MIDDLE EAST TECHNICAL UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EE-493 SENIOR DESIGN COURSE

CONVOY PROJECT

STANDARDS REPORT

08 December 2017

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I. INTRODUCTION

A set of rules are required for the projects involving multiple groups working together, so that the groups can coordinate and cooperate to their fullest to achieve a goal. This purpose is fulfilled by the standards committee, which aims to define this set of rules called standards.

This document is a report, highlighting the standards set for the “Platoon (convoy)” project. It contains the details of the standards set under the supervision of the coordinator and with the mutual agreement of the teams participating in the project. This report also describes the structure and operation of the standards committee for the project.

II. PROJECT DESCRIPTION

This project requires each group to design an autonomous robot. The robot is a part of a convoy, which is lead by a leading robot (mock up robot). The whole convoy moves according to the movement of the leading robot. When commanded externallly, the autonomus robot should leave the convoy and rejoin the convoy as a last robot. The autonomous robot should signal when leaving the convoy (leaving flag) and also persevere the signal if it is the last robot in the convoy (last robot flag).

III. THE STANDARDS COMMITTEE AND ITS OPERATIONS

The Structure of the Standards Committee

- **Coordinator Faculty Member**: Prof. Dr. Aydan Erkmen
- **Chairperson:** Abdullah Aslam
- **Scribe:** Tugce Numanoglu
- **Number of Participants:** 5

The Operations of the Standards Committee

The standard committee held 4 meetings, one each week. Each week, new standards were set and few were revised. The breakdown of set and revised standards are as follows,

- Week 1,

    - Standard issues are specified
        - Markers and Flags
        - Physical Standards
        - Leaving protocol

    - Visibility markers options are discussed

- Week 2,
    - Agreed on visibility markers
    - Mock-up Movement limitations are set
    - Suggestions for last one signal and leaving signal are given
    - Physical Standards are discussed
- Week 3,
    - Mock-up Movement limitations and physical standards are revised
    - Last one signal and leaving signal are discussed
- Week 4,
    - Synchrony between “Leave-the- line” and “Last-in- line” signals is established.
    - Restriction (distance/time) for leaving-the- line is decided on.
    - Last one signal and leaving signal are agreed on

IV. PROJECT STANDARDS

Standards are listed with clear description.

Mock-Up Robot Movement

1) Maximum speed of the Mock-up robot: 12 cm/s
2) Minimum radius of curvature of the Mock-up robot: 100 cm
3) When “Leave-the-line” command is given, mock-up has to keep the path it was following before the command was given.

Robot Specifications

1) Nominal distance between robots: 20 cm
2) There should be flat surface from 8 cm to 12 cm (from the ground) on the left and right sides of the robot and from 4cm to 8 cm on the back of the robot. (the flat surface can contain sensors)
3) Time limitation for leaving line: 15 s

4) Distance requirement for leaving the line: 10 cm (distance between the sides of the robots)

Visibility Markers

1) **Rectangle**
   - Location: At the back of the robot, in the middle of the horizontal edges of the robot
   - Centre of rectangle height: 16 cm from the ground
   - 57 mm 7 segment display's boundaries coloured with green

2) **IR LEDs**
   - Location: Placed horizontally at a height of 10 cm from the ground.
   - Distance between LEDs: 12 cm, centered at the center of the robot.

"Leaving-the-line" flags

1) **Blinking IR LEDs**
   - Use the same IR LEDs used as visibility markers
   - Blinking frequency: 5 Hz (T=0.2 s)
2) **Number 8**
   - 8 is shown on the seven-segment display

"Last-on-the-line" flags

1) **Blinking IR LEDs**
   - Use the same IR LEDs used as visibility markers
   - Blinking frequency: 2 kHz
2) **Laser Beam**
   - Hight of the laser beam: 10 cm from ground
   - Location: Placed on the left and right sides of the robot at the far back edges

Synchrony between "Leaving-the- line" and "Last-in- line"

- "Leaving-the-line" signal must be turned on when the leave the line command is given by the group.
- "Leaving-the-line" signal must be turned off when the robot re-joins the convoy as a last robot keeping the specified distance (20cm) between the robot in front.

- “Last-in-line” signal must be given by the re-joined robot when it turns off the “Leaving-the-line” signal.
- “Last-in-line” signal must be turned off by the previous last robot when it detects a robot at specified distance (20cm) behind.

Signed by:

Company Name:	Standards Com. Representative:	Signature:
1. …….		
2. …….		