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SMART CITIES

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Abstract:

The Smart Parking System helps solve city traffic jams, fuel waste and pollution. It uses a website to manage parking spaces. This project uses HTML and CSS to create a website. The website shows parking spots. Helps users find empty spaces easily. It is designed for everyone to use, no matter their tech skills. The website is easy to navigate and understand. The system does not have a backend or a database yet. Its simple design makes it cheap to start with. It can be improved later with Internet of Things technology, Python automation and online payment systems. Smart Parking System is part of the "city" idea. It shows how good website design can reduce time spent looking for parking. It reduces emissions and traffic in areas like malls and hospitals. Smart Parking System provides a framework for a fully automated management solution. It proves that simple digital tools can help create technology-driven city development. Smart Parking System can be a starting point, for smart city projects. It can help reduce traffic and pollution in cities.

Keywords: **Smart Parking System, HTML, Web Interface, Parking Slot Visualization, Static Web Application**

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I. INTRODUCTION

The rapid growth of urbanization has led to a significant increase in the number of vehicles, making parking management a major challenge in cities. Traditional parking systems rely on manual processes, where drivers have to search for available spaces, leading to time wastage, traffic congestion, and increased fuel consumption. This creates inconvenience for users and inefficiency in managing parking spaces.

The Smart Parking System is designed to overcome these challenges by using modern technologies such as sensors, Internet of Things (IoT), and mobile applications. The system detects the availability of parking slots in real time and provides this information to users through a digital platform. This allows drivers to find and reserve parking spaces quickly and easily.

By automating the parking process, the system reduces human effort and improves accuracy. It also helps in better utilization of available space and enhances the overall parking experience. The Smart Parking System plays an important role in the development of smart cities by making transportation systems more efficient and user-friendly.

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In today's rapidly developing world, urbanization and industrialization have led to a significant increase in the number of vehicles on the roads. As the population grows and the standard of living improves, more people are able to afford personal vehicles. While this brings convenience and mobility, it also introduces serious challenges, one of the most common being parking management.

Parking has become a major concern in cities, towns, and even semi-urban areas. In traditional parking systems, drivers have to manually search for available parking spaces. This process is often time-consuming and frustrating, especially in crowded places such as shopping malls, offices, hospitals, airports, and public areas. The lack of proper parking management systems leads to traffic congestion, wastage of fuel, and increased pollution. In many cases, drivers spend several minutes or even hours searching for a parking spot. This not only wastes time but also contributes to stress and inconvenience. Moreover, the absence of real-time information about parking availability makes the situation worse. Drivers have no way of knowing whether a parking slot is available until they physically reach the location.

To address these issues, the concept of a Smart Parking System has been introduced. A Smart Parking System is an advanced solution that uses modern technologies such as Internet of Things (IoT), sensors, wireless communication, and mobile applications to manage parking spaces efficiently. The main goal of this system is to provide real-time information about parking availability and make the parking process more convenient for users.

In a Smart Parking System, sensors are installed in each parking slot to detect whether the slot is occupied or free. These sensors continuously monitor the status of the parking spaces and send the data to a central server. The server processes this data and updates it in real time. Users can access this information through a mobile application or web interface, allowing them to check parking availability before reaching the location.

The system can also include additional features such as online booking, digital payment, and notifications. These features enhance the user experience and make the parking process faster and more efficient. For example, users can reserve a parking slot in advance and avoid the hassle of searching for a spot.

Another important advantage of Smart Parking Systems is that they help in reducing traffic congestion. Since drivers can directly go to available parking spaces, there is less unnecessary movement of vehicles on the roads. This not only saves time but also reduces fuel consumption and environmental pollution.

The Smart Parking System is an important component of smart cities. It integrates technology with urban infrastructure to improve the quality of life for people. By providing efficient parking solutions, it contributes to better traffic management and sustainable development.

In addition to user convenience, the system also benefits parking management authorities. It provides accurate data about parking usage, which can be used for planning and decision-making. It also reduces the need for manual supervision, making the system more efficient and cost-effective.

The Smart Parking System is a modern solution to the growing problem of parking management. It uses technology to provide real-time information, improve efficiency, and enhance user experience. This project focuses on designing and implementing such a system to address the challenges faced in traditional parking systems.

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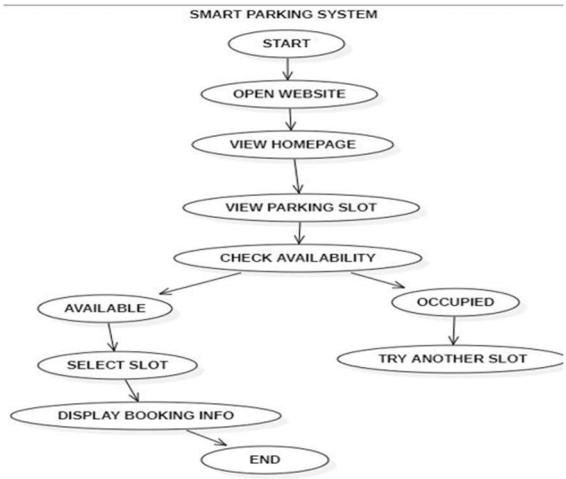

II. PROPOSED

The Smart Parking System that is proposed is designed to provide a way for people to see which parking spots are available. This system uses a website to show people which spotsre open and which are taken. The system is made using web technologies like HTML. The main goal of the system is to make it easy for people to find a parking spot and to help them understand which spots are available.

Overview of the Smart Parking System

The Smart Parking System works like a website that people can open and look at to see which parking spots are available. Each spot is shown in an organized way and it is clear whether the spot is available or not. For example a green color can mean that a spot is available and a red color can mean that it is taken. The Smart Parking System is not like systems that use real-time information and complicated backend processing. Instead it shows how a parking system can be made using basic web technologies. This makes the Smart Parking System easy to understand and use.

The Smart Parking System has a simple design and it has a few main parts:

1. The person who uses the Smart Parking System is called the user or client. The user is the person who looks at the website to see which parking spots are available.
2. The website that shows the parking information is called the web interface. The web interface is made up of HTML pages that display the parking information.
3. The parking spots are shown in an organized way and this is called the parking slot display.
4. The status of each spot is shown using indicators like text or colors. This is called the status representation.

When someone opens the website the HTML page loads in the browser. All the parking information is shown right away. The user does not need to wait for any information to be sent from a server or database.

The Smart Parking System is easy to use. It works in a straightforward way:

1. The user opens the website in a browser.
2. The user sees the homepage with options to navigate.
3. The user chooses to look at the parking spots.
4. The user sees a page that shows all the taken spots.
5. The user checks to see which spots are available.
6. If a spot is available the user can think about parking
7. If a spot is taken the user looks for another spot.

The Smart Parking System does not actually let people book a spot. It shows how a real system would work.

The Smart Parking System is divided into parts to make it easy to understand:

1. The homepage is the page of the website. It welcomes the user. Provides basic options to navigate.
2. The parking spot display shows all the parking spots in a grid or table. Each spot is clearly. Easy to find.
3. The status indication shows whether a spot is available or taken using colors or text.
4. The navigation allows the user to move between pages like the homepage, parking spots and contact information.

The Smart Parking System is designed to be simple, clear and easy to use. The goals of the system are:

1. To make it easy for people to use

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2. To make it clear and easy to understand
3. To make it accessible from any browser
4. To make it low-cost and not require software or hardware

The layout of the system is designed to help people find the information they need quickly and easily.

The Smart Parking System has advantages:

1. It is easy to develop and use
2. It does not require complicated backend or database
3. It has a simple and user-friendly interface
4. It helps people understand how a parking system works
5. It can be used as a starting point for future development

The Smart Parking System also has some limitations:

1. It does not have real-time updates
2. It does not let people actually book a spot
3. It does not store information in a database
4. It cannot handle users at the same time

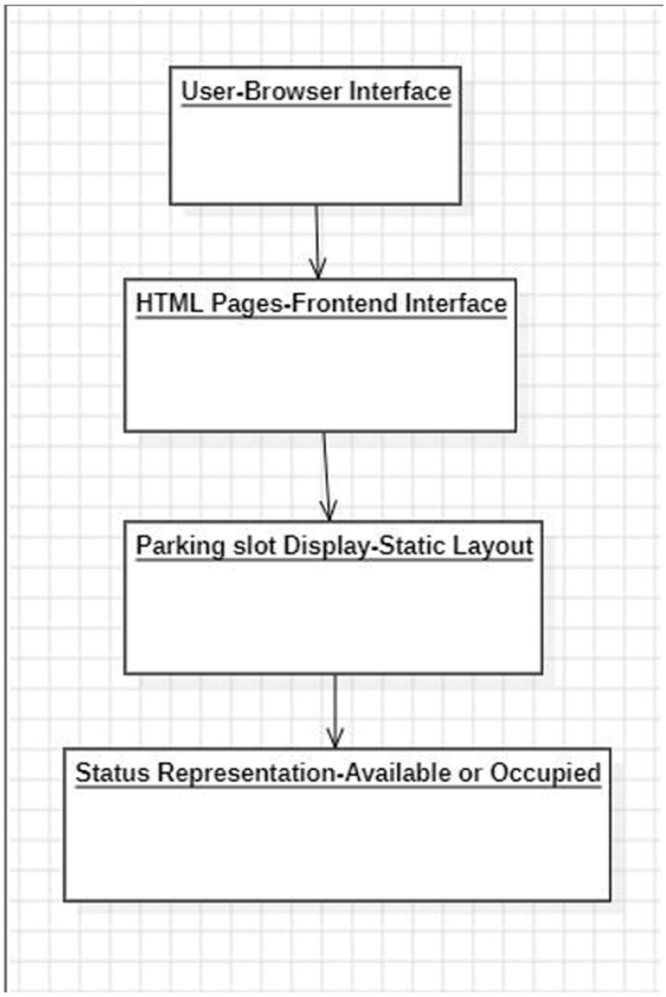
These limitations exist because the system is made using only HTML and focuses on the frontend design.

In the future the Smart Parking System can be improved in ways:

1. Adding backend processing using Python
2. Connecting to a database for real-time information
3. Implementing an online booking system
4. Adding payment options
5. Using sensors to detect whether a spot is available automatically

These improvements can turn the system into a fully functional smart parking solution.

The proposed Smart Parking System provides an clear way to show people which parking spots are available. Even though it is a system it shows how a real parking system works and can be used as a starting point, for developing more advanced systems in the future. The Smart Parking System is an example of how a simple system can be made using basic web technologies.



III. METHODOLOGY AND DESIGN

Methodology:

Overview of How We Do Things: The way we make the Smart Parking System's a series of steps that we follow to create, build and set up the system. We start by finding out what the problems are then we collect information develop the system test it and finally put it in place. The system uses a way of watching what is happening in real time using the Internet of Things. This means that parking spots are always being checked by sensors and the

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information is processed and shown to users through an app.

Steps We Take

1. Finding Out What the Problems Are: More cars are on the road → not parking spaces. People waste a lot of time looking for a place to park. This causes traffic jams. Makes the air dirty
2. Figuring Out What We Need: We need to know if parking spots are available right now. We need an app that is easy for people to use. We need a system that can detect empty spots accurately. We need to make sure it does not cost too much
3. Designing the System: We design the system, including the hardware and software. We choose the right sensors like infrared or ultrasonic ones. We pick a way for the system to communicate, like Wi-Fi
4. Building the System: We set up the hardware, including sensors and a microcontroller. We write the software code using Python and a web app. We connect it to a database
5. Testing the System: We check to make sure the sensors are working correctly. We make sure the system updates in time. We fix any errors that we find
6. Putting the System in Place. We install it in the parking area. We connect it to a server. We make the Smart Parking System available, to users

How We Develop the System:

We can use a way of developing the project called Agile.

This means we:

1. Divide the Smart Parking System into parts
2. Build it a bit at a time
3. Keep testing and making it better all the time

System Design:

System Architecture Design

Our system is made up of three parts:

The Hardware Layer,

The Communication Layer and

The Application Layer.

Here is what each layer does:

1. The Hardware Layer has sensors that figure out if a vehicle is present.
2. The Communication Layer sends data using Wi-Fi.
3. The Application Layer is where the user interface lives, like an app or a website.

Functional Design

The main things our system does are:

1. It detects if a parking slot is empty or not.
2. It sends data to the server.
3. It updates the user interface.
4. It lets people book and pay for parking.

Data Flow Design

We have two levels of data flow:

Level 0 is simple: the User talks to the System and the System talks to the Parking Data.

Level 1 is a bit more complicated: the Sensor talks to the Microcontroller, which talks to the Server, which talks to the User.

The DFD Diagram is on page 7.

Database Design

We use a tables to store our data:

1. The Users Table
2. The Parking Slots Table
3. The Booking Table

Some example fields we use are:

1. Slot ID, which's a special number, for each parking slot
2. Status, which says if a slot is Occupied
3. Time, which says when something happened.

Experimental Setup

The Smart Parking System is a web-based interface that we made to show how parking information can be displayed on a web page. This project is like a website that you can view in a web browser. We used HTML and CSS to make it. We did not need any special backend or database. The main goal of this setup is to show how we can clearly display parking slot information on a web page.

4. We used a computer to develop and test the Smart Parking System. This computer had hardware like 4GB RAM, a working processor and a web browser. We did not need any hardware or devices because the

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Smart Parking System does not use real-time data or sensors. This made it easy to develop and test the Smart Parking System.

5. To make the Smart Parking System we used a text editor like Notepad to write the HTML and CSS code. We did not need to install any software. We used a web browser like Google Chrome, Microsoft Edge or Mozilla Firefox to open and test the web pages. We saved the HTML files on the computer. Opened them directly in the web browser.
6. First we designed the structure of the web pages for the Smart Parking System. We made sections like the homepage, parking slot display page and navigation menu using HTML. Then we used CSS to make the Smart Parking System look better by adding colors, layouts and styling. We paid attention to the parking slot display section, where we arranged the slots in a grid format. Each slot is labeled clearly. We used colors like green for available and red for occupied to show the status.
7. After we finished designing the Smart Parking System we tested it by opening the HTML files in a web browser. We checked to make sure everything was displayed correctly. The layout was properly aligned. We also tested the navigation between pages to make sure users can easily move from one section to another.
8. We tested the Smart Parking System in ways. For example we checked if all parking slots are visible if the status colors are clear and if the design works properly on screen sizes. Since the Smart Parking System is static we focused on making sure the design is accurate and easy to use.
9. We also checked to make sure the Smart Parking System is easy to use. We wanted to make sure that even someone with knowledge can understand the interface without getting confused. The simple layout and clear labeling help users quickly see which parking slots are available.
10. The experimental setup of the Smart Parking System is simple and cost-effective. It shows how we can design a parking system interface using basic web technologies like HTML and CSS. Even though it does not have features it provides a strong foundation, for future development and enhancement of the Smart Parking System.

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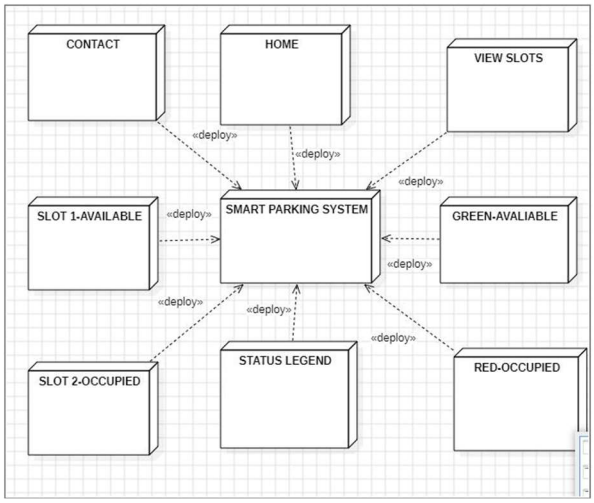

IV. RESULT

The Smart Parking System that we made for this project worked well when we used HTML and CSS to build it. The main thing we wanted to do was make it easy for people to see which parking spots are available. The results show that the Smart Parking System is good at looking nice being easy to use and showing information in a way.

We tested the Smart Parking System by opening the HTML pages in a web browser. When someone goes to the website the homepage shows up. It has options to navigate to other pages. The layout is simple and easy to understand so people can move around the website without getting confused. The links to pages work right and take people to the page that shows which parking spots are available.

The page that shows the parking spots is an important part of the Smart Parking System. The spots are arranged in a grid, which makes it easy for people to see all the occupied spots at the same time. Each spot is labeled clearly. We use colors to show if it is available or not. For example we use green to

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show spots and red to show occupied spots. This way people can quickly see which spots are available without having to read a lot of text.

We looked at the Smart Parking System to see how clear it was, how easy it was to use and how it looked. We found out that people can easily see which parking spots are available in a few seconds. The simple design helps reduce confusion and makes the website more enjoyable to use. Even people who are not good with technology can use the Smart Parking System without any problems.

Another good thing about the Smart Parking System is that it looks consistent. All the pages have a layout, which makes the website look organized and professional. We made sure that all the elements on the page are lined up properly and we used the spacing and font throughout the website. This makes the website easier to read and nicer to look at.

We also tested the Smart Parking System to see how it worked on screen sizes. The layout works well on different devices, like desktops and laptops. Even though it is a HTML design it still works well on different screen sizes. We could make a small changes to make it work even better on mobile devices.

V. APPLICATION/DISCUSSION/ ABLATION STUDY

Applications: The Smart Parking System is really useful in a lot of places where parking's a big deal. You can use it in shopping malls, hospitals, airports, colleges and office buildings. These are the kinds of places where a lot of cars come and go every day. It gets really hard to manage parking by hand. The Smart Parking System helps people figure out which parking spots are free and which ones are taken. The Smart Parking System is a starting point. Even though it is a system that uses HTML it can be used to make more advanced parking systems. Students can also use it to learn about how parking systems work. If we make some improvements to the Smart Parking System we can use it in cities to reduce traffic and make parking easier.

Discussion: The system we are talking about focuses on how it looks and feels to the user. It uses HTML and CSS to make a simple and easy to understand interface that shows people which parking spotsre available. One of the things about the Smart Parking System is that it is simple. People can easily see which parking spots are free without needing to know a lot about technology. The Smart Parking System is not perfect. It does not update in time. The Smart Parking System does not automatically change the status of parking spots. The Smart Parking System also does not let people actually book a parking spot.. There is no place to store information about users or parking spots. These are some of the reasons why the Smart Parking System's not very useful in real life. With these problems the Smart Parking System shows us how a smart parking system can work. It is a starting point, for future projects. If we add some features to the Smart Parking System like a backend and real-time updates we can make it more useful. The Smart Parking System can be. Made to work better.

Ablation Study: An ablation study is a way to figure out how important different parts of a system are. We do this by taking parts or changing them. In our project if we take away the parking slot display the system won't be useful. This is because users be won’t able to see if parking slots are available. If we remove the color indication users will get confused. Green means available and red means occupied. Without it users will have a time understanding the status of slots. If we take away the navigation menu users will have trouble moving between pages. This shows that every part of the system is important. Each part makes the system easy to use and effective. From this study we learn that simple things like layout, colors and structure are very important. They are important, in designing a system that's easy for users to use. Each part of the Smart Parking System helps it work well and be easy to use. The Smart Parking System relies on each of these parts to be useful. The parking slot display, color indication and navigation menu are all important.

CONCLUSIONS

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The Smart Parking System that we made for this project is really easy to understand when it comes to seeing which parking spots are available. Our main goal was to create a website that people can use easily. It had to be simple. We used HTML and CSS to make the website. It helps people see which parking spots are taken and which ones are not. The system is good at showing how we can organize parking information in a way that makes sense.

One of the things about this system is that it is simple. You do not need any software or a big database to use it. People can just open it in their web browser. See what is going on with the parking spots without getting confused. We used colors and a nice layout to make the system easy to use and look at.

The Smart Parking System is easy to use because it is simple.

The Smart Parking System is a system because it does not need any complex things to work.

Although the Smart Parking System does not tell you what is happening now or let you book a spot it is a good starting point for making a smart parking system. It helps us understand how these systems work and how we can make them.

The Smart Parking System can help us make smart parking systems in the future.

In the future we can make the Smart Parking System better by adding technology like databases and real-time updates. Overall this project is a start, for making advanced smart parking solutions. The Smart Parking System is a project.

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