Assignment 2 - User Stories

Relevant Features:

1. Parking spot detection
2. Autonomous parking maneuvering
3. Autonomous parallel parking

Use Cases

Actors for the entire System: The user/passenger of the car, the driverless car, and the driverless car system, sensors, car manufacturers, software engineers, regulatory authorities, mapping and localization systems, other vehicles and pedestrians.

Actor: The driverless car parking system

Use Case: Detect parking spots - The driverless car parking system detects potential parking spots

The driverless car parking system should be able to identify and analyze potential parking spots using sensors and cameras

Basic Flow: The driverless parking system scans the environment using the car's sensor. The sensor data is processed by the system and the system identifies open parking spots

Alternate Flow: One or more sensors fail to provide accurate data

- The system detects a sensor malfunction
- An error message is displayed indicating the affected sensors.
- The system may attempt to recalibrate or use alternative sensors.
- If the issue persists, the system provides notification on the console and recommends manual parking.

Alternate Flow: Limited parking Information is available

- The system processes the sensor data, but there is limited information
- As a result, the system generates a partial map and the system displays a notification on the console about limited coverage and potential inaccuracies

Alternate Flow: Environmental interference occurs

- The sensors detect significant environmental interference such as heavy rain, snow, or fog or unexpected obstacles

- The system displays a warning on the console about reduced accuracy due to environmental conditions.
- The system suggests caution to the driver and recommends manual parking

Autonomous Parking Maneuvering:

Use Case: Autonomously maneuver the car to parking spot - The driverless parking system autonomously navigates and maneuvers the car to a parking spot.

The driverless parking system should be able to facilitate the autonomous maneuvering of the vehicle to a user-selected parking spot while actively considering and avoiding obstacles in its path.

Basic Flow: The driverless parking system navigates to the parking spot without having encountered any obstacles.

- The system plans a trajectory by considering the car's dimensions and the surrounding environment.
- The system uses sensors and cameras to continuously scan and analyze the environment to identify obstacles and potential hazards.
- The car autonomously navigates to the selected parking spot.
- Once the car reaches the designated spot it completes the parking maneuver, activating safety measures such as applying the parking brake.

Alternate Flow: The system detects an obstacle during navigation.

- An obstacle is detected during the autonomous navigation.
- The system adjusts the car's trajectory to avoid the obstacle.
- If the obstacle cannot be avoided safely, the system halts the parking maneuver and alerts the user.

Alternate Flow: The system loses the GPS signal during the parking process

- The system loses the GPS signal during the parking process
- The system switches to alternative sensors and maps if available, ensuring continued autonomous navigation.
- If alternative methods are insufficient, the system may pause and request user intervention.

Alternate Flow: The user cancels parking maneuver:

- The user cancels the parking maneuver.
- The system acknowledges the cancellation request and brings the car to a stop.
- User regains manual control for further driving or parking decisions.

Alternate Flow: A malfunction occurs in the driverless parking system

- The driverless parking system experiences a malfunction
- The system identifies the malfunction and notifies the user.
- The car reverts to manual mode, and the user is prompted to contact technical support.

Autonomously parallel park

Use Case: Autonomously parallel park - The driverless car system parallel parks itself

The driverless car system should be able to assist the driverless car in parallel parking within a designated parking space.

Basic Flow:

- The car's sensors detect and evaluate available parallel parking spaces.
- The car autonomously positions itself parallel to the curb within the identified space.
- The system controls acceleration, braking, and steering for a smooth parking maneuver.
- The car continuously monitors surroundings, adjusting for precise alignment within the parking space.
- The system provides visual or audible confirmation to the user.

Alternate Flow: User Aborts Parking Maneuver

- The user activates the abort command through the car's interface.
- The system acknowledges the user's command.
- The car smoothly transitions back to normal driving mode.

Alternate Flow: User Adjusts Parking Position Manually:

- The user disengages the automated parking system.
- The car gives control to the user.
- The user adjusts the car's position manually.
- The user completes the parking maneuver manually if necessary.

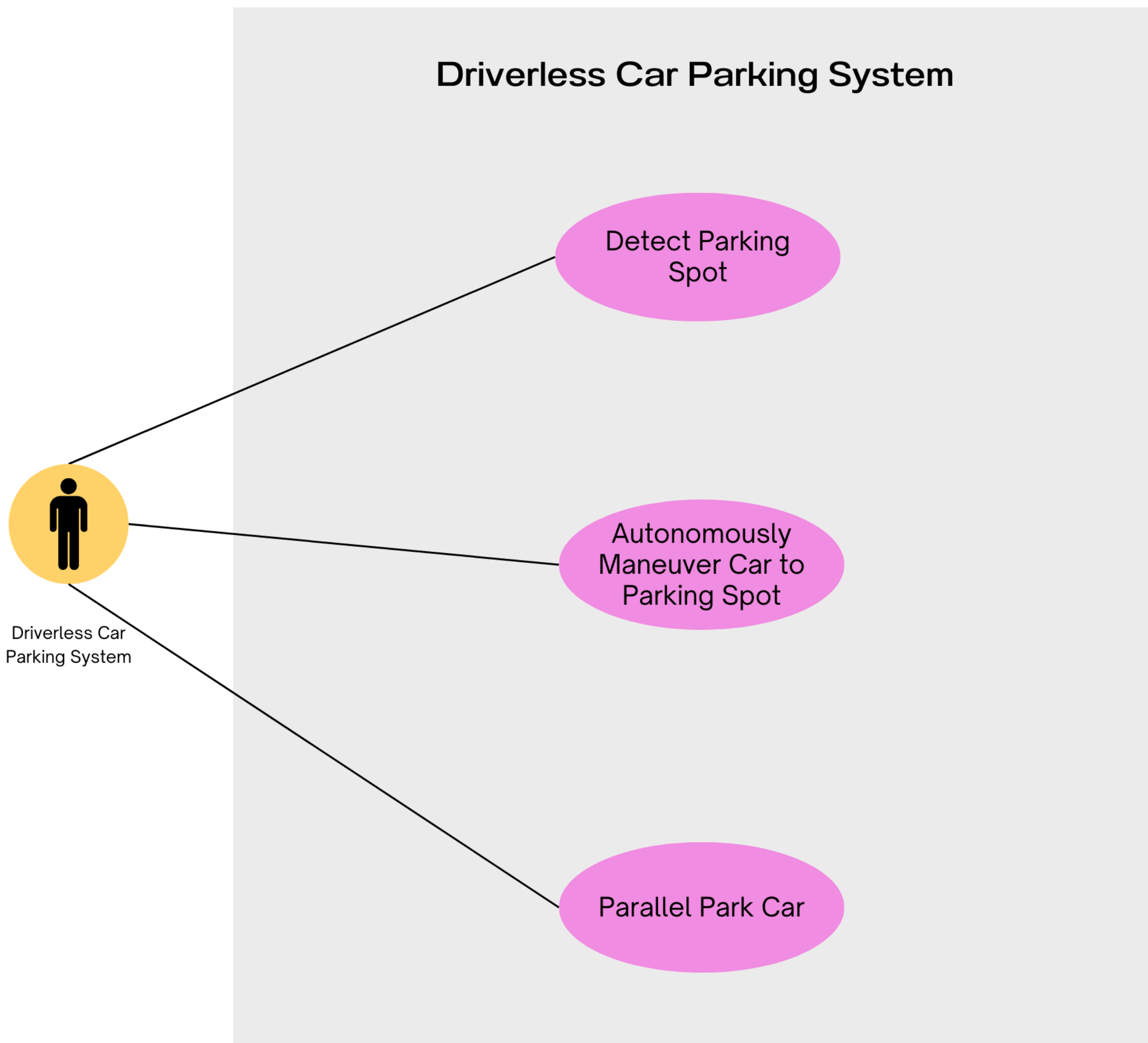
Alternate Flow: Obstacle Detected During Maneuver:

- Car's sensors identify an obstacle in the planned parking path.
- The system immediately aborts the current maneuver.
- The system recalculates a new parking path considering the obstacle.
- The car adjusts its position to avoid the detected obstacle.
- The system resumes the parking maneuver.

Alternate Flow: Communication Loss During Maneuver:

- The car loses communication with the central system.
- The system disengages from the parking maneuver for safety reasons.
- The car alerts the user about the communication loss.
- The user is prompted to take appropriate action such as manual parking or waiting for communication restoration.

Use Case Diagram



User Stories

Title: Parking Spot Detection

User Story: As a driverless car parking system, I want to detect open parking spots in my vicinity so that I can park seamlessly without human intervention.

Description: The driverless car parking system aims to autonomously detect open parking spots using advanced sensor technologies, such as cameras, LiDAR, and ultrasonic sensors. The system will employ sophisticated algorithms to identify available spaces based on size, location, and accessibility, ensuring robust performance in various environmental conditions.

Acceptance Test: detectParkingSpot

Acceptance Criteria:

1. Given: the driverless car is equipped with sensor technology and communication capabilities,
   When: the car enters a parking area or is in proximity to parking spaces,
   Then: the system should accurately detect and identify open parking spots within the vicinity based on sensor inputs.

2. Given: varying environmental conditions such as different lighting, weather, and time of day,
   When: the driverless car is navigating through a parking area,
   Then: the parking spot detection system should consistently perform effectively, adjusting to different conditions to ensure reliable performance.

3. Given: a dynamic parking environment with moving vehicles, pedestrians, and potential obstructions,
   When: the driverless car is searching for parking spots,
   Then: the system should prioritize the safety of both the vehicle and its surroundings, avoiding collisions and demonstrating an awareness of the dynamic environment.

4. Given: real-time communication capabilities of the driverless car parking system,
   When: the open parking spot is detected,

Then: the system should communicate the availability of the parking spot to the central system or other connected vehicles to enhance overall parking efficiency in the area.

5. Given: the potential for system updates and improvements,
   When: new versions or enhancements are released,
   Then: the parking spot detection system should be easily upgradable, and the updates should be deployed seamlessly to ensure continuous improvement and adaptation to evolving environments.

Priority: 1 - High

Story Points: 34 SP - 18 months

Title: Autonomous Parking Maneuvering

User Story: As a driverless car system, I want to autonomously navigate and maneuver the vehicle to the user's selected parking spot, so that the user can experience effortless and efficient parking without manual intervention.

Description: The driverless car system aims to autonomously navigate and maneuver the vehicle to the user's selected parking spot, ensuring effortless and efficient parking without manual intervention. This involves seamless integration with advanced navigation systems, allowing for precise and safe parking experiences according to user preferences.

Acceptance Test: maneuverCarToParkingSpot

Acceptance Criteria:

1. Given: the driverless car system is activated,
   When: the user selects a parking spot using the interface or command,
   Then: the car should initiate the navigation process towards the chosen parking spot.

2. Given: the driverless car system has started navigating towards the selected parking spot,
   When: the car encounters obstacles or pedestrians in its path,
   Then: it should detect and avoid them and adjust its route if necessary to ensure a safe parking process.

3. Given: the driverless car has successfully reached the user's selected parking spot,
   When: the car is within a reasonable distance to the parking spot,
   Then: it should maneuver itself to align with the parking space without colliding with surrounding objects.

4. Given: the driverless car has aligned itself with the parking space,
   When: the user confirms the parking action through the interface or command,
   Then: the car should complete the parking process by safely coming to a stop and braking

5. Given: the parking process has been completed,
   When: the user decides to exit the car,
   Then: the car should remain safely parked until further instructions are given, maintaining its position without unintended movements.

6. Given: the driverless car system is in use,
   When: there are unforeseen issues or errors during the autonomous parking process,
   Then: the system should provide clear and informative error messages to the user, indicating the nature of the problem and any necessary actions to be taken.

Priority: 1 - High

Story Points: 34 SP - 18 months

Title: Autonomous Parallel Parking

User Story: As a driverless car, I want to autonomously parallel park into parallel parking spaces

Description: The driverless car seamlessly and precisely executes parallel parking maneuvers into designated spaces utilizing advanced sensors and control systems. This innovative feature increases convenience while also addressing challenges associated with parallel parking. It also minimizes the need for manual intervention, contributing to overall user satisfaction.

Acceptance Test: parallelPark

Acceptance Criteria:

1. Given: that the driverless car has identified an available parallel parking space,

When: the car receives the command to parallel park,
Then: the car should initiate the parallel parking process by scanning the space and aligning itself

2. Given: that the driverless car has initiated the parallel parking process,
When: the car detects obstacles or other vehicles during the parking maneuver,
Then: the car should adjust its trajectory and speed to avoid collisions.

3. Given: that the driverless car has successfully aligned itself within the parallel parking space,
When: the car completes the parking maneuver,
Then: the car should come to a complete stop and notify the system that it has successfully parallel parked.

4. Given: that the driverless car is autonomously parallel parking,
Whe:n the parking space is too small for the car to fit or there is an obstruction preventing successful parking,
Then: the car should notify the system that the parking attempt has failed and seek an alternative parking solution.

5. Given: that the driverless car has completed parallel parking autonomously,
When: the car is parallel parked on a slope,
Then the car should activate necessary safety mechanisms such as the parking break to ensure it remains stationary without rolling.

Priority: 1 - High

Story Points: 34 SP - 18 months

Advantages and Disadvantages of Use Cases and User Stories for Driverless Parking Features

Use Cases:

Advantages:

- Focus on system behavior: Use cases provide a detailed description of how the system should behave in specific situations, considering different actors and goals. This helps ensure the system meets all functional requirements.

- Clarity and Specificity: Precise use cases ensure everyone involved understands exact parking scenarios, like handling various parking lot layouts, or navigating tight spaces. This clarity leads to a well-defined system that meets diverse parking needs.
- Identify alternative flows: By outlining various flows, use cases can help uncover potential edge cases or unexpected situations the system might encounter such as a malfunctioning system or gps signal loss. This allows developers to design safeguards and fallback mechanisms, leading to a safer and more reliable parking experience.
- Facilitates communication: Use cases act as a common language for developers, designers, and stakeholders, promoting clear understanding of the system's functionality. Clear communication is important for developing safe, reliable, and user-friendly driverless parking systems
- Use Case Diagram: Creating a use case diagram for self-parking development enhances clarity, helps to identifies key actors and actions and helps to visualize different scenarios

Disadvantages:

- Can be time-consuming: Creating detailed use cases for every possible scenario can be time-intensive, especially in complex systems like driverless parking.
- Less user-centric: Use cases primarily focus on system behavior, potentially neglecting the user's perspective and experience. For example, the system might park the car correctly but far from their desired destination or provide unclear instructions during the process. This can inconvenience the user.
- Limited flexibility: Use cases tend to be static documents and may not adapt well to changing requirements or new ideas.
- Up-front requirements: In the context of driverless car development, upfront requirements, while detailed, may face challenges adapting to the dynamic real-world environment and evolving autonomous car technologies. New sensors, perception algorithms, and even vehicle designs emerge rapidly. Upfront requirements based on today's technology might become obsolete tomorrow, hindering the integration of these advancements and limiting the system's long-term potential.

User Stories:

Advantages:

- User centric: User stories for self-parking cars prioritize the driver's perspective, outlining functionalities and desired outcomes from the driver's point of view in the context of autonomous parking. This approach enhances the user-friendliness and intuitiveness of the self-parking system.
- Adaptability: User stories are brief and flexible which allows for changes during the development process of autonomous parking features. This adaptability ensures that the self-parking system can evolve to meet evolving user preferences and technological advancements.
- Enhanced Collaboration: Emphasizing user stories in self-parking car development promotes collaboration among developers, designers, and product owners. Everyone

involved can come to a shared understanding of the specific user needs related to autonomous parking features. This ensures that the self-parking system is not only technically robust but also aligns with the user's expectations and preferences in various parking scenarios.

- Acceptance Tests: Setting clear rules for how self-parking car features should work is helpful. It makes sure everyone knows what to expect, keeps the focus on what users need, helps test things thoroughly, avoids potential problems early on, encourages teamwork and allows for ongoing improvements.
- Story pointing and prioritizing: Story pointing helps estimate the amount of effort required for developing a feature, making it easier to plan and allocate resources for the system. Prioritization can ensure that the most important tasks are worked on first, leading to efficient development and the timely delivery of the self-parking system.

Disadvantages:

- Limited Specifics: User stories are often concise. This consciousness may result in a lack of intricate details necessary for comprehensive system design and rigorous testing of the autonomous parking functionality.
- Incomplete Functionality Coverage: Without meticulous planning user stories for self-parking cars may overlook important functionalities or fail to address edge cases. This can result in gaps in the autonomous parking system's capabilities.
- Subjectivity Challenges: In the context of self-parking car development, user stories can be subjective and prone to interpretation. Therefore precise communication and well-defined parameters will be necessary to prevent misunderstandings. This is essential to ensure that the autonomous parking features align with user expectations and perform in diverse scenarios.