# Use Case Diagram

Based on the requirements that were agreed on with the customer, two main use cases of the system can be found:

\begin{itemize}

\item{Drive out of a perpendicular Parking Lot}

\item{Drive out of a parallel Parking Lot}

\end{itemize}

Both use cases have in common that at the end of the successful process, the user has to regain the control over its vehicle in a defined way. Additionally, the user should always have the possibility to interrupt the process and regain the control over the car, even if the process has not yet finished. Each of the use cases are triggered by the driver as well as they are supported by various sensors and control systems.

# Sensor Overview

To support the presented use cases, the system needs an overview of the cars surrounding. Six sensors, two of them cameras and 4 of them distance sensors, are placed in the car to provide this overview. The placement of the sensors can be retrieved from figure \ref{fig:SensorOverview}.

The sensors that are placed in the middle of the car’s front and rear are cameras. In many cases cameras are already integrated in the car and provide the user a realistic image of its surrounding. The distance sensors at the corners of the bumpers might be radar- or ultrasonic-sensors. Radar sensors have the advantage, that they might be placed within the bumper and that they are therefore not visible.

# Context Diagram

After the use cases and the required sensors have been found, the context of the system to develop can be determined (see figure \ref{fig:ContextDiagram}). Dataflows are depicted with solid arrows while signals that are used to control the systems are sketched with dashed arrows.

Beside the sensor information, the graphical representation of the process and the information that is sent to the car’s control systems, there exist two systems that are used to interrupt the process of leaving a parking lot. If a driver sits in the car and presses the break pedal, the process will be interrupted immediately and the driver will regain the control over its vehicle. If the whole process is controlled remotely without the driver sitting in its car, the external application that controls the process should act as a dead man’s switch that is operated by the user. If the signal from this application is no more retrieved by the system, the process should be interrupted.

# Design Sketches

A first design sketch has been developed (see figure \ref{fig:initialMockup}) and the customer’s feedback on the design has been gathered, this feedback is used to create refined mockups. Since the customer requests two designs -- one for the day and one for the night-mode -- two of these refined designs are developed.

These newly designed mockups also take the customer’s feedback into account that some outputs should be simplified and that the area where the sensor information is presented should not be reduced. Instead, the area presenting the aerial view is reduced and the sensor information are presented in a wider area.