# Project Proposal:
# Smart Parking Garage
# Management System
# (SPGMS)

CSCI 441 VC Software Engineering
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# Team B

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https://github.com/nbrandenburg/CSCI_441_VC_Team_B

**Team Profile**

Nicole Brandenburg, Team Leader

Nicole's strengths include organization and communication facilitation. She has experience in programming languages C++, Java, and JavaScript, as well as HTML, CSS, and SQL. She has experience with web design and database management.

Gene Holt

Gene's strength is in-depth knowledge of IT with some experience in programming languages like Java, c++, JavaScript, html/css and SQL.

Oakley Cardwell

Oakley possesses expertise in backend development and IT. His forte lies in architectural design and strategic planning. Proficient in a wide array of programming languages, he has extensive experience in full-stack development.

**Introduction**

The Smart Parking Garage Management System (SPGMS) aims to revolutionize the way parking garages operate by introducing a sociotechnical system that interacts seamlessly with both users and the physical environment. This proposal outlines the problem domain, the proposed solution, and the plan of work.

**Problem Diagnosis**

Current Challenges: Many parking garages face challenges such as inefficient space utilization, difficulty in tracking available spots, and lack of real-time data for users. From a user perspective, not finding a spot in a timely manner delays planned activities, increases the chances for the user to park further away from their intended area, and not being able to easily locate their vehicle when they want to leave. If the lot/garage they park at requires payment, the user will need to take time away from their plans to ensure that payment is made when they need to extend their visit or risk being towed. The more people searching for a parking space in any given parking lot/garage, the more difficult it is to enter/exit and navigate the parking lot/garage due to congestion. From an owners/operators perspective, if a spot is available and there is no

method to advertise it's availability, it can cause potential loss in revenue if no user randomly discovers it's availability. These problems are amplified in densely populated areas where people are randomly searching for parking spaces.

**Proposed Solution**

Our team plans to create a program that introduces interventions such as a user-friendly website for drivers, and predictive analysis data for garage operators. Drivers will be able to check spot availability, reserve spots, and even pay for their parking in advance. Garage operators will have historical statistical data from which to make business decisions regarding pricing and promotions, and to minimize unused space.

Our intended requirements for the program are as follows:

| Functional Requirements |
| --- |
| The system shall provide capability for drivers to check in for a reservation. |
| The system shall accommodate walk-in customers needing parking spots. |

| Non-Functional Requirements |
| --- |
| The system shall log the status of each space in the garage in real time. |
| The system shall record historical data for each space and each driver. |

| User Interface Requirements |
| --- |
| The system shall allow drivers to make reservations and payments online. |
| The system shall allow drivers to cancel reservations online. |
| The system shall allow garage operators to view historical data of parking spaces. |

> The system shall allow garage operators to set prices and promotions from their online accounts.

If our program is successful, drivers will be able to confidently make plans for parking in advance, and never arrive at the garage to discover that there is no space available. Garage owners will see increased revenue through efficient space utilization, enhanced user experience leading to repeat customers, and potential partnerships with nearby businesses for promotional offers.

Some example scenarios of the proposed system are outlined in the format of user stories, as recommended by Marsic (74).

| User Stories |
|---|
| As a driver, I can use the website to reserve a space to park my car. |
| As a driver, I can set up a recurring reservation for a specific space to use on a regular basis. |
| As a driver, I can cancel a reservation on the website if my plans change. |
| As a garage operator, I can view the status of each space in the garage in real time, so I know if there are spaces available. |
| As a garage operator, I can view historical trends in space usage to know if my spaces are being used efficiently. |

**Plan of Work**

Phase 1: Research and Data Collection

1.1. Identify target areas for data collection (e.g., specific parking lots, streets, or districts).

1.2. Gather real-time parking data.

1.3. Conduct surveys or interviews with users to understand parking preferences and behaviors.

1.4. Analyze collected data to identify patterns, peak parking times, and user pain points.

1.5. Document findings and prepare a report to guide the website development.

Phase 2A: Website Core Development

2A.1. Define website architecture and choose a development framework.

2A.2. Design the user interface (UI) and user experience (UX) based on research findings.

2A.3. Develop the core functionalities, such as user registration and dashboard.

2A.4. Integrate a database system to store user data, parking spot details, and reservation history.

Phase 2B: Website Feature Development

2B.1. Develop the spot reservation feature, allowing users to book parking spots in advance.

2B.2. Integrate a payment gateway to facilitate transactions for spot reservations.

2B.3. Implement real-time spot tracking, possibly using sensors or cameras, to show available spots in real-time.

2B.4. Add any additional features based on user feedback or research findings, such as spot recommendations or loyalty programs.

Phase 3A: Testing - Alpha and Beta

3A.1. Conduct internal alpha testing to identify major bugs and issues.

3A.2. Gather a group of external users for beta testing to get feedback on usability and functionality.

3A.3. Document feedback and issues, and prioritize them for resolution.

3A.4. Make necessary adjustments based on feedback.

Phase 3B: Deployment and Launch

3B.1. Finalize the website for public release, ensuring all features are optimized and bugs are resolved.

3B.2. Choose a hosting solution and deploy the website.

3B.3. Monitor the website's performance, ensuring uptime and smooth user experience.

3B.4. Launch marketing and promotional campaigns to attract users to the platform.

**Product Ownership**

<u>Nicole Brandenburg</u>

Nicole will focus on the frontend operations of the website.

<u>Gene Holt</u>

Gene will assist in frontend/backend development.

<u>Oakley Cardwell</u>

Oakley will initialize and implement the backend and database structure, as well as design the overall architecture for the functionality of the website.

**Conclusion**

The Smart Parking Garage Management System (SPGMS) is not just a software solution but a comprehensive approach to redefining the parking experience. With a clear understanding of the problem domain, a well-thought-out treatment plan, and a dedicated team, we believe this project will be a success.

**References**

Marsic, Ivan. *Software Engineering*. Rutgers University, 2012. New Brunswick, New Jersey. www.ece.rutgers.edu/~marsic/books/SE/.