# MIDDLE EAST TECHNICAL UNIVERSITY

## DEPARTMENT OF
## ELECTRICAL AND ELECTRONICS ENGINEERING

### EE493 ENGINEERING DESIGN I

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# Car Chasing Robot
## Conceptual Design Report

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**Supervisor:** Assoc. Prof. Emre Özkan
METU EE / C-112

**Project Start:** 4/10/2018
**Project End:** 26/5/2019
**Project Budget:** $450

**Company Name :** Duayenler Ltd. Şti.

| Members | Title | ID | Phone |
| --- | --- | --- | --- |
| Sarper Sertel | Electronics Engineer | 2094449 | 0542 515 6039 |
| Enes Taştan | Hardware Design Engineer | 2068989 | 0543 683 4336 |
| Erdem Tuna | Embedded Systems Engineer | 2617419 | 0535 256 3320 |
| Halil Temurtaş | Control Engineer | 2094522 | 0531 632 2194 |
| İlker Sağlık | Software Engineer | 2094423 | 0541 722 9573 |

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# 1 Executive Summary

Increasing demand on automobiles, encourages industry to produce more. The increase of car count in the traffic, makes the traffic flow more complex. In this scope, autonomous cars bring an innovative solution for reducing the complexity. Potential benefits of automated cars include smart use of fuel, safer traffic and increased mobility. To realize and come up with such solutions, DUAYENLER Ltd. Şti. (DUAYENLER) is founded by five innovative and enthusiast electronics engineering students to intelligently automate the future of traffic.

DUAYENLER is composed of talented and diligent people from different disciplines to complete the envisioned problem. DUAYENLER consists of two engineers from computer area, two from electronics area and one from control area. Since realization of the problem requires combinations of different disciplines, DUAYENLER is qualified to accomplish the encountered problems.

DUAYENLER will address the need of autonomous cars. Thus, the aim of the proposed project is to design and construct a vehicle that can follow a closed path without a driver on board. Furthermore, the vehicle will be able to sense other vehicles on the road as well as handling the obstacles.

The vehicle will use camera vision and sensors to detect and understand environment. With the obtained data, the vehicle will operate in a way that it adjusts its direction and speed correctly. Additionally, if the vehicle detects another vehicle within 5 cm either at the front or at the back, it will activate the handshake protocol to communicate with the opponent and stop with positive signal.

The duration of the project is intended to last 33 weeks, starting from October, 1 2019 and ending in May, 26 2019. The estimated cost for research and development phase is $ 450 whereas mass production cost per vehicle will be at most $ 200. Along with the vehicle itself, DUAYENLER will provide its customers with deliverables such as user and technical manuals, elliptical race path, chargeable battery and battery charger. Also, the vehicle will have two (2) years of warranty.

# 2 Introduction

DUAYENLER is established with the aim of developing autonomous car technologies for near future. To serve that purpose, Car Chasing Project is initiated by the company. With this project, the company aims to accomplish the following objectives:

1. Sensing the environment and other vehicles on the roads

2. Automatic adaptive lane detection

3. Self driving

4. Autonomous wireless communication with surrounding counterparts

- Problem statement

- Background information

- Organization of the report

This report includes;

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# 3 Solutions

# 4 Plans

# 5 Conclusion

As technology develops further, the automated robotics can ease the human life by finding solutions to daily problems. Driving is one of these problems. Many companies are trying to solve this problem by pushing the limits of the robotics area. DUAYENLER, as a visionary company in this field, will produce a fast-autonomous car that is trying to catch the opponent in its elevated elliptical path.

As in every project, creating an autonomous car has some problems that must be considered; such as staying on the path, implementation of the handshake protocol with the opponent robot, being fast and robust. However, there are some solution alternatives. For example, to keep the robot in the path, image processing or sensor arrays can be used. For the faster and robust movement of the car, more capable DC motors such as brushed DC motors and a 4-wheeled car structure with servos on the front can be used. To carry out the handshake protocol with the opponent, Bluetooth modules working in accordance with a distance sensor can be used.

According to DUAYENLER, the major objectives are fast operation, robustness, weight balance and low power consumption. Since the main aim is catching the opponent without losing the path, the fast operation and robustness are very important. Also, low power consumption is another objective that should be common for all the companies.

DUAYENLER believes that the result will bring an innovative approach to the design of autonomous cars because it not only has the self-driving capability, but also the capability of communicating with the opponent.

# 6 Disclaimer