

Systematic Vehicle Parking System

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Abstract: Each and every individual who claims or drives a vehicle in India or abroad would be very acquainted with the issues of discovering parking spots in parking lots. The Systematic Vehicle Parking System had been imagined with the view to robotize the labor associated with the searching of empty spots. It definitely lessens the exertion, deferrals and overheads that are mostly experienced by the searcher. Checking of vehicles in and out is aimed during the entry and exiting of vehicles from designated parking lots along with the record of pertinent data. A rich and simple to-utilize GUI helps in exploring the framework effectively and thoroughly.

Keywords: GUI, Revenue Collection, Data Entry, Univocal nature

I. Introduction

During this rapidly growing scenario, the industrial growth is reflected by the continuous increase in the number of automobiles on the streets (Faheem *et-al.*, 2013) which causes lots of parking problems. This problem is more increased by slow paced city planning (Wenzhi *et-al.*, 2006). Parking is an expensive process not in terms of money only but also in terms of time and efforts (Kotbet-*al.*, 2016). Currently, car parking is facing the main problem of controlling the number of vehicles inside it along with vehicle movement in and out and number of unattended vehicles.(Ahmed and Wei 2016.). Today, any driver wastes minimum 10 min to park his vehicle due to unavailability of free slots which leads to 30-40 min to congestion (Sharma *et-al.*). Systematic parking systems are an innovation that helps in resolving this ever-challenging problem.

It is built to be optimized for use in multilevel parking buildings where a huge number of parking spaces are available, but difficult to keep track of. It is planned keeping the specific objectives in mind: To provide an efficient, user-friendly, hi-performance, reliable system for implementing the workflow involved in a Multi-Level Parking Lot. It has been observed that space searching time and space availability during parking has become one of the top issues. Almost half of the people face the problem of space availability ie 49% (Jog *et-al.*, 2015).

It is built using the Java Swings Framework, in lieu of its rich GUI capabilities, robustness and ease of use. Data collected about vehicle entries is stored in an MS Access Database. It is a console-based desktop application that can be configured to run on virtually any PC with a Java Virtual Machine (JVM). A Waterfall Model approach to Software Engineering was undertaken, and hence the steps are detailed in a similar fashion.

II. Literature Review

Development of the parking systems implemented in Europe, the United States and Japan is done with the incorporation of advanced technologies. Now-a- days, due to the rapid growth of the parking system, huge manpower is needed to locate the empty spaces in parking lots. Therefore, there is a need for an automatic or systematic parking system (Idris *et-al.*, 2009). Since, parking systems experience various challenges on a regular basis, therefore, various technologies have been used by the researchers to propose new systems. Various types of vehicle systems are implemented in the world like multi level parking system, volkswagen parking system, automated car parking system, Rotary car parking system etc. (Pashte*et-al.*, 2016).

Recently, investigators use RFID based parking systems along with Infrared Sensors (IR). This system will facilitate faster user authentication and hence reduce waiting time and increase the efficiency of the parking space. This also discusses the Arduino Board (Sabnamet-al., 2016).

Similar study was done where discussion of the mechanical model and the software system related to the smart parking system has taken place. They also shared the hardware description about the microcontroller, relay and RFID tag reader. By using Proteus 8 software, practical development of software had been performed (Nimble et-al., 2016).

Other than this, IoT technologies have been used to generate the smart parking system such that the driver can book a parking space from anywhere. This technology helps objects to be sensed and controlled remotely over existing networks. It even creates an opportunity for direct integration of the world into computer regions which improves efficiency (Karamchandani and choudhary. 2016). Their system consists of an IR sensor, RFID tag and E valet server. An android application is provided to drivers which provide the graphical view of parking spots (Osmani et-al., 2016). Similar system is proposed in which users from rural areas can book a parking space by using a mobile app. They used sensors for detecting the vacant parking lots. They aim to lift the parking management from a purely physical system to computational service using IoT and Wi-Fi based technologies (Bachhav and Mechkul. 2017). Even using a cloud computing model, a low cost IoT based vehicle system is proposed that consists of HCSR-04 based ultrasonic sensors to detect the proximity of the car and status of occupancy of slots. Also, an IR sensor is deployed at the gates to sense the car number. A Blynk android app is also used to give notifications to different users about availability of slots (Mishra et-al., 2019).

Various researchers elaborate the research method of an automatic parking control system and designs a parking controller. They research the parking space scene recognition algorithm, and the results are experimentally verified. Path planning and a trajectory tracking simulation are performed according to the actual parking scenario. (Ma et-al., 2017). Similarly, development of the parking system along with licence plate recognition, parking lot status and parking guidance system has taken place (Rashid et-al., 2012).

III. Architecture

1. Technical Architecture

In the beginning, when the barrier is down, the entry of the vehicle takes place, by entering the type of vehicle in the software, the availability of slots can be checked. If the result is positive that means the slot is available and hence the parking slip can be generated by entering the vehicle number in it. Thus, the barrier can be opened and the vehicle is allowed to enter (Figure: 1).

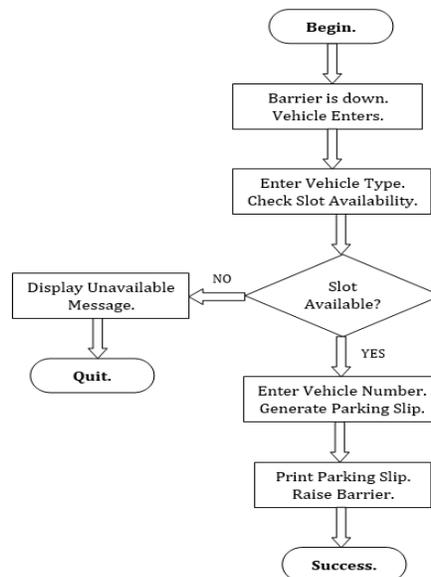


Figure 1: Flowchart of Entry Terminal

2. Data Architecture

Project includes two inputs to be maintained i.e. Clerks and Manager. Clerks have to enter the data like vehicle type and the vehicle number. On the other hand, the manager can find the report and the user details. The output of the system is the reports and the parking slips. This helps in attaining the monthly and yearly reports by the manager in the easiest way possible (Figure: 2).

This can be explained as considering the 3 types of terminals in the DATABASE i.e. In Terminal, Manager Terminal and Out Terminal. The input is given to In Terminal by the clerk in the form of vehicle no. and type.

Such a process is also done by other researchers using RFID (Chowdhury et-al., 2018) that sometimes increases the costs as well. Similarly, input to Manager Terminal in form of report/user details. The input to out terminal in the form of slip data or vehicle no. This all inputs help in managing the report in the Database and help in organising the authorised parking area.

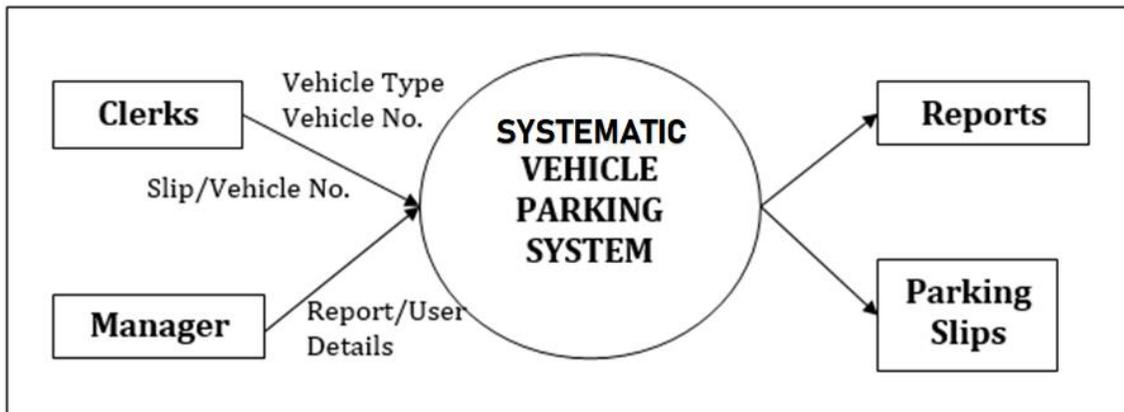


Figure 2: Context level diagram

3. Methodology

The system includes two sections, login and logout. Each section contains the admin part and the clerk part. Admin contains three subparts i.e. users, views and reports. Users contain the editing, addition and removal of vehicles. In views, available slots and total slots can be viewed. Reports can be generated for the vehicles, revenue, parking slip and the employees. Similarly, clerk part contains two subparts i.e. In Terminal and Out Terminal. Printing of receipt and collection of revenue can be done in them respectively (Figure: 3).

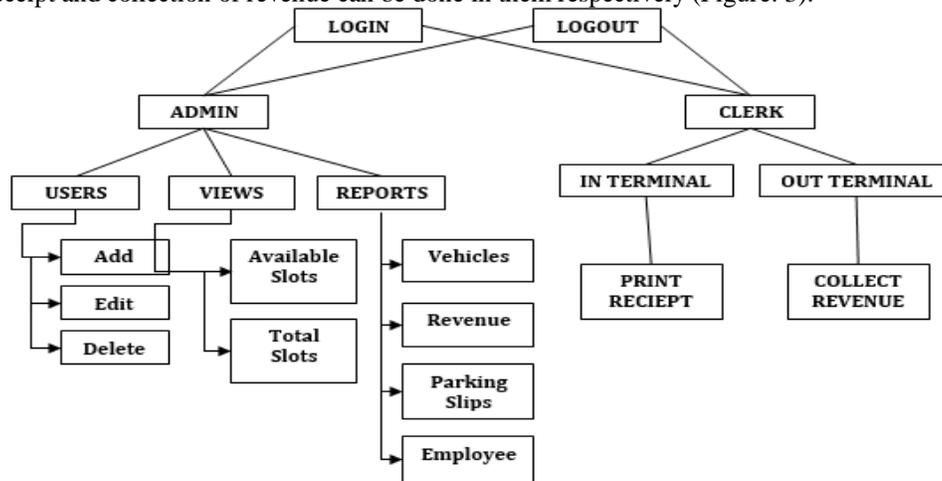


Figure 3: Module in SVPS

While carrying out the development of this project, we implemented the WATERFALL MODEL for software development life cycle. It was chosen because it is optimal for use in small projects with pre-defined requirements. It has a streamlined and linear approach to development which can help in the project being carried out effectively in the time available. In addition, it is relatively cost-saving and inexpensive as compared to other SDLC models.

IV. Requirements

- Minimum Configurations include processors of 800MHz Intel Pentium III or equivalent with memory of 128 MB and disk space of 20 MB.
- Recommended Configurations include processor Fof 2.6 GHz Intel Pentium IV or equivalent and memory of 256 MB with disk space of 40 MB.
- Peripheral & Connectivity Devices require Network Interface Card (for LAN Access), Monitor (for Display), Keyboard (for Data Entry), Mouse (for Navigation) and Printer (for Receipts/Reports).
- Minimum Software Requirements includes Operating System i.e. Windows 95/ME/NT/2000 or equivalent, Java2 Platform Standard Edition v1.4.2 or higher and Oracle DB or My SQL.

V. Result and Discussion

Hence, a systematic parking system is studied and proposed by using Java Coding and Waterfall Model Approach. This system not only helps to accommodate multiple user logins at different terminals simultaneously but to electronically calculate revenue based on predefined standard parking rates. It is the easiest and the convenient method for the clerks to maintain the data.



Figure 4: Login Page of System

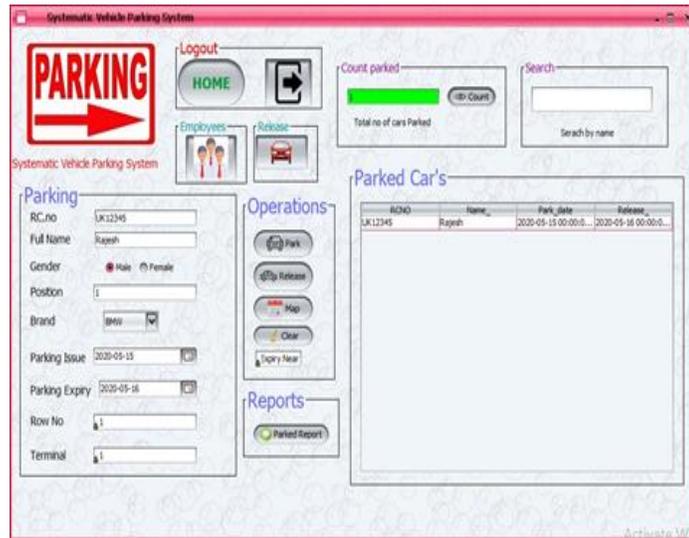


Figure 5: Vehicle Entry page

The proposed system provides easy login for employees and the manager (Figure: 4) and shows the availability of empty slots in the parking area automatically during the vehicle entry which adds to its cost effectiveness (Figure: 5). Investigators even use a management system based on video analytics in a multi camera environment to check the availability of parking spots (Mago. 2017, Castro *et-al.*, 2017). Parking slip can be easily generated which not only shows the in and out time but also specifies the parking floor number which helps the customer to be free from the searching of empty space (Figure:6). Along with this, managers can easily get the daily vehicle reports (Figure: 7), employee report (Figure: 8) and the total slots filled and vacant in the lot (Figure: 9). Other functions like searching for employees, editing the details of employees, change of password etc can be easily done in the system.

What is proposed here, is not just another automation of a manual workflow system, it can also be viewed as a solution to the aforementioned problems of the everyday consumer. It not only rids the vehicle owner from the hassles of finding parking spots, it ensures that there is never over or under accommodation of vehicles beyond the lot's capacity. The system completely eliminated even the possibility of embezzlements. The rates are fixed and predefined. No tampering can be done with the systematic calculation of the revenue based on the time taken directly from the console.



Figure 6: Parking Slip



Figure 7: Vehicle Report

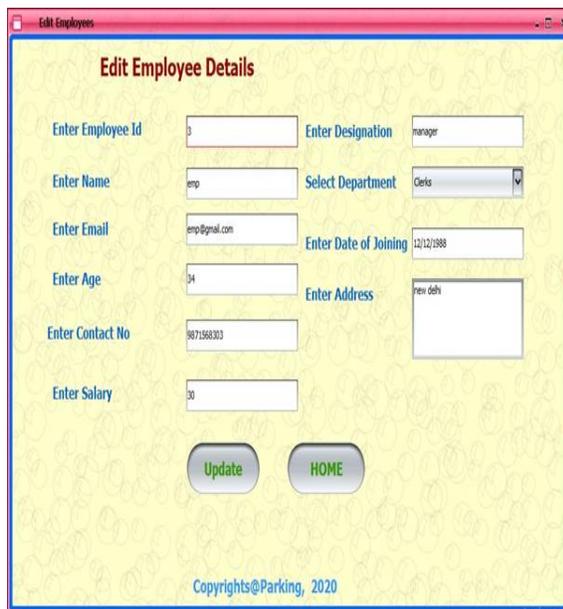


Figure 8: Employee Report



Figure 9: Total and Vacant Seats

VI. Conclusion

The paper talks about the proposed arrangement of the Systematic Parking System utilizing Java and Waterfall Model Approach. The Literature study is performed at first with the assistance of a couple of references inquiring about papers that help in giving the direction to the plan of the model. This is trailed by the clarification of specialized design and the information engineering which incorporates the information and yield from the three terminals at the same time. The necessities including the hardware and software are talked about along with the need of such a framework.

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