Smart Parking System: Dynamic Resource and Systematic Allocation of Parking Slots using Sensors
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Abstract:
The goal of “SMART PARKING SYSTEM: DYNAMIC RESOURCE AND SYSTEMATIC ALLOCATION OF PARKING SLOTS USING SENSORS” is to generate sensible android application for group of users for items or services that might be helpful for them. The Proposed System Based on Internet-of-Things Technologies differs in the way they find an empty parking space for car through the sensor automatically within public area. The Proposed System makes user smart and saves time for finding parking space. Proposed System approach solves a Mixed Integer Linear Problem at each decision point in a time-driven sequence. The difference between existing systems an proposed system is that we aim to make system as less human dependent as possible by automating the cars as well as the entire parking slot, on the other hand existing system requires some amount of human interaction. A sensor which is placed in the public area will gives notification on user mobile throughout the application. As soon as notification read by the user, he could easily understood where to park his car.

Index Terms: Radio Frequency Identification, RFID Reader, Smart Parking System, Aurdino.

I. INTRODUCTION

As the population increased in the metropolitan cities, the usage of vehicles got increased. It causes problem for parking which leads to traffic congestion, driver frustration, and air pollution. When we visit the various public places like Shopping malls, multiplex cinema hall & hotels during the festival time or weekends it creates more parking problem. In the recent research found that a driver takes nearly 8 minutes to park his vehicle because he spend more time in searching the parking lot. This searching leads to 30 to 40% of traffic congestion. Here we go to see how to reduce the parking problem and to do secured parking using the smart parking under Slot Allocation method with the help of Android application. RFID application is used for debit the amount for parking charges through the RFID tag. The main contribution of our proposed systems is to find out status of the parking area and provide secured parking. Wireless sensor networks (WSNs) have attracted increasing attentions from both academic and industrial communities. It can be deployed in various kinds of environments to monitor and collect information. In this paper, we describe a WSN-based intelligent car parking system. In the system, low-cost wireless sensors are deployed into a car park field, with each parking lot equipped with one sensor node, which detects and monitors the occupation of the parking lot. The status of the parking lot detected by sensor nodes is reported periodically to a database via the deployed wireless sensor network and its gateway. The database can be accessed by the upper layer management system to perform various management functions, such as finding vacant parking lots, auto-toll, security management, and statistic report. We have implemented a prototype of the system using RFID and IR Sensor. The system evaluation demonstrates the effectiveness of our design and implementation of the car parking system.

II. RELATED WORK

In 2010, a vision based car parking system is developed which uses two types of images (positive and negative) to detect free parking slot. In this method, the object classifier detects the required object within the input. Positive images contain the images of cars from various angles. Negative images do not contain any cars in them. In 2012, an intelligent system for car parking has been proposed by making use of Image processing. In this system, a brown rounded image on the parking slot is captured and processed to detect the free parking slot. In 2012, Number Plate Recognition technique for developing autonomous car parking system uses image processing basis to process the number plates of the vehicles. In this system, the image of the license number plate of the vehicle is acquired. It is further segmented to obtain individual characters in the number plate. Ultrasonic sensors are used to detect free-parking slots. In proposed system describe a WSN-based intelligent car parking system. In the system, low-cost wireless sensors are deployed into a car park field, with each parking lot equipped with one sensor node, which detects and monitors the occupation of the parking lot. In 2010, a vision based car parking system is developed which uses two types of images (positive and negative) to detect free parking slot. In this method, the object classifier detects the required object within the input. Positive images contain the images of cars from various angles. Negative images do not contain any cars in them. In 2012, an intelligent system for car parking has been proposed by making use of Image processing. In this system, a brown rounded image on the parking slot is captured and processed to detect the free parking slot. In 2012, Number Plate Recognition technique for developing autonomous car parking system uses image processing basis to process the number plates of the vehicles. In this system, the image of the license number plate of the vehicle is acquired. It is further segmented to obtain individual characters in the number plate. Ultrasonic
sensors are used to detect free-parking slots. In proposed system describe a WSN-based intelligent car parking system. In the system, low-cost wireless sensors are deployed into a car park field, with each parking lot equipped with one sensor node, which detects and monitors the occupation of the parking lot. The aim of this paper is to automate the car and the car parking as well. It discusses a project which presents a miniature model of an automated car parking system that can regulate and manage the number of cars that can be parked in a given space at any given time based on the availability of parking spot. Automated parking is a method of parking and exiting cars using sensing devices. The entering to or leaving from the parking lot is commanded by an Android based application. We have studied some of the existing systems and it shows that most of the existing systems aren’t completely automated and require a certain level of human interference or interaction in or with the system. The difference between our system and the other existing systems is that we aim to make our system as less human dependent as possible by automating the cars as well as the entire parking lot, on the other hand most existing systems require human personnel (or the car owner) to park the car themselves.

III. SYSTEM OVERVIEW

The main purpose of this project is to reduce the traffic congestion that occurs in and around the urban areas which is caused by vehicles searching for parking. This system can be extended to have a feature to count the number of vehicles entering the gate to keep track of number of parking spots available in the parking lot. This work is further extended as a fully automated system using multilayer parking method. Safety measures such as tracing the vehicle number face recognition of the drivers so as to avoid theft & automatic billing process can also be designed. We plan to expand the tests on the real time environment where the users can the “Smart Parking” system in their handheld devices.

A. Radio-frequency identification (RFID)

RFID uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source such as a battery and may operate at hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC).

B. Technologies to be used: Java, Android

About Java: Java has been tested, refined, extended, and proven by a dedicated community of Java developers, architects and enthusiasts. By making applications available across heterogeneous environments, businesses can provide more services and boost end-user productivity, communication, and collaboration—and dramatically reduce the cost of ownership of both enterprise and consumer applications.

Android: is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touch screen mobile devices such as smart phones and tablets. Android's user interface is mainly based on direct, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input. In addition to touchscreen devices, Google has further developed Android TV for televisions, Android Auto for cars, and Android for wrist watches, each with a specialized user interface.

C. System Architecture.

In the system, low-cost wireless sensors are deployed into a car park field, with each parking lot equipped with one sensor node, which detects and monitors the occupation of the parking lot. The status of the parking field detected by sensor nodes is reported periodically to a database via the deployed wireless sensor network and its gateway. The database can be accessed by the upper layer management system to perform various management functions, such as finding vacant parking lots, auto-toll, security management, and statistic report.

![Figure 1. Admin Web](http://ijesc.org/)

**Web application Module:**

This module provides the offline interfacing of the system to admin. Admin can be able to register parking slots for the incoming vehicles into the parking field as well as generate the report of parking vehicles bases daily, weekly and monthly. The major task done by admin in this module at entry point of the parking area is to scan the RFID tag which is is stick on the vehicle and check whether it is stolen or not, if it is then immediately inform to the police.
Police Portal:

The main user for this portal is police. Police user can be able to see all the data about vehicles parking, stolen vehicles and parking slots. Police can take entry of the vehicle and its registered RFID tag. This will help to detect stolen vehicle easily.

Android Application:

This application is provided for end user registration. End user can get access to system by userid and password after registration. He can reserve parking from anywhere by paying some amount. Online payment can be done through this application. Offline payment can be done at the time when user leaves the parking.

Driver Application for Aurdino:

Aurdino with IR Sensor vehicle is properly park or not, Buzzer for wrong Vehicle parking.

IV. MATHEMATICAL MODULE

System Specification: S= {S, s, X, Y, T, fmain, DD, NDD, ffriend, memory shared, CPUcount}

- S (system):- Is our proposed system which includes following tuple.
  - s (initial state at time T):- GUI of Car parking system using web. The GUI provides space to enter a query/input for user.
  - X (input to system) :- Input Query. The user has to first enter the query. The query may be ambiguous or not. The query also represents what user wants to search.
  - Y (output of system) :- List of Parking and Collection Reports with all details. User has to enter a query into Car parking system using web then Car parking system using web generates a result which contains relevant and irrelevant Crime Reports and their details.
  - T (No. of steps to be performed):- 6. These are the total number of steps required to process a query and generates results.
  - fmain(main algorithm):- It contains Process P. Process P contains Input,Output and subordinates functions. It shows how the query will be processed into different modules and how the results are generated.
  - DD (deterministic data):- It contains Database data. Here we have considered OLD i.e. Crime records contains the users crime with the criteria rules which contains number of ambiguous queries. Such queries are user for showing results. Hence, OLD is our DD.
  - NDD (non-deterministic data):- No. of input queries. In our system, user can enter numbers of queries so that we cannot judge how many queries user enters into single session. Hence, Number of Input queries are our NDD.
  - ffriend :- IE, VR, CR,RF in our system are the friend functions of the main functions. Since we will be using both the functions, both are included in ffriend function. IE is Information Extraction which is used for extracting information on browser. CR is based on the Collection reports added into the system for submitting the data to the server. VR is based on the Vehicle information stored on to the Database. RF is based on RFID scanning for Vehicle.

- Memory shared: - Database. Database will store information like list of Surveyors, web users, and its registration details and numbers Crime happened in the particular area. Since it is the only memory shared in our system, we have included it in the memory shared.

- CPUcount: - 2. In our system, we require 1 CPU for server and minimum 1 CPU for client. Hence, CPUcount is 2.

Subordinate functions:

- VR= {VI, SUBMIT, MESSAGES} Where,
  - U=Input Query using the Vehicle information
  - SUBMIT = {1, 2, 3, … , n}
  - A MESSAGE is output of VR which is Status Messages.

- IE= {FD, Info} Where,
  - CP is input which is filter information to IE
  - Info is the function to Extract all the Data based on the FD(Filter Data)

Algorithm:

- Step 1: Accept a Query (Q).
- Step 2: Get Data from from.
- Step 3: call VR function
  - Step 2.1: Get VI as Input to VR.
  - Step 2.2 : SUBMIT data
  - Step 2.5: Output as MESSAGE.
- Step 4: call to IE Function
  - Step 4.1: Get FD as Input.
  - Step 4.2 : Process Info
  - Step 4.4 : Get Relevant Information
  - Step5: Display Result.
- Step 6: Stop.

- CR= {CFD, SUBMIT, LIST} Where,
  - CFD=Input {Query using the information and Filter input for Reports}
  - SUBMIT = {1, 2, 3, … , n}
  - LIST is output of CR which is Collection Reports.
RFI is input which is RFID Identification.
Check is the procedure to to check the RFID details available or not.

Algorithm:
- Step 1: Accept a Query (Q).
- Step 2: Get Data from from.
- Step 3: call CR function
  - Step 2.1: Get CFD as Input to CR.
  - Step 2.2: SUBMIT data.
  - Step 2.5: Output as LIST.
- Step 4: call to RF Function
  - Step 4.1: Get RFI as Input.
  - Step 4.2: Call Check.
  - Step 4.4: get message is exist or not.
- Step 5: Display Result.
- Step 6: Stop.

V. CONCLUSION

We conclude that using the slot allocation method we can book and block our own cheapest and shortest distant parking slot. It is an efficient one for solving parking problems, which overcomes the traffic congestion and provides automated billing process using the RFID tag. The components used for the implementation of the system provide efficient output at various stages of implementation. The interfaces established between various components provide an effective communication across the overall working of the system. Thus, the system functioning is efficient and is recommended for commercial implementation.

VI. REFERENCES


