Problem Statement and Goals
Park'd

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Table 1: Revision History

Date	Developer(s)	Change
Sep 22, 2022	Albert, Almen, David, Gary, Jonathan, Kabishan	Revision 0
Apr 4, 2023	Albert, Almen, David, Gary, Jonathan, Kabishan	Revision 1

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1 Problem Statement

In a car centered city where you drive everywhere, finding a place to park can either be straightforward or a complete chore. How often do you enter a parking lot and immediately find a spot to your liking? One that's close to the store, or handicapped reserved. Do you find yourself more often driving up and down lanes looking left and right for a spot? While following others doing the same. What if there was a way that saved you the trouble and showed you an open spot?

1.1 Problem

Drivers waste their valuable time driving around parking lots looking for an open spot. We aim to drastically reduce this time by finding open spots and directing drivers to them.

1.2 Inputs and Outputs

Included in this section are high level inputs and outputs to characterize the Problem.

1.2.1 Inputs

- Parking lot cameras or sensors

- Parking lot location

- Parking spot preference (standard, handicapped, reserved)

- User spot selection

1.2.2 Outputs

- Location of open spots

- Directions to the selected spots

1.3 Stakeholders

For our problem, two stakeholders were identified, drivers and parking lot owner/manager.

1.3.1 Drivers

Any person who needs to park their car at a parking lot would be a key stakeholder for our project as they would be the main user of our product. Drivers are the main demographic that faces the problem of finding an empty spot in a parking lot. They would be able to use our product to find empty parking spots, which would be especially useful in a busy lot.

1.3.2 Parking Lot Owner/Manager

Parking lot owners/managers need to give permission to setup cameras or sensors on their property. They also don't want customers to waste their time in parking lots when they can be shopping. With fewer drivers wandering around, collisions and arguments are less likely to occur.

1.4 Environment

The system is used in a vehicle by a driver or passenger, so it must comply with laws relating to device usage by drivers.

2   Goals

Goals	Description	Importance
Open Spot Detection	Analyze a video feed of a parking lot and detect whether parking spots are empty or occupied.	Detecting empty and occupied parking spots is the core functionality of our program. This goal must be achieved and the feature must be robust before we can develop other features and aspects of the project.
Video Translation	Accurately translate locations from a video feed to physical locations in the parking lot and creating a map of the parking lot.	Detecting where the parking spots are from a video feed and mapping it out is essential as we want to provide a map the users can easily understand. They can use that map to see which spot is most convenient for them as well as easily navigate to available spots.
Spot Guidance	Guide drivers to the shortest path to empty parking spots.	Just finding an open parking spot for the user would not be effective as they would still have to drive around the parking lot looking for the available spot. Navigating users to the available spot would save them more time as they would immediately know where to park and how to get there.

Table 2: Goals

Goals	Description	Importance
Preference	Drivers can set a preference to specific types of parking spots.	The ability to set a preference for special parking spots such as Accessible spots would be important as well as convenient for applicable users. The preferred spots would be highlighted or automatically selected for users to easily navigate to.
Special Spot Recognition	Recognize special parking spots such as Accessible or Reserved spots	We do not want to navigate users to empty parking spots that they do not have the right to use, such as Reserved and Accessible spots. On the other hand, we want to highlight the special spots for those who can use them and/or have set a preference for a special parking spot.
~~Hands free interaction~~	~~Users can interact with the system in a hands-free manner and the system will give information to the user in a way that minimizes distraction.~~	~~Since it is illegal for drivers to touch their phone while driving, the system needs to be usable in other hands-free means. It is extremely important for users to be safe and not distracted while using our system in their vehicles.~~

Table 3: Goals continued

3 Stretch Goals

Goals	Description	Importance
Immediate Spots	Prioritize giving drivers spots closest to their location.	Parking lots can be large with confusing layouts and spots should be prioritized by ease of access by vehicle and by foot.
Vandalism analysis	Appraise the risk of vandalism to a vehicle by analyzing body language, and detect when it is taking place.	Parking lots are publicly accessible and vehicles are always at risk of break-ins and damage. This feature may alleviate the worries that some drivers have regarding their vehicles.
Spacious Spots	Detection of spots with adequate space for a given vehicle, depending on vehicle dimensions and gaps left adjacent to the space.	Recommending an unusable space, for example due to poor parking by adjacent drivers, is a frustrating experience. Our application should minimize the amount of erroneous parking recommendations.
Reservations	Reserving a parking spot before arriving at the destination.	Reserving a space can save computation time at the moment of arrival by front-loading the search for an open parking space. This feature will also help ensure that a parking spot is not taken after it is given to the driver.

Table 4: Stretch Goals

Goals	Description	Importance
Hazard Detection	Identification of parking hazards such as damaged pavement, large puddles, or loose debris.	Hazard detection will help alert drivers to obstructions in their parking space to minimize erroneous recommendations, in conjunction with the adequate space detection feature.
Improper Parking Detection	Detection of parking across multiple lines, in reserved areas such as fire lanes, or across driveways, among other possibilities.	This feature could be used by parking lot administrators to administer fines or other warnings. It will help maintain an orderly parking area, which could be a further incentive to potential partners and users.
Occupancy Tracking	Track the duration of occupancy for a given space and compare it to an estimation of the average parking duration of the area. Furthermore, analyze groups which appear to be preparing to leave the parking lot.	In the event that a parking lot becomes full, providing an estimate of when a spot may become available can be helpful to the end user. The common chore of following a exiting group back to their vehicle could be automated.
Hands free interaction	Users can interact with the system in a hands-free manner and the system will give information to the user in a way that minimizes distraction.	Since it is illegal for drivers to touch their phone while driving, the system needs to be usable in other hands-free means. It is extremely important for users to be safe and not distracted while using our system in their vehicles.

Table 5: Stretch Goals continued