

Proposal Report

**Problem statement:**

A self-contained robot will be designed which follows similar robots in a single line. It will also be capable of leaving the line upon the external leave command and re-join the convoy as a last one. Robots will not communicate each-others directly, they will broadcast the information which indicates that they are leaving or they are the last one in the line. Any signal will be provided by two different actuators and be sensed by according sensors. The vehicles will keep appropriate following distance and move in the reasonable speed. When followed robot will turn on the leaving signals and start to leave the line, the following one will stop following it and look for and follow the vehicle in front of the leaving robot. All robots will have distance sensor to prevent crash. Vehicles will be able to follow leading robot when it is not following a straight line and changes its direction, also turning to the sides will not cause a problem if this process happens in the same time as a leaving process. Vehicles will be able to change their speeds as well. A vehicle should follow only the robot right in front of it and that’s why it will be able to differentiate that vehicle and the one in front of it.

**Societal impact:**

Autonomous cars are getting popular nowadays due to their obvious advantages. This project will act like an initial step toward this industry. Preventing crashes, moving in reasonable speed and being able to get out of the traffic and re-joining are the similar tasks that autonomous cars should be capable of. On the other hand experiences gained from this project can be used also in truck convoy projects similar to the one “Tesla” company is working on. Only the leading truck should have a driver and the ones follows it. This approach will decrease the drag force because vehicles will move in a line and have smaller following distance. Less drag force means less fuel consumption, less driver means less payment. Overall autonomous trucks will decrease transportation fees and contribute to the economy.

**Human Resource**:

For the selection of the company members, individuals were chosen so that can they complement each other’s skills. The company wanted to implement the project in a hi-tech manner therefore three members from the computers option were selected. These members have a deep underlying knowledge of computer systems and this will allow the company to utilize microcontrollers to its full potential. The computer member can design basic hardware circuitry to offload the CPU as much as possible. The project requires accurate and precise control of actuators, motors and/or servos for physical movement of the designed devices. OJO has a control option member who will help the company greatly with any problems tht might be encounter during implementation and design. Power management is a crucial consideration in any project. OJO’s projects will be no exception to this. Given that devices the company plans to build will be mobile and will not have any direct connection with mains power. Keeping sure that the power system can provide plentyfull power is essential.

Breif explanation about the team members are as follows:

**Abdullah Aslam:**

**Option:** Power Systems

Experience with UAV control and familiarity with programming languages.

**Anar Abdullayev:**

**Option:** Computers

Experience with microcontrollers(Arduino, PIC and ARM based ones),motion sensors and communication interface.

**Bulut Ulukapı:**

**Option:** Computers

Experince with data structures, microcontrollers and various programming languages

**Syed Saad Saif:**

**Option:** Control

Experience in microcontroller based discrete time feedback controllers and has deep understanding of C programming language as well as object oriented programming

**Umut Can Serçe:**

**Option:** Computers

Experience with various programming languages and HDLs.

**Requirements**

The robots should be able to follow the leading robot with a certain accuracy. The exact requirements will be determined In the standards commitee.

On being given a signal the robot should leave the convoy and rejoin it at the last positon.

The robot should be able to determine if it is the last robot in the convoy.

The robot should indicate to the other robot if it is the last robot or not using two independent methods.

The robot should indicate to other robots when it is leaving the convoy using two independent method.

**Objectives**

The robot should be power efficient.

It should work ın all lighting conditions.

The robot should be light and easily maneuverable.

The robot should have a minimal amount of moving components to make it robust.

The robot should rejoin the convoy within 10 seconds.