for the user with direction provided on screen using map view. This Study shows the documentation of the real time parking system

1. INTRODUCTION

In many situations, driver faces difficulty to find a vehicle space or check whether vehicle parked at its assigned slot location or not. Most of the time we have to hire more people to check all those problems. To vanquish all these issues, we have to convert the system to Smart Parking Base System where parking is managed automatically by devices . At this blooming time, we have a lot of Parking Systems present; they all have some advantages like cost effectiveness and some disadvantages like wastage of time. After probe all those situations, we developed a system which is automatic and cost effective. This smart system can be used for real based parking system. We have introduced smart parking system using sensors and communicating devices with Web API. The work is based on web application, where several sensors are connected to Web Application through API. This Web Application is developed in Laravel language. This technology will help to manage parking system easily. New technologies are efficient than previous parking method. Because it contains all the relevant data of vehicles in our database.

The following type of data about vehicles enlisted below: -

- Automatic scan and generation of token for parking, having the details of parking slot.
- Check in time of vehicle.
- Current location of vehicle to the admin.
- Checkout time of vehicle.
- All the cards used for parking purpose can be recharged on the spot or at the administration block.

2. RESERACH OBJECTIVE

At this blooming time, we have a lot of Parking Systems present, they all have some advantages like cost effectiveness and some disadvantages like wastage of time. After probe all those situations, we developed a system which is automatic and cost effective. This smart system can be used for real based parking system. Proposed system covers these aspects:

1. This system easily manages parking system through networks of different sensors.
2. This system can easily find a parking space and check whether the user parked the vehicle or not.
3. This system can create unlimited locations and add slots to these locations.
4. This parking system will improve the probability of successful parking and minimizes the waiting time of user.
5. This parking management system will encourage users to track parking slots and make the parking process a hassle-free experience.

3. LITERATURE REVIEW

This section is consisted of last decade methodologies of car parking system using explaining different sensors and algorithms working. Last decade methodologies include paper from 2011 to 2020 with reference of the discussion paper. This may help the researcher to understand the previous working of researchers in this topic and also provide baseline to our project.

3.1. Real Time Car Parking System Using Image Processing

In this paper, the designed system captures the image of the car in a real time mode. Car is allowed for the parking on the basis of free slots, firstly the left side filled for the parking and after that car are directed towards the right side of the parking. If slots filled completely than no cars are allowed for parking. They use web camera, PC and LEDs as hardware modules and MATLAB as software model for image processing.

Methodology consists of following steps:

- Image acquisition.
- RGB to gray conversion.
- Image enhancement.
- Image matching using edge detection.

In the working of system, car image is captured by eb camera and save for the reference image for the parking and RGB to gray conversion is done to enhance the image, gamma correction is used for this conversion. The interval time for the capturing of image is 2 second. After the successful conversion if reference image is matched with real image more than 90%, car

is allowed for parking and this parking system accommodate 20 cars at a time.

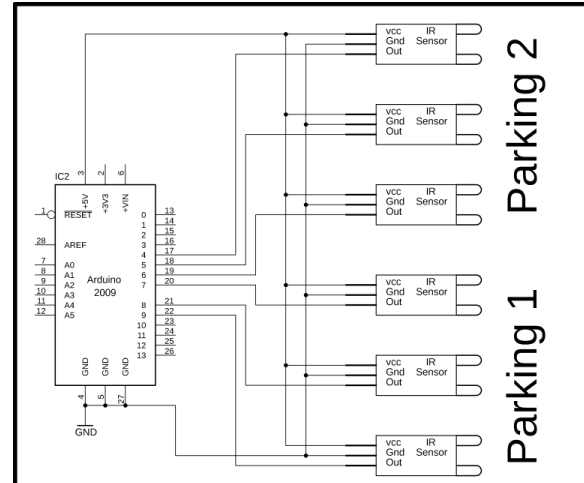
3.2. Intelligent Parking Space Detection System Based on Image Processing

In this paper, the designed system is based on image capturing of rounded brown images that is drawn first time manually for the reference of image detection. This technique gives more efficient results of image comparison as compared to use of moving object. This system is using image processing method instead of sensors that may reduce some complexities like wiring and sensor costs.

This project is consisted of five modules:

- System Initialization.
- Image Acquisition.
- Image Segmentation.
- Image Detection.
- Image Enhancement. In the first step of this system, system automatically identifies the parking locations in the parking lot image.

The second step system stores the captured image using camera to process this image in the MATLAB. In the third step image is separated from the pixels to improve the contrast by suing threshold technique. In the fourth step image is enhanced using morphological functions to extract extra pixels from image to detect the boundaries of object. In the last step system detects the rounded brown image of each parking lot.



3.3. Real-Time Monitoring System for Parking Space

3.3.1. Management Services

In this paper, the designed system has a GUI that helps the administrator to monitor the status of car parking system in a real time, from the screen interface. This system is based on queue theory and GUI of this system provides other event of simulation like car arrival, departure and other services. The M/M/2 queue model is used to represent the service time and distribution arrival rate for the cars on the entrance gate. The G/G/2/64 model is used on exit gate for the arrival and departure pattern of users, these patterns occur randomly and independently on gate. Through a mathematical model using in this system the probability of having vehicles is calculated that may be zero or for any specific number. To analysis the queue system performance the formulate values can be determined using parameters include expected (average queue length, average number in the system, average total time and average waiting time).

This system is consisted of two subsystems:

- Entrance Barrier Gate
- Exit Gate The entrance system work like outer network for servicing time of cars and ticket machines. There are 2 barrier gates acts as servers G1 and G2. The queue of cars serves FIFO technique on the gates. The exit gate system uses G/G/2/64, consists of 2 servers on each exit gate E1, E2. The number 64 depicts that the parking lot have the capacity of 64 cars for parking in the zone. Queue system ensures that parking system can never be exceed from parking lot range, it first fills first level and then directs the car to the second level. The proposed system of this paper use Dijkstra Algorithm for the implementation of the model. Through this algorithm all possibilities are calculated for parking.

3.4. Integration of RFID and WSN Technologies in a

3.4.1. Smart Parking System

In this paper, the designed system is based on the combination of different IoT technologies including RFID (Radio Frequency Identification), WSN (Wireless Sensor Network), UHF (Ultra High Frequency) and a mobile. The proposed system is consisted of heterogenous network of hybrid RFID, IEEE802.15.4-based WSN and UHF devices that can easily be implemented on any outdoor parking system. System uses RESTful java software application that monitors parking lot with central implemented database management system. The proposed uses mobile application to direct the drivers to the nearest vacant parking location. And also notify the occupancy of parking. Moreover, system uses NFC based e-wallet to provide the

facility to users for paying parking charges. GCM (Google Cloud Messaging) is installed on central servers to manage the alert events like expiration of purchased time and improper use of parking). This information is displayed to cop by mobile applications to control this ad hoc scenario.

This system is consisted of:

- WSNs.
- SG (Smart Gateway).
- CS (Central Server).
- Parking App for drivers.
- Policemen App for traffic cops.

The main components of proposed Zigbee network are R (Router) and C (Coordinator) nodes. R nodes have the information for routing capabilities and C nodes collect information and send to central server. WSN with different R and RR (Router Reader) used in this system. R nodes are placed on parking lot with light sensors to monitor the state, whereas RR nodes are placed on reserved parking poles. The retrieved information from nodes send to C nodes in a multi-ho manner, which is then transmit to SG. All the information is analyzed and transmit to CS along with parking position. The NFC based payment is provide to user for parking the vehicle, provided by SG. The main work of RR nodes is used to check the authorized car parking labeled by UHF-RFID tags. The database handling is done by CS that is used to manage all payment of users and parking spaces. Expiration and reserved details of parking is displayed on drivers and police Aps with the help of Google Cloud Message services.



3.5. Park Here! A Smart Parking System based on

3.5.1. Smartphones' Embedded Sensors and Short Range Communication Technologies

In this paper, the designed approach uses smart phone to detect automatic parking without using on spot sensors. Sensors embedded in smart phones like gyroscope, accelerometer and Bluetooth connectivity is used in the proposed with algorithm for detection. Combination of internet connections, Wi-Fi links and D2D (Device-to Device) connections allows the strategy to regulate the information about parking. Main components of the system are:

- Parking event detection
 - Parking data repository
 - Parking data dissemination
 - Parking data fusion
- Parking event detection is the triggering event of the user side that triggers parking actions of current user.

This action can be done in the background without involving user interaction. Parking data repository checks the statistics and the recent actions triggered by the current vehicle or the vehicle in the range. Repository is updated for the CD (City Database) vehicle

to perform vehicle periodic access. Repository is updated through data received by mobile over Wi-Fi connections. Parking data dissemination updates the repository by vehicle information and notify the users using internet connection, this feature is a bottleneck of system because the load on the internet led down the system. Local dissemination is performed by D2D of mobile using Park Her! Application to detect the parking for a vehicle. Parking data fusion perform merging to the data stored in local repository. In the rest of the paper algorithms and the results are discussed on the basis of successful experimentation.

A New Smart Car-Parking System Based on Dynamic Resource Allocation and Pricing

In this paper, the proposed is based on MILP model that provide the parking dynamically and statically for the users, and providing variety of reservation options. The proposed system of this paper combines different reservation techniques for parking includes Share-time, Real-time and Dynamic. This system also proposes pricing policies for dynamic and static reservations and provide maximize profit for parking management.

The proposed system is consisted of two types of reservations:

- RTR (Real Time Reservation)
- STR (Share Time Reservation)

With this combination driver can reserve parking in advance or on a same time. RTR uses dynamic resource allocation and provide drivers the best parking until they reached at parking spot. While, STR uses static allocations of time frames and allocate the parking to the drivers. Dynamic price engine is used to update the prices for parking on the

basis of resource allocation. iParker framework includes:

1. Authority
2. Parking Manager
3. Pricing Engine
4. SAC (Smart Allocation Center)
 - i. Static Allocation
 - ii. Dynamic Allocation
5. Data Centre
6. Sensors
7. Virtual Message Signs
8. Central Request Center
9. Parkers

3.6. Advanced CAR Parking System using Arduino

In this paper, the proposed architecture design is based on Arduino control. The proposed system is allowed to park a car only to authorized person using a card containing information about the vehicle number and other details. If the user is authorized, he can park his car only if the parking slot is free, if parking is busy, he is unable to park his car even he is authorized. If user parked his car in parking mobile notification is generated. The parking system is not allowed to park a car by unauthorized user. This parking system is a multifloored parking system and display the free parking slot on each floor. The proposed system uses IR sensors on parking slot to sense any obstacle and vehicles. Sensor's information is displayed on the Entry and Exit gate, if use's RFID is matched with the punched card, it allows user for entry and exit. Database is maintaining to

check the user's entry and exit. There are two gates used in the parking:

- Entry
- Exit

On the entry gate, user punches his RFID card on RFID Reader, Reader will read the tag information and send it to the Arduino for authorization verification. After receiving the valid authorization, signals will send to electric motor for opening the gate. There is a counter variable which is incremented and decremented according to car entry and exit on parking. On the exit gate, user again punches his RFID card on RFID Reader, IR sense the vehicle and decrement the value by 1 if he is authorized user and open the gate by sending signal to electric motor. All information of increment and decrement is display on LED screens in the parking.

I-SPARK: IoT based Smart Parking System

In this paper, the proposed system is consisted of great combination of IoT technology and webpage or mobile device to display the parking slots. The proposed system uses RFID for automatic billing and security purposes as well.

Features of system involves:

- IR Sensor
- LM35 Sensor (Temperature)
- LDR Sensor (Light)
- Arduino Mega+ Ethernet Shield
- Cloud
- HTML Page/ Mobile

Commands These features are the combination of both software and hardware.

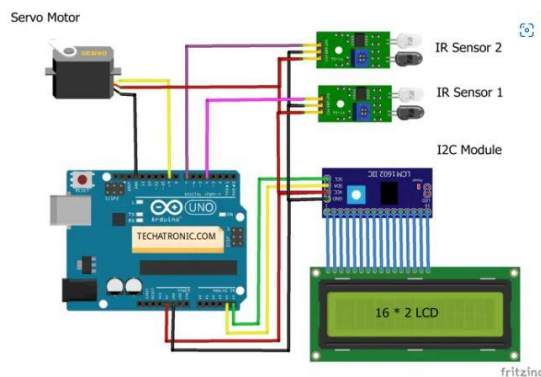
Further, this system is divided into two parts:

- Monitor the empty slots
- Monitor the light and temperature for concerned person.

Both cases include cloud due to its availability in the protocol of MQTT that accomplish the core element tasks of real time system for servers, client, and topics.

Monitoring of temperature and light requires LM35 and LDR sensors and their data after processing will send to the authorized person and indicate about darkness and temperature change. Monitoring of empty slots is accomplished by IR/Ultrasonic sensors. IR sensors are being used for indoor parking and ultrasonic sensors are used for outdoor parking. Webpage indicates about the free slots to user, filled slots are highlighted through red spot on the screen.

automatic car parking Circuit Diagram



3.7. A Real-Time Cloud-Based Intelligent Car Parking System for Smart Cities

In this paper, the proposed system is based on real-time cloud-based IoT technologies that operates without image processing. To enhance the security in the system different MAC addresses are used for routers and

wireless sensors placed on different parking places along Data Encryption Standard (DES).

Proposed system architecture includes:

- Wireless Sensors
- Wireless Router
- Integrated Cloud Platform
- Digital Parking Signs
- Web Apps and Analytics
- Mobile Apps

The status of the proposed real-time status is detected by WSNs and sends to the wireless router. Wireless routers are cost effective for the large-scale parking. In this parking system user can login in to the system and select the slot for parking. The slot status change to the “pending” after user’s selection, if user not pay the fess of parking within two minutes, it will again change the status of “available”. The status of parking is updating through WSN nodes and the parking slots selection can be accomplished by different set of notification steps done by user.

3.8. A Real-Time Automatic Plate Recognition System Based on Optical Character Recognition and Wireless Sensor Networks for ITS

In this paper, proposed is based on Optical Character Recognition (OCR) of number plates of vehicle. This system is considered more efficient due to excessive use of traffic cameras, because almost all cameras are connected through internet and using vision techniques slots for the parking can be detected easily. This system captures the

image of number plates of vehicle and verify its licensed and also detect parking slot of the vehicle. The verification process of number plate is accomplished in real-time mode and stored in database for the record of traffic department and agencies.

The proposed system architecture includes:

- Plate Localization (Object Detection)
- Plate Extraction
- License Plate Segmentation
- Character Recognition

Plate Extraction and License Plate Segmentation are the preprocessing steps and Character Recognition implement by Pytesseract (Python-tesseract). The algorithm of proposed system is start with plate localization that extract license plate from the image captured by camera. It applies bilateral filter [14] to reduce the noise of captured image for accurate detection of number plate as it effects by the environment as well. Moreover, system calculates the data on the basis of defined parameters of accuracy.