Smart Parking Using RFID

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Abstract- ***One of the major problems faced by Smart cities is that of traffic congestion. The rate at which number of vehicles are increasing greatly surpasses that at which new parking places are made available. This project proposes a solution of Smart Parking System by leveraging Internet of Things technology. The IoT application monitors the availability of parking slots with real-time data being stored in cloud, with the provision for users to access this data via an android application. The status of each parking slot in the parking enclosure is indicated by wireless technology using ultrasonic sensors. Pre-booking of the parking slot is also possible through the app developed. The intention of the system is to help reduce the worsening traffic and parking issues faced in cities.***

Keywords— RFID TAG, RFID reader, Arduino, GPS, IR Sensor, Microcontroller.

I. INTRODUCTION

In the development of traffic management systems, an intelligent parking system was created to reduce the cost of hiring people and for optimal use of resources for car-park owners. Currently, the common method of ending a parking space is manual where the driver usually nods a space in the street through luck and experience. This process takes time and effort and may lead to the worst case of failing to any parking space if the driver is driving in a city with high vehicle density. The alternative is to pretend car park with high capacity. However, this is not an optimal solution because the car park could usually be far away from the user destination. In recent years, research has used vehicle-to-vehicle and vehicle-to infrastructure interaction with the support of various wireless network technologies such as radio frequency identification (RFID), Zigbee, wireless mess network, and the Internet. This study aimed to provide information about nearby parking spaces for the driver and to make a reservation minutes earlier using supported devices such as smart phones or tablet PCs. Furthermore, the services use the ID of each vehicle in booking a parking space. However, the current intelligent parking system does not provide an overall optimal solution in finding an available parking space, does not solve the problem of load balancing, does not provide economic benefit, and does not plan for vehicle-refusal service.

To resolve the aforementioned problems and take advantage of the significant development in technology, the Internet-of-Things technology (IoT) has created a revolution in many fields in life as well as in smart-parking system (SPS) technology. The present study proposes and develops an effective cloud-based SPS solution based on the Internet of Things. Our system constructs each car park as an IoT network, and the data that include the vehicle GPS location, distance between car parking areas and number of free slots in car park areas will be transferred to the data center. The data center serves as a cloud server to calculate the costs of a parking request, and these costs are frequently updated and are accessible any time by the vehicles in the network. The SPS is based on several innovative technologies and can automatically monitor and manage car parks.

Furthermore, in the proposed system, each car park can function independently as a traditional car park. This research also implements a system prototype with wireless access in an open-source physical computing platform based on Arduino with RFID technology using a smart phone that provides the communication and user interface for both the control system and the vehicles to verify the feasibility of the proposed system.

AIM

This study aimed to provide information about nearby parking spaces for the driver and to make a reservation minutes earlier using supported devices such as smartphones or tablet PCs.

Objectives

To proposed a parking system that improves performance by reducing the number of users that fail to find a parking space and minimizes the costs of moving to the parking space and to reduce the average waiting time of users for parking.

To constructs each car park as an IoT network, and the data that include the vehicle GPS location, distance between car parking areas and number of free slots in car park areas will be transferred to the data centre.

II. LITERATURE SURVEY

The advances in cloud computing and web of things (IoT) have provided a promising chance to resolve the challenges caused by the increasing transportation problems. We tend to gift a unique multilayered conveyance knowledge cloud platform by exploitation cloud computing and IoT technologies To resolve the challenges caused by the increasing transportation issues. We present a novel multilayered vehicular data cloud platform by using cloud computing and IoT technologies. Two innovative vehicular data cloud services, an intelligent parking cloud service and a vehicular data mining cloud service in the IoT environment are also presented reviews[1].

Small and Medium-Sized Enterprises (SMEs) face tremendous challenges in their attempt to pursue technological innovations. This paper argues that co-opetition strategy—simultaneous pursuit of competition and collaboration—helps SMEs to develop their ability to effectively pursue technological innovations. We developed multilevel conceptual model consisting of factors at the industry, dyadic, and firm level to understand the drivers of co-opetition and discuss benefits and costs of co-opetition for SMEs. We believe that this paper will stimulate future conceptual and empirical research on this important topic and has implications for SME managers and policymakers[2].

The aim of this paper is to propose a design of an Automated Car Parking System commanded by an Android application that regulates the number of cars to be parked on designated parking area by automating the Parking and Unpacking of the car with the help of Commands of an Android Application. The study of some existing systems shows that the level of automation in them is limited only to features like Number plate extraction, Comparison based on Snapshots of parking spaces, processing of images or Mechanical lifts in case of multilevel parking. Our system aims to reduce the human intervention to the minimal by automating the process of car parking. This in turn would prove to be useful in reducing the time required for search of free parking space by manually driving through multiple slots. The automation in the car is achieved by means of feature of Path Tracing using Sensors. We, hereby, also present a mathematical representation of our system. We also hereby present the results obtained and finally, focus on the future advancements for the project[8].

III. ARCHITECTURE

The system design process builds up general framework building design. Programming outline includes speaking to the product framework works in a shape that may be changed into one or more projects. The prerequisite indicated by the end client must be put in a systematical manner. Outline is an inventive procedure; a great configuration is the way to viable framework. The framework "Outline" is characterized as "The procedure of applying different systems and standards with the end goal of characterizing a procedure or a framework in adequate point of interest to allow its physical acknowledgment". Different configuration components are taken after to add to the framework. The configuration detail portrays the components of the framework, the segments or components of the framework and their appearance to end-clients. The reason for the design is to arrange the arrangement of the issue determined by the necessities report. This stage is the initial phase in moving from issue to the arrangement space. As such, beginning with what is obliged; outline takes us to work towards how to fulfil those needs. The configuration of the framework is maybe the most basic component influencing the nature of the product and has a noteworthy effect on the later stages, especially testing and upkeep. Framework outline depicts all the significant information structure, document arrangement, yield and real modules in the framework and their Specification is chosen.

The architectural configuration procedure is concerned with building up a fundamental basic system for a framework. It includes recognizing the real parts of the framework and interchanges between these segments.

The beginning configuration procedure of recognizing these subsystems and building up a structure for subsystem control and correspondence is called construction modeling outline The proposed architecture for this system is given below. It shows the way this system is designed and brief working of the system.

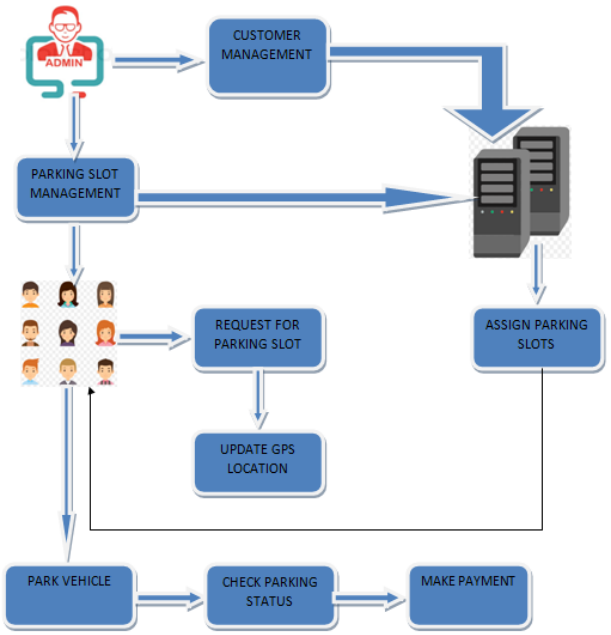

Figure 1 – Architecture diagram

A. *Admin Registration*

Admin will register by giving his user name and pass word and he will update all the status of the parking of 2 wheelers and 4 wheelers and area details where the parking slots available.

B. *User Registration*

User will register by giving his user name and pass, once user register he will get the booking slots details along with the areas where the free slots available by giving type of the vehicle and area he can book the slot in the particular area where user needed.

C. *Parking process*

Ones user reaches the parking area user car has given RFID tag that RFID tag has been read by the RFID reader if the number present in the RFID tag is same then the system allows the car to park in the slot which user had booked.

IV. WORK FLOW

A. *Data Flow Diagram*

The DFD is straightforward graphical formalism that can be utilized to speak to a framework as far as the info information to the framework, different preparing did on this information and the yield information created by the framework. A DFD model uses an exceptionally predetermined number of primitive images to speak to the capacities performed by a framework and the information stream among the capacities. The principle motivation behind why the DFD method is so famous is most likely in light of the way that DFD is an exceptionally basic formalism- It is easy to comprehend and utilization. Beginning with the arrangement of abnormal state works that a framework performs, a DFD display progressively speaks to different sub capacities. Actually, any various leveled model is easy to get it.

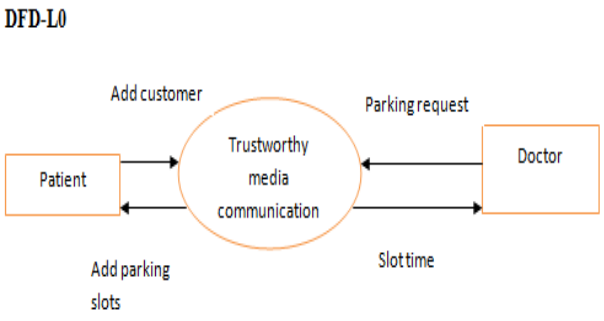

Figure 2: Level 0 Data Flow Diagram.

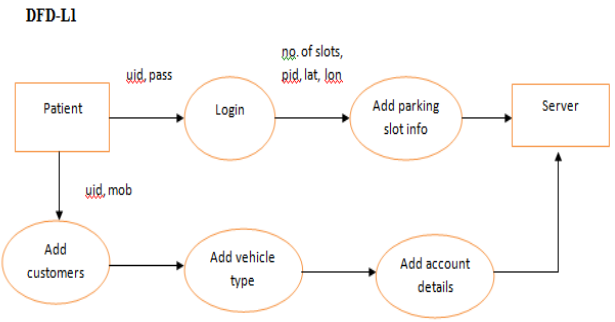

Figure 3: Level 1 Dataflow Diagram

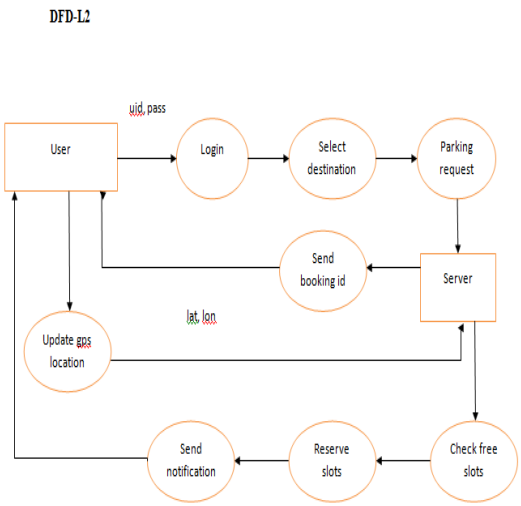

Figure 4: Level 2 Dataflow Diagram.

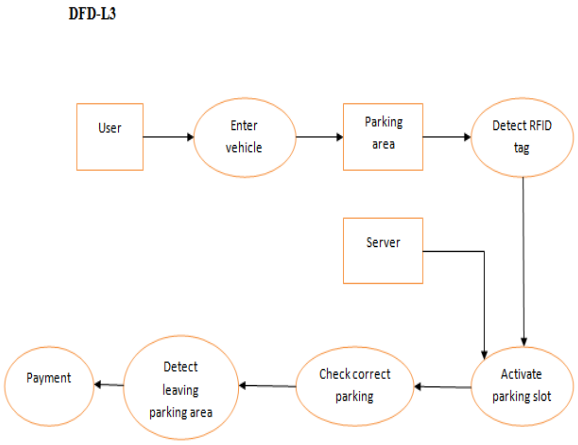

Figure 5: Level 3 Dataflow Diagram.

B. *Sequence Diagram*

A sequence diagram is a system is an interaction diagram that shows how process operates with one and other and in what order. It's a construct of a message sequence chart.

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and sequence of messages exchange between the objects needed to carry out the functionality of

the scenario. Sequence diagram are sometimes called event diagrams or event scenarios.

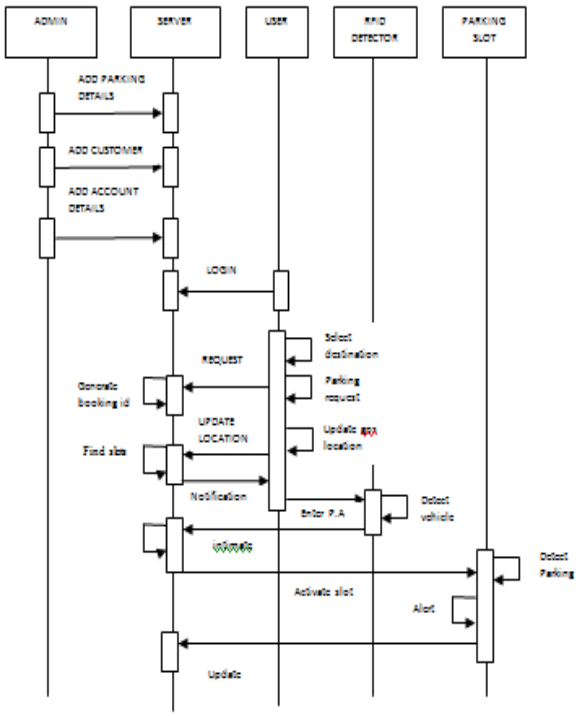

Figure 6: Sequence Diagram.

V. IMPLEMENTATION AND RESULTS

The implementation phase of any project development is the most important phase as it yields the final solution, which solves the problem at hand. The implementation phase involves the actual materialization of the ideas, which are expressed in the analysis document and developed in the design phase. Implementation should be perfect mapping of the design document in a suitable programming language in order to achieve the necessary final product. Often the product is ruined due to incorrect programming language chosen for implementation or unsuitable method of programming. It is better for the coding phase to be directly linked to the design phase in the sense if the design is in terms of object oriented terms then implementation should be preferably carried out in a object oriented way.

The implementation stage in a system project in its own right. It involves

- Careful planning
- Investigation of the current system and the constraints on implementation.
- Training of staff in the newly developed system.

Implementation of any software is always preceded by important decisions regarding selection of the platform, the language used, etc. these decisions are often influenced by several factors such as real environment in which the system works, the speed that is required, the security concerns, and other implementation specific details. There are three major implementation decisions that have been made before the implementation of this project. They are as follows:

- Selection of the platform (Operating System).
- Selection of the programming language for development of the application.
- Coding guideline to be followed.

point usage ought to be ideally completed in an article arranged manner.

Step 1 - Parking Registration: The parking slot owners register themselves and enter the location, address, latitude, longitude, two wheelers capacity, four wheelers capacity of the parking area.

Step 2 – User Registration: The user needs to register in the parking area for the first time and they will be given RFID tag and the details will be stored in the cloud.

Step 3 – Parking slot booking: Once user starts using the application, he sends the destination area and the application will update the geographical location to the cloud. The cloud will maintain the online users current location and based on that we should find out which user will reach first.

Step 4 - Assigning the slot**:** Each parking area will update the current status of the parking slot to the cloud as well as share the information with its neighbour parking areas. Based on the parking area's status the current users location from shortest path algorithm will be applied which will find out which user will reach sooner and will be assigned the slot in the nearest parking area. If the nearest parking area will be full, the user's will be redirected to another parking area where slots are available prior to their reach.

Step 5 – Charges: Once the vehicle enters the parking area the RFID detector in the parking area detects the tag inside the vehicle and the allocated slot will be filled up and the status will be updated to the cloud. Once the vehicle leaves the parking area the RFID detector detects it and the cloud will check the amount of time the vehicle was parked and based on that cloud will send notification of charged.

Few snippets of results are as follows:

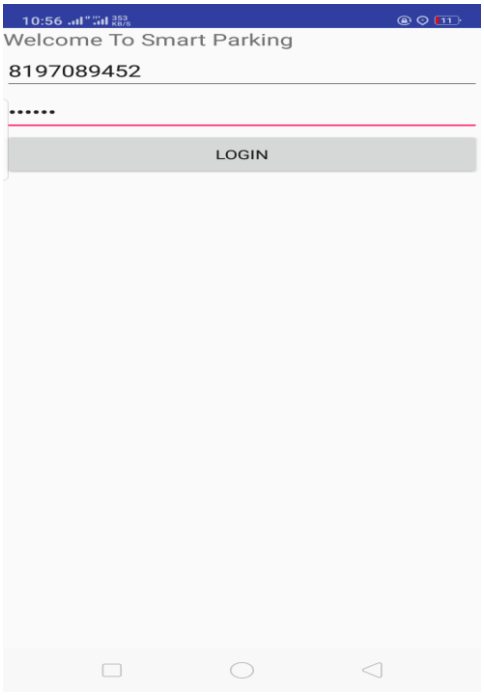

Figure 7: Snippet 1

Figure 8: Snippet 2

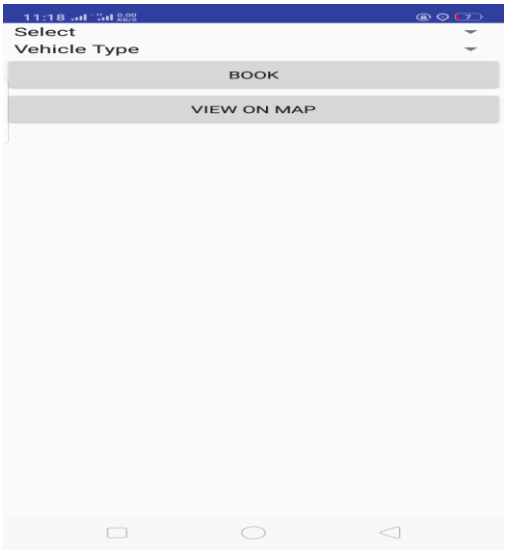

Figure 9: Snippet 3

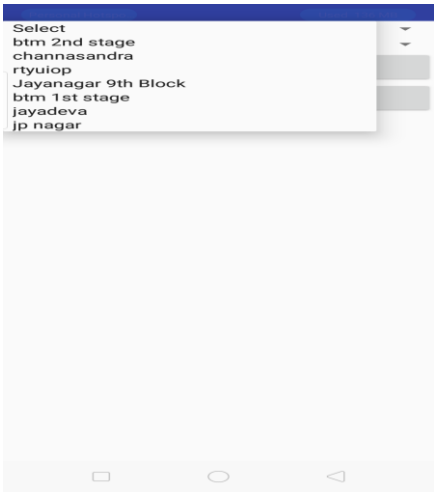

Figure 10: Snippet 4

Figure 11: Snippet 5

Figure 12: Snippet 6

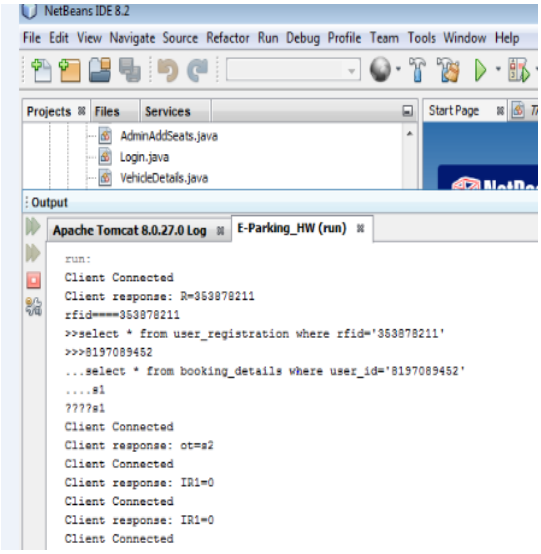

Figure 13: Snippet 7

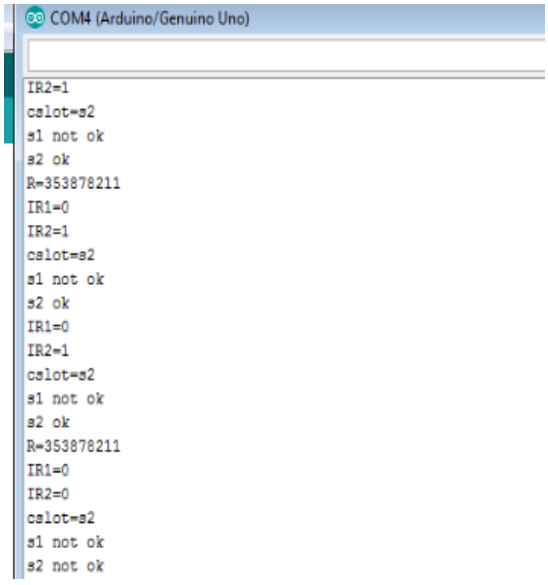

Figure 14: Snippet 8

VI. CONCLUSION

This study has proposed a parking system that improves performance by reducing the number of users that fail to and a parking space and minimizes the costs of moving to the parking space. Our proposed architecture and system has been successfully simulated and implemented in a real situation. The results show that our algorithm significantly reduces the average waiting time of users for parking. Our results closely agree with those of our proposed mathematical models. The simulation of our system achieved the optimal solution when most of the vehicles successfully found a free parking space. The average waiting time of each car park for service becomes minimal, and the total time of each vehicle in each car park is reduced. In our future study, we will consider the security aspects of our system as well as implement our proposed system in large scales in the real world.

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