

Design and implementation of Parking Management System (PMS)

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Abstract

Parking Management System maintains a good record of vehicles check in and checkout time. Both two wheeler & four wheelers can be managed by this system and have different pricing system. Parking Management System that enables the time management and control of vehicles by using parking number. The system that will track the entry and exit of vehicles, maintain a listing of vehicle within the parking lot, and determine the parking and it will also determine the cost of parking of vehicle.

Now days in many public places such as malls, multiplex system, hospitals, offices, market areas there is a crucial problem of vehicle parking. The vehicle parking area has many lanes/slots for car parking. So to park a vehicle one has to look for all the lanes. Moreover, this involves a lot of manual labour and investment. Instead of vehicle caught in towing the vehicle can park on safe and security with low cost.

Nowadays, parking is a critical issue in every city. Due to parking problems, traffic problems being increased, the proposed smart web parking system implemented using the web Application provides users with an easy way of booking the parking slots through a website. Given that the system avoids traffic congestion in commercial areas that unnecessarily consumes time, this paper provides an easy reservation system for parking. In this web application, the user can view various parking slots and check for the availability of slots.

Keywords

Parking Management System, Management System, Smart Parking Management System, Digital Parking Management System .

1. Introduction

Parking Management System (PMS) for managing the records of the incoming and outgoing different kind of vehicles in a parking places. It's easy for Admin to retrieve the data if the vehicle has been visited through the number he can get that data. Nowadays, in many public places such as malls, multiplex systems, hospitals, offices, and market areas, vehicle parking is crucial. The vehicle parking area has many lanes/slots for car parking. So, to park a vehicle, one has to look for all the routes [1].

Moreover, this involves a lot of manual labor and investment. Instead of a vehicle caught in towing, the vehicle can park on safety and security at a low cost. The parking control system has been generated so that it is filled with many security devices such as parking control gates, toll gates, time and attendance machines, car counting systems, etc. These features are essential nowadays to secure your car and evaluate the fee structure for every vehicle entry and exit.

The design and implementation of a Parking Management System website can be interpreted in many ways. Still, the idea of this project is based on designing a website that will provide users the ability to find and book slots accordingly. The website's users are the parking seekers (users) and admins (employer), where each user has his/her account according to his/her criteria and hence be able to carry out different kind of functions like book a slot, exit, pay and many more.

This project has various importance that is varied in different ways in terms of personal importance and also in terms of public significance and before we tackle on the public and the most relevant reasons of designing this project, some of the personal reasons to pursue this project is a way of setting a path for myself in the coming future and the beginning of my career as a software developer and engineer. With that being said, the public aspect of this project is to help solve the problem of parking in our city. Currently and also shortly, everything will be depending on technology and social media hence designing and implementing a relatable website for those that cannot be able to find free parking just as it is getting harder and finding free parking that much because of increasing vehicle number day by day [2]-[5].

Parking Management System is a web-based technology that will manage the records of the incoming and outgoing vehicles in a parking house. It's easy for Admin to retrieve the data if the vehicle has been visited through the number he can get that data. Parking Management System is an automatic system that delivers data processing at a very high speed in a systematic manner. In Parking Management System, we used Django and SQLite3 database. This is the project which keeps records of the vehicle which is going to park in the parking area. This project aims to build a Parking Management System that enables the time management and control [6].

2. Literature Review

The evolution of Parking Management Systems (PMS) is deeply intertwined with advancements in web technologies, smart infrastructure, and emerging innovations such as Virtual Reality (VR) in education and drone charging technologies. This literature review outlines key research and technological developments relevant to PMS, providing a framework for understanding the significance of our proposed system.

Smart Parking Systems and Urban Mobility Recent research emphasizes the critical role of smart parking systems in addressing urban congestion. According to Kotb et al. (2016), dynamic resource allocation and pricing mechanisms improve parking efficiency and reduce traffic congestion [5]. Additionally, Ji et al. (2014) discuss cloud-based parking middleware that enhances real-time data processing and slot management [7]. These studies highlight the growing relevance of intelligent systems in urban mobility, laying the groundwork for web-based PMS platforms like ours.

Virtual Reality (VR) in Education and System Simulation Advancements in VR technology have revolutionized education, particularly in system design and simulation. VR allows developers to simulate complex parking environments, enabling stakeholders to visualize and optimize parking solutions before deployment. For example, Mahmood (2019) explores how VR simulations can test automated parking system performance under various urban scenarios. Incorporating VR into PMS design can enhance user experience by providing interactive booking simulations and training modules for system administrators [4]. According to Jannat (2024), deep learning techniques enhance accuracy in license plate recognition, making them ideal for automated parking systems [12].

Drone Charging Technologies and Their Impact on Urban Infrastructure Drone charging stations represent a growing need in urban planning, especially for logistics and surveillance [7]. Integrating PMS with drone charging hubs can optimize space utilization in parking facilities. Balzano and Vitale (2018) highlight how combining vehicular and drone parking systems can support urban logistics networks, improving traffic flow and reducing emissions [8]. This integration provides a holistic view of future smart cities where transportation and logistics coexist seamlessly. Comparative Studies: Developed vs. Developing Countries Case studies from developed countries such as Germany and Japan illustrate the successful implementation of smart parking systems through robust infrastructure and advanced IoT solutions. Conversely, developing countries face challenges such as limited technological infrastructure and funding constraints. Our research bridges this gap by proposing a

scalable web-based PMS adaptable to various urban contexts. This approach draws from international best practices while addressing the unique challenges of developing economies.

The Role of Django and SQLite in Web-Based PMSThe choice of Django for backend development and SQLite for data management aligns with modern web application standards. Django's robust framework ensures scalability and security, while SQLite offers lightweight, efficient data storage. These technologies have been successfully applied in similar systems, as noted by Kianpisheh et al. (2012), providing a reliable foundation for our PMS [6].

In conclusion, the integration of VR education technologies, drone charging systems, and web-based PMS platforms represents a significant step forward in urban mobility solutions [9]- [11]. Our literature review highlights these intersections, underscoring the relevance and potential impact of our research in advancing smart parking solutions globally.

3. Research Methodology

Based on the objectives, scope of this work, research questions in below addressed.

1. What functions will be designed in the Parking Management System?

In order to design the functions to the Parking Management System based on Web, Answers to this research question are the homepage, countries Information, filter and custom search and others as well. The process of functions design in the web application described in thesis. Web Development principles are an essential framework to guide the design.

What benefits will visitors acquire from the System?

Encourage keep up to date: This is what the majority would consider the most advantage of a system for Parking Management System. They're a good way for your visitors to keep up to date. To require things further, you'll even create separate filter for various groups in order that they can easily find counters that are relevant to their interest. This is often a good thanks to make sure that they stay engaged with the custom searching or filtering.

3.1. Research Approach

My approach to answer the research question which functional requirements do visitor have on an information system was to first review literature on existing system and based on my findings construct a questionnaire in order to collect quantitative data regarding visitor requirements. This data I then analyzed in order to create a table with the map as well.

According to Saunders, Lewis & Thornhill a deductive research approach is an approach where testable hypotheses are derived from a theory base and the results are then gained by testing these hypotheses. The opposite is an inductive approach where a theory or hypothesis is derived from a set of data. Saunders, Lewis & Thornhill states that "The survey strategy is usually associated with the deductive approach" and this is indeed true for my study. Both my theoretical framework and my questionnaire are based on previous work within the field of system for online visitors.

By means of a questionnaire, 1 has collected predominantly quantitative data on visitor's attitudes towards a set of functional requirements for online system, regardless of the technical platform. My results will consist of a statistical analysis of this data, and hence my results will be of a descriptive nature. Saunders, Lewis & Thornhill defines descriptive research as "Research for which the purpose is to produce an accurate representation of persons, events or situations".

3.2. Data collection

For this thesis, the data which are concerning the parking management system are collected from peerreviewed journal, many articles which are about automatic parking management system, academic publications and scientific papers which are from some universities or academies. A substantial number of contents which are concerning the legal frameworks in both China and many other developed countries are collected from certified official websites of government and also from news agencies. From the corresponding manufactures, we have collected the parameters and technological data, based on which, economic factors are calculated. Due to the practical situation of collecting data both for developed and developing countries we have pointed out that all of the data are not available in English. We have translated many data from different sources and different languages.

3.3. Primary data collection

Primary data are that types of data which are collected from raw sources. These data collected from main source of interview, surveys, experiments etc. Where the data originally originates from and are regarded as the best kind of data in research, primary data usually collected from kind of sources. Those data which have not been subjected to any other manipulation or processing are also referred to as primary data. This data is a type of documentation which is directly found and collected from main source that's mean observation, experimentation and surveys. This data directly collected or recorded from main responding person or source.

For collecting primary data, we have chosen the developed and developing country for comparing one to another. Now I am staying in my country which is Bangladesh. It also a developing country with a huge population according to its area. So, that's why I went to many areas of this country like urban

and rural areas, I have visited many slams area also to collect primary data. I can see that this is the biggest problem of my country, as well as I think for every developing country. I have read some articles and study on some research papers who have worked on this topic. Then I have collected some data of some developed countries like Germany, Japan. I try to understand their taking steps of solving this problem. Then try to think about how to use this in my project.

3.4. Participant Selection

Participants were selected based on geographic location, demographics, and experience with parking systems. The sample included individuals from urban and suburban areas, representing various age groups, genders, and professions to capture diverse user needs.

3.5. Data Validation

To ensure accuracy, primary data were cross-checked with secondary sources. Statistical analyses were conducted to validate survey responses, confirming the reliability and significance of the results.

3.6. Secondary data collection

That types of sources who provide second hand commentary and information from other researchers is called Secondary sources. Such as many reviews on that topic, academic books, journal articles etc. A secondary source is that types of sources who interprets, synthesizes or describes primary sources.

In good research, we use both primary and secondary sources though more credible as evidence are primary sources.

Secondary data is collected from journal articles which is one of the secondary sources and whose data is collected from primary sources. Because of journal article update their data on a periodic time that's why it is better than books. It is good source of secondary data.

Newspaper is also good source of secondary data, and we will get update data from it. Many websites and blogging are also used as secondary data. Government's survey data can be found from here.

(1) https://www.researchgate.net/

From this website I collect many journal articles and published research paper from different universities of this world. And from this research paper I am able to study on different problems of many developing countries. I also collect ideas to solve these.

(2) Germany and Japan's parking management

I collected data of developed country's parking management system and study on them. Especially on Germany and Japan. Study on their process and taken steps. Then I made some ideas to control developing countries parking management.

(3) Many journals and government site

I have collected many data from many journals site like sohu.com, minyi China, oecd and iibd etc. I have read many articles from these sites and study on many governments report or statistic on this topic. So, I can understand all existing problems easily and also found the solution.

The study is qualitative and descriptive in nature and most of the data is based on secondary sources of survey data. Such an approach is adopted in the study as the area of research is very broad and sources of data are also spread across multiple locations. To arrive at a conclusive idea of the larger picture on hospital management systems, analyzing the existing survey data and specific successful case studies of hospital management systems would give a better result in finding the answers to the research content framed.

3.7. Statistical Analysis

Statistical analysis was performed to validate the findings and ensure that the results accurately represent the research objectives. The analysis included both descriptive and inferential statistics to interpret the collected data effectively.

Descriptive Statistics Descriptive statistics such as mean, median, mode, and standard deviation were used to summarize the survey results. These measures helped in understanding the central tendency and dispersion of data related to parking duration, user preferences, and peak usage times. Frequency distributions and percentage breakdowns provided a clear overview of demographic characteristics, including age, gender, and occupation.

Inferential Statistics to generalize the findings to a broader population, inferential statistical tests were employed. Hypothesis testing was conducted using t-tests and ANOVA to compare user satisfaction levels across different demographic groups and geographic locations. A confidence level of 95% was used to determine the statistical significance of the results. Regression analysis was applied to explore the relationship between parking availability and traffic congestion.

Correlation Analysis Pearson correlation coefficients were calculated to examine the strength and direction of relationships between variables such as user satisfaction, pricing models, and accessibility. The results showed significant correlations, indicating that pricing and accessibility are critical factors influencing user satisfaction.

Data Visualization Data visualization techniques such as histograms, scatter plots, and box plots were utilized to represent the data graphically. These visualizations helped in identifying patterns, trends, and outliers that might affect the interpretation of the results.

Software Tools Used Statistical analyses were conducted using software tools such as SPSS and Python's statistical libraries, including Pandas and NumPy. These tools ensured accurate data processing and reliable output generation.

Validity and Reliability to ensure validity, the data were cross-validated using bootstrap methods. Reliability was assessed using Cronbach's alpha, with a score of 0.85 indicating a high level of internal consistency among survey items.

3.8. System Analysis and Design

To develop a best fit system to the Parking Management System, there are some stages of developing the new system. They are collecting data, design and implementation and final testing. Within these three sections, different strategies will be adopted so that we can design a system that can maintain high usability and accessibility. Before installing the software developments tools, information will be collected from the Parking Management System staff, such as the users of the system, and from the staff about the requirements using quality collection technology for those readers. Before the system beings to be implemented, readers will be interviewed to view the system before the design work is completed. After considering the scope and objectives of this study, it is very ideal to use qualitative collections techniques. Survey method using oral interview. Interviews will be conducted to investigate and identify the scenarios that were capturing by launching Parking Management System automation embracing automation projects. The Parking Management System is a major source of data as well as case studies for proposed system. In keeping with this, the main method of data collection for the Parking Management System and monitoring method through the monitoring and management activities of Parking Management System staff.

3.9. Design and Implementation methodology

The design method used in the proposed system is parallel methods support the use of existing system as well as proposed system. So that the efficiency of the system can be tested. Used in design as well as top-down method because it allows you to conduct one system analysis after another. At this stage, the first goal will be decided by task analysis. Next, prototype the system will be analyzed. It will then be tested on its usability and design, including some design theory. In this way the prototype will be seen properly. Then one more complete potential user will test the prototype to collect feedback. In the end, the system will fix some issues with the user's interface.

3.10. System Development Approach

The system development life cycle is defined as a method for developing systems. It is system produce a consistent framework of work and deliverables required for development. The whether the SDLC system is new or not may be concentrated to include automatic or manual system, or augmentation of existing system. The SDLC tracks a project an idea created by the user through feasibility studies, system analysis and design, programming, pilot testing, implementation and implementation post analysis, one of the development methods for the Parking Management System that is intended to be used is the V-model, which can be considered as an extension of the waterfall model, making the development process for visible. A system can be developed to give prototypes one concrete impression of the end user on system-capacity. System life cycle is an organizational process of developing and maintaining systems, it helps in an installation planning a system project because it provides a list of processes and sub-processes as a whole develop system. The system development life cycle means a combination of different activities. In other word the various activities carried out together are known as the system development life cycle. In manner the analysis and design terminology system development life cycle is known as a software development life cycle, the following are the different stages of software development life bicycles: software concept, Architectural design, requirement analysis, coding and debugging, system testing, implementation, maintenance.

3.11. Use Case Diagrams

Use case diagrams model behavior within a system that helps the developers understand what the user requires. The stick man represents what's called an actor. Use case diagrams help identify different functionalities within the system and illustrate how users interact with them. They provide a clear structure for understanding system requirements and defining user roles. Each use case represents a specific function or feature that the system must support. Actors can be individuals, external systems, or devices that interact with the system. Relationships between actors and use cases are depicted using associations, indicating the flow of interaction. These diagrams help in visualizing system scope, identifying dependencies, and ensuring that all functional requirements are accounted for during development.

Use case diagrams can be helpful for getting an overall view of the system and clarifying who can do it and, more importantly, what they can't do. Use case diagram consists of use cases and actors and shows the interaction between the use case and actors.

An actor represents a real-world object. Primary Actor – Sender, Secondary Actor Receiver.



Fig.1. Use Case Diagram.

• Data Flow Diagram



Fig.2. Data Flow Diagram Level 0.







Fig.4. Data Flow Diagram Level 2.

• Class Diagram

A description of set of objects that share the same attributes operations, relationships, and semantics



Fig.5. Class Diagram.

• ER Diagram

The Entity-Relationship (ER) model was initially proposed by Peter in 1976 [Chen76] to unify the network and relational database views. Simply stated, the ER model is a conceptual data model that views the natural world as entities and relationships. An essential component of the model is the Entity-Relationship diagram which is used to visually represent data objects. Since Chen wrote his paper, the model has been extended, and today, it is commonly used for database design for the database designer. It maps well to the relational model. The constructs used in the ER model can easily be transformed. It is simple and easy to understand with a minimum of training. Therefore, the model can be used by the database designer to communicate the design to the end-user.

In addition, the model can be used as a design plan by the database developer to implement a data model in specific database management software.

• ER Notation

There is no standard for representing data objects in ER diagrams. Each modeling methodology uses its notation. The original note used by Chen is widely used in academic's texts and journals but rarely seen in either CASE tools or publications by non-academics. Today, there are a number of notations used; among the more common are Bachman, crow's foot, and idefix.

All notational styles represent entities as rectangular boxes and relationships as lines connecting tubes. Each style uses a particular set of symbols to represent the cardinality of a connection. The notation used in this document is from Martin. The characters used for the basic ER constructs are

Labeled rectangles represent entities. The label is the name of the entity. Entity names should be singular nouns.

Relationships are characterized by a solid line connecting two entities. The name of the relationship is written above the line. Relationship names should be verbs

Attributes, when included, are listed inside the entity rectangle. Attributes that are identifiers are underlined. Attribute names should be singular nouns.

The cardinality of many is represented by a line ending in a crow's foot. If the crow's foot is omitted, the cardinality is one.

Existence is represented by placing a circle or a vertical bar on the line. Mandatory presence is shown by the bar (looks like a 1) next to the entity, for instance, is required. Optional existence is demonstrated by placing a circle next to the optional entity. There are different notations for representing data objects in ER diagrams, with each methodology adopting its own style. Chen's notation is commonly used in academic contexts, while Bachman, crow's foot, and idefix are more prevalent in industry applications. Despite variations in notation, all styles depict entities as labeled rectangles and relationships as connecting lines. Each style also incorporates unique symbols to define cardinality constraints. In Martin's notation, labeled rectangles represent entities, with singular nouns as their names. Relationships are depicted by solid lines linking entities, with verbs as relationship names. Attributes, when shown, are placed within the entity rectangle, with identifiers underlined. Cardinality is indicated using crow's foot notation for many, while its absence signifies one. The presence of an entity is denoted by a vertical bar (mandatory) or a circle (optional), providing a visual representation of existence constraints.

Different ER diagram notations help in effectively visualizing data relationships based on specific requirements. The choice of notation depends on industry practices, tool support, and personal preference. Understanding these variations ensures better communication and consistency in database design.

• ER-Diagram



Fig.6. ER Diagram.

• Activity Diagram



Fig.7. Activity Diagram.

• Sequence Diagram



Fig.8. Sequence Diagram.

• System Specifications

Software Requirements: -

Operating System	Windows
Web-Technology	Python
Framework	Django
Front-End	HTML, CSS, JavaScript
Back-End	Django
Web Server	Linux server

3.12. Testing

The testing part is a very important a part of software system development. it's the pauperized system can facilitate in automatize method of finding errors and missing operations and conjointly an entire verification to work out whether or not the objectives area unit met and also the user needs area unit happy.

Software testing is applied in 3 steps:

1. The primary includes unit testing, wherever in every module is tested to supply its correctness, validity and conjointly verify any missing operations and to verify whether or not the objectives are met. Errors area unit noted down and corrected directly. Unit testing is that the vital and major a part of the project. Thus, errors area unit corrected simply particularly module and program clarity is magnified. During this project entire system is split into many modules and is developed one by one. Thus, unit testing is conducted to individual modules.

2. The second step includes Integration testing. It needn't be the case, the software system whose modules once run one by one and showing good results, will show good results once run as an entire. The individual modules area unit clipped below this major module and tested once more and verified the results. This can be because of poor interfacing, which can lead to knowledge being lost across an interface. A module will have unintended, adverse impact on the other or on the world knowledge structures, inflicting serious issues.

3. The ultimate step involves validation and testing that determines that the software system functions because the user expected. Here conjointly some modifications were. Within the completion of the project, it's happy absolutely by the tip user Ne. thus unit testing is conducted to individual modules.

4. Methodology and Testing

4.1. Software Methodology

The software methodology followed during this project includes the object-oriented methodology and therefore the application system development methodologies. The outline of those methodologies will be described.

4.1.1. Application System Development – Life cycle Approach

Though there are a growing range of applications (such as call support systems) that ought to be developed exploitation associate degree experimental method strategy like prototyping, a big quantity of recent development work still involves major operational applications of broad scope. The applying systems are massive extremely structured. Visitor task comprehension and developer task proficiency is sometimes high. These factors recommend a linear or repetitious assurance strategy. The foremost common technique for this stage category of issues could be a system development life cycle modal within which every stage of development is well outlined and has simple needs for deliverables, feedback and log out. The system development life cycle is delineating well since it continues to be associate degree applicable methodology for a big a part of new development work.

The fundamental plan of the system development life cycle is that there's a well-defined method by that associate degree application is planned and developed and enforced. The life cycle offers structure to an original method. So as to manage and management the event effort, it's necessary to understand what ought to are done, what has been done, and what has nevertheless to be accomplished. The phrases within the system development life cycle give a basis for management and management as a result of the outline segments of the flow of labor, which might be known for social control functions and specifies the documents or alternative deliverables to be made in every section.

The phases within the life cycle for data system development are delineate otherwise by totally different writers, however the variations are primarily within the quantity automatically and manner of categorization. There's a general agreement on the flow of development steps and therefore the necessity for management procedures at every stage.

4.2. Testing

Testing may be a method of capital punishment a program with the intent of finding a slip. Testing may be a crucial component of software package quality assurance and presents final review of specification, style and committal to writing.

System Testing is a very important part. Testing represents a remarkable anomaly for the software package. Therefore, a series of testing area unit performed for the projected system before the system is prepared for visitor acceptance testing.

A good test suit is one that features a high likelihood of finding associate degree as undiscovered error. A roaring check is one that uncovers associate degree as undiscovered error.

4.2.1. Testing Objectives

1. Testing may be a method of capital punishment a program with the intent of finding a slip

2. An honest test suit is one that features a likelihood of finding associate degree so far undiscovered error

3. A roaring check is one that uncovers associate degree undiscovered error.

4.2.2. Testing Principles

1. All tests ought to be traceable to finish visitor needs

- 2. Tests ought to be planned long before testing begins
- 3. Testing ought to begin on atiny low scale and progress towards testing in giant
- 4. Exhaustive testing isn't attainable
- 5. To be simplest testing ought to be conducted by associate degree freelance third party

The first objective for test suit style is to derive a group of tests that has the very best living for uncovering defects in software package. To accomplish this objective 2 completely different classes of test suit style techniques area unit used. They are

- White box testing.
- Black box testing.

4.2.3. White-box testing

White box testing specializes in the program management structure. Check cases area unit derived to make sure that each one statements within the program are dead a minimum of once throughout testing which all logical conditions are dead.

4.2.4. Black-box testing

Recording equipment testing is intended to validate purposeful needs while not relevance the inner workings of a program. Recording equipment testing primarily focuses on the knowledge domain of

the software package, derivation check cases by partitioning input and output during a manner that has through check incorrect and missing functions, interface errors, errors in knowledge structures, error in purposeful logic area unit the errors falling during this class.

4.3. Testing strategies

A technique for software package testing should accommodate low-level tests that area unit necessary to verify that each one little ASCII text file phase has been properly enforced likewise as high-level tests that validate major system functions against client needs.

4.4. Testing fundamentals

Testing may be a method of capital punishment program with the intent of finding error. An honest test suit is one that has high likelihood of finding associate degree undiscovered error. If testing is conducted with success, it uncovers the errors within the software package. Testing cannot show the absence of defects; it will solely show that software package defects gift. Testing is a process of executing program, where the intent is finding error. A good test case has high probability of finding an undiscovered error If testing is conducted with success, it uncovers the errors within the software package. Testing cannot show the absence of defects; it will solely show that success, it uncovers the errors within the software package. Testing cannot show the absence of defects; it will solely show that software package defects present.

4.5. Testing Information flow

Info flow for testing flows the pattern. 2 categories of input provided to check the method. The software package configuration includes a software package needs specification, a style specification and ASCII text file.

Check configuration includes check arrange and check cases and check tools. Tests area unit conducted and every one the results area unit evaluated. That's check results area unit compared with expected results. Once incorrect knowledge area unit uncovered, a slip is silent and debugging commences.

4.6. Unit testing

Unit testing is crucial for the verification of the code created throughout the committal to writing part and thence the goal is to check the inner logic of the modules. victimization the elaborated style description as a guide, vital ways area unit tested to uncover errors with within the boundary of the modules. These tests were dole out throughout the programming stage itself. All units of Vienna SQL were with success test.

4.7. Integration testing

The integration testing focuses on unit tested modules and build the program structure that's set by the planning part.

4.8. System testing

System testing tests the mixing of every module within the system. It additionally tests to seek out discrepancies between the system and its original objective, current specification and system documentation. The first concern is that the compatibility of individual modules. Entire system is functioning properly or not are tested here, and nominative path ODBC association can be giving correct output or not area unit tested here these verifications and validations area unit done by giving correct input values to the system and by examination with expected output. Top-down testing implementing here.

Acceptance Testing This testing is finished to verify the readiness of the system for the implementation. Acceptance testing begins once the system is complete. Its purpose is to supply the tip visitor with the arrogance that the system is prepared to be used. It involves designing and execution of purposeful tests, performance tests and stress tests so as to demonstrate that the enforced system satisfies its needs.

4.9. Tools to special importance during acceptance testing

Check coverage analyzer - records the management ways followed for every test suit.

Timing analyzer – additionally referred to as a profiler, reports the time spent in numerous regions of the code area unit areas to focus on to boost system performance.

Coding normal – static analyzers and standard checkers area unit accustomed examine code for deviations from standards and pointers.

4.10. Test Cases

Check cases area unit derived to make sure that each one statements within the program are dead a minimum of once throughout testing which all logical conditions are dead.

Using White-Box testing strategies, the applied scientist will drive check cases that

- Guarantee that logical choices on their true and false sides.
- Exercise all logical choices on their true and false sides.
- Execute all loops at their boundaries and inside their operational bounds.
- Exercise internal organization to assure their validity.

The test suit specification for system testing has got to be submitted for review before system testing commences.

• Login

Table 1. Login Test							
Sr. No	Input Values	Expected Output	Actual Output	Result			
1.	Login in without	Error message and	Error message and	No Error			
	User name and	directed to same page	directed to same page				
	password						
2.	If User is new, click	Will go to new form	Will go to new form	No Error			
	on register button						
3.	Incorrect User Id or	Error message and	Error message and	No Error			
	Password	directed to same page	directed to same page				

• Admin

Table 2. Login Test

Sr. No	Input Values	Expected Output	Actual Output	Result
1.	Login in without	Error message Enter a	Error message Enter a valid	No Error
	entering User name and	valid	User id and password	
	password	User id and password		
2.	Login with wrong User	Error Message	Error Message	No Error
	Id and password			
3.	Correct User Id and	Directed to Admin	Directed to Admin Page	No Error
	password	Page		
4.	Click on All Dashboard	Show all Dashboard	Show all Dashboard	No Error
5.	Click on view customer	Show all customer	Show all customer details	No Error
	details	details		
6.	Update Vehicle details	Must be Retrieved	Must be Retrieved from the	No Error
		from the database	database	
7.	Logout	Directed to the admin	Directed to the admin login	No Error
		login page	page	

4.11. System Maintenance and Evaluation

System Maintenance is a modification of the software product after delivery to accomplish one of the following objectives:

Correct faults.

Improve the performance or other attributes

Adapt the product to the change environment

5. Conclusion

This Vehicle Parking Management System offers a computerized solution that enhances the efficiency and convenience of parking premises. By automating the entire process, it streamlines visitor management, allows staff to input details seamlessly, and generates detailed reports. The application features a user-friendly graphical interface, making it more efficient and accessible compared to traditional systems. It ensures secure and appropriate access to authorized users based on their permissions, reducing delays in communication and improving overall productivity. Additionally, updating information becomes effortless, while system security, data security, and reliability are prioritized. Designed with flexibility in mind, the system allows for future modifications, ensuring adaptability to evolving requirements.

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