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MASTER COURSE  
DISTRIBUTED COMPUTING SYSTEMS  
ENGINEERING

WORKSHOP EE5503 :  
**TopicOfAssignment**

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# Contents

<b>1</b>	<b>Aims, Objectives and expected Outcome</b>	<b>2</b>
<b>2</b>	<b>Project Plan</b>	<b>3</b>
<b>3</b>	<b>Project Management</b>	<b>4</b>
<b>4</b>	<b>Resource Allocation</b>	<b>5</b>
<b>5</b>	<b>Risk Analysis</b>	<b>6</b>
<b>6</b>	<b>Market Analysis</b>	<b>7</b>
6.1	Current Systems implemented in todays Cars . . . . .	7
6.2	Scientific Projects . . . . .	8
6.3	Development of the market . . . . .	9
6.4	Conclusion . . . . .	9
<b>7</b>	<b>Tasks and Work Plan</b>	<b>11</b>
<b>8</b>	<b>Process Flow, Critical Path Identification and Predictive Models</b>	<b>12</b>
<b>9</b>	<b>Customer Reports and Analysis</b>	<b>13</b>
<b>10</b>	<b>Product Development and Production Life Cycle Analysis</b>	<b>14</b>
<b>11</b>	<b>Facilitation and Monitoring of the Process</b>	<b>15</b>
<b>12</b>	<b>Conclusions</b>	<b>16</b>

## List of Abbreviations

# Chapter 1

## Aims, Objectives and expected Outcome

**Author:** Hans

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# Chapter 2

## Project Plan

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# Chapter 3

## Project Management

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# Chapter 4

## Resource Allocation

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# Chapter 5

## Risk Analysis

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# Chapter 6

## Market Analysis

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An important step in development of a new product is to analyze the market. This analysis not only includes the identification of competitors and their offered technologies, but also the investigation of the demand on the product to develop and its future progression.

The subsequent analysis is done in an indirect way so that the presented information is retrieved by querying the internet and putting altogether the retrieved information.

### 6.1 Current Systems implemented in todays Cars

There are only a few systems available that help the driver in leaving a parking space. These systems exhibit a huge variety of autonomy. The manufacturers Volvo, Audi and Lincoln sheet park assistance systems that take control over the steering wheel while leaving a parking lot (see Volvo Cars Support [2016], Lincoln Motor Company [2014] and Audi Espaa). While the steering is done autonomously, the driver has to manually operate the pedals. This kind of systems is mostly restricted to parallel parking.

Mercedes-Benz offers a more autonomous, but also more restricted way of assisted parking. The Mercedes Benz Parking Pilot is able to park and leave

the parking site autonomously. The quitting of the parking site is restricted to those scenarios in which the Parking Pilot was also used to park the car (see Daimler AG [2016]).

Tesla offers the Summon functionality implemented in its Model S and Model X. It allows a driver to leave its car and park as well as retrieve it autonomously. This feature is restricted to perpendicular parking only (see Tesla Inc. [2016] ). Current Systems available from Suppliers

The development of systems assisting a driver in parking and leaving a parking lot can be illustrated by the evolution of the products originating from Robert Bosch GmbH. While the early systems act as it was described by for the manufacturers Volvo, Audi and Bosch (see Robert Bosch GmbH [2013a] ), the current systems are now able to drive itself into and back out of a parking site autonomously (see Robert Bosch GmbH [2013b] ). Another future application of park assistants is the Bosch Home Zone Park Assist. It enables a driver to train its car for certain parking situations (see Robert Bosch GmbH [2016]). The car records a route that is driven and it is able to reproduce it even if the starting point of the route is slightly different. On its trained way, the car is able to detect impediments and to react to them.

## **6.2 Scientific Projects**

There exist several projects that target on the same functionality. While the work of Katsev and Braun (see Braun and Katsev [2004] ) that already started in 2004 seems not to have reached the point where leaving a parking lot is implemented since no further resources can be found on that project, Roland Doloczki and Don Kevin Gaubitz produced a working prototype of RC-Car that autonomously leaves a parking space (see Doloczki and Gaubitz [2015] ). To achieve their goal, Doloczki and Gaubitz use ultrasonic and infrared sensors to sense the environment around parked vehicle.

## **6.3 Development of the market**

It is obvious that the demand on systems that perform certain manoeuvres autonomously will increase with the success of autonomous cars. But also in the meantime till these cars make the breakthrough, there might be an increased need for advanced driver assistance systems (ADAS) like parking assistants. Following McKinsey Inc., there will be three eras in the revolution of self-driving cars (see Bertonecello and Wee [2015]). The first era, starting from now and lasting till the late 2020s, is characterized by the first autonomous vehicles being produced and their impact on established car manufacturers. McKinsey states that the premium makers will take an incremental approach to autonomous vehicles by implementing more sophisticated ADAS. This assumption is supported by Statista, assuming that the shipment of ADAS units will increase by more than 500% in the time from 2012 to 2020 (see Statistica Inc.).

One of the buzz word regarding future driver assistance systems is Valet Parking which means that a car parks itself after the driver has left it and that the car can be retrieved from its parking position without active control of the driver. Therefore, Valet Parking needs the possibility of a car autonomously leaving its parking site. A research project targeting on Valet Parking was announced by Daimler, Bosch and Car2go in the year 2015 (see Daimler AG [2015]).

## **6.4 Conclusion**

It has been worked out that the systems that are implemented in today's cars are less sophisticated than the system that is planned to develop. Additionally, the increasing need for ADAS like park assistants has been exposed. However, there are other scientific projects that aim on the same kind of system and that have to be overcome by additional functionality or improved safety and reliability. The major competitor in this sector will be the Robert Bosch GmbH that already demonstrated its product with a real vehicle and that is working together with a lot of important car manufactur-

ers like Daimler or Audi.

# Chapter 7

## Tasks and Work Plan

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## Chapter 8

# Process Flow, Critical Path Identification and Predictive Models

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## Chapter 9

# Customer Reports and Analysis

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## Chapter 10

# Product Development and Production Life Cycle Analysis

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# Chapter 11

## Facilitation and Monitoring of the Process

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# Chapter 12

## Conclusions

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## List of Tables

## List of Figures

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