



**MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING
EE493 SENIOR DESIGN COURSE**

**THE HOCKEY PROJECT
STANDARDS REPORT
7.12.2018**

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I. INTRODUCTION

While working on a project, making a design, building a robot the standards that we have to follow is quite important since no matter how tremendous the capabilities of each team member are if we cannot follow the rules of design that means we accomplish nothing. Therefore, the determination of the standards of a project is important and should be done carefully. As the members of the standard committee by acknowledging the importance of the standards, we prepared a standards report which is a document describing the standards of the Hockey Project. Each group of the standard committee have to follow these rules during their design. The general project description, the standard committee structure and its operations, and the standards of the project are given in the following sections.

II. PROJECT DESCRIPTION

The purpose of this project is to design devices that play a game similar to hockey. Two teleoperated robots controlled by users will try to score opponents goal. Robots are free to move only in their half fields. Robots are free to contact with the ball as they wish except grasping or scooping, and they should send the ball opponents half field in 20 seconds. If any rule of the game is violated the robot will be penalized. The robot scoring 2 goals more than the opponent wins the game. The playfields shape is a regular hexagon. In the design, Wi-fi is not allowed.

III. THE STANDARDS COMMITTEE AND ITS OPERATIONS

The Structure of the Standards Committee

Gülbin Dural Ünver and Sinan Korkan are the coordinator faculty members. Ali Birkan Dönmez is elected as moderator. Furkan Bahadır Elik is elected as the reporter.

15 groups attended the standards meetings

The Operations of the Standards Committee

During the standards committee meetings, the goal, ball, game rules, robot, walls, field lines, communication protocols are negotiated.

At the first week, the topics that will be discussed and the moderator and reporter are determined. The interference of communication protocols, examination of E-Building and KKM floors, the study of the game ball are assigned as homework for next week.

At the second week, the new reporter is appointed. Game rules, robot constraints, field lines are negotiated. Bringing sample balls is assigned as homework for next week.

At the third week, robot constraints, interference of communication protocols are studied. Sample balls, tapes, and walls are assigned as homework for next week.

At the fourth week, game field lines, walls are negotiated. Except the color of the ball, all standards are determined.

IV. PROJECT STANDARDS

The standards are listed in this section as follows:

Communication Standard

Obviously, the most important part of this project is the communication. To briefly cite, tele-operated robots should be controlled from a distance which is up to at least 30 meters. Considering the limited communication technique options existing in the market, there is a risk of interference between the sensors or modules of different robots. Therefore, there is a need for a communication standard. Luckily, most communication links existing in the market offer spaced carrier channels. For instance, these devices can communicate on channels whose carrier frequencies: $f = f_c + Nf_{\text{spacing}}$. In the equation, f_c , f_{spacing} and N represent center frequency, frequency spreading between channels and channel number, respectively. However, clearly setting these numbers is a violation of confidential project design rules. Thus, a more general convention is set rather than allocating certain frequencies to the groups, robots etc. The final standard rule is simple and clear: Each group has to characterize their communication links so that they are not affected by the electromagnetic interference. The groups cannot use Wi-Fi protocol or wired connection for communication.

Ball Standard

One of the key standards that had to be determined in this project was the colour, diameter and materialistic properties of the ball that the game will be played with. The predefined standard by the project committee was about the diameter of the ball and this rule says that the ball must have a diameter between 30 and 45 mm. Furthermore, as the standard committee, we decided that the ball having following properties would be beneficial for us all:

- The ball should be lightweight and should not bounce a lot from the ground (after first bounce it should reach approximately 30-40% of its initial height).
- If it has a colour that is undesired, it is important that it should be repainted easily.
- Its reflection from the wall should have almost the same angle with its incidence angle.

After taking all of these constraints into consideration, the standard committee decided on the ball in Figure 1 in the condition that its colour would be changed by painting it. The general description of the ball is shortly given in Table 1. Furthermore, by looking at Figure 2, one may see the painted version of the ball to the green.



Figure 1: The Ball Selected for the Project

Table 1: The General Description of the Ball Selected

Colour	Green
Diameter	36 mm
Brand	Artengo (Beach Tennis Ball)

If in the future some problems occur due to the colour of the ball -for instance during the detection of the ball etc.-, the standard committee may change the colour according to the overall demand of the committee members.



Figure 2: The Ball Painted to Green for the Project

Wall Standard

In the project description, the wall standard was not determined. In the committee meetings, this standard was also determined. According to committee decision, wall properties are listed below.

- The material of the wall should be MDF.
- Wall should have 30 cm height, 75 cm width and 8 mm thickness.
- Wall surface should be covered by black cardboard.
- If black cardboard does not give a proper result, companies have a chance to cover the wall by using black paint.

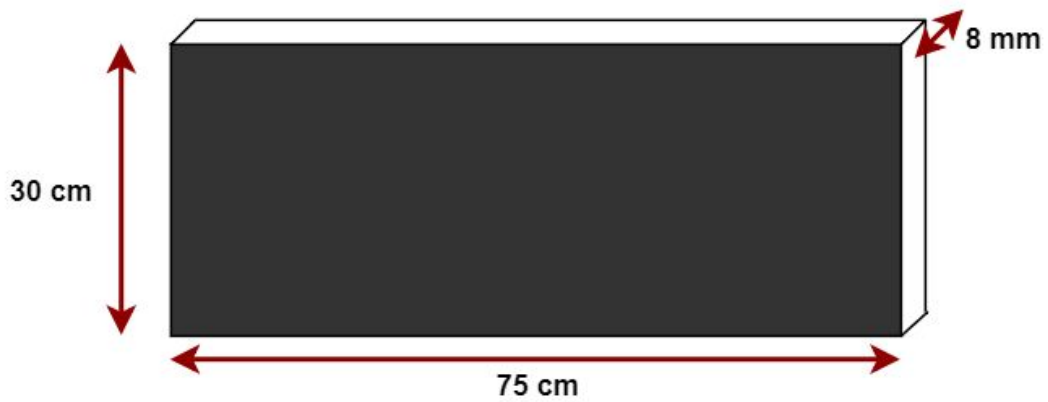


Figure 3: The Side View of One of The Walls

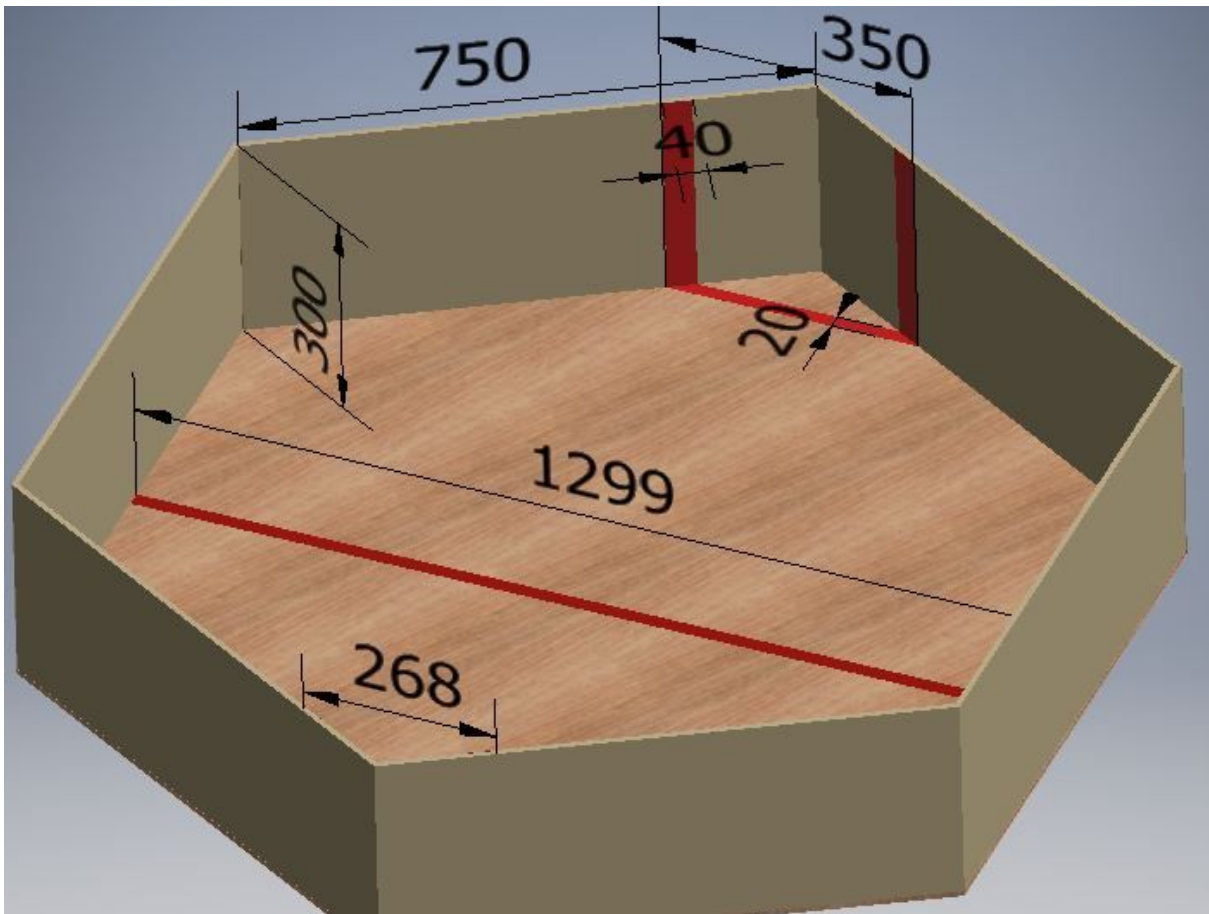


Figure 4: The overall view of game field walls

The Goal and The Playfield Standards

Goal and playfield lines are another topics that were determined in the Standard Committee Meetings. Colour, width and material defined at this period. According to these decisions:

Both of the goal and playfield lines are represented by using red electrical tape. The width of electrical tape should be 2 cm on the playfield.

The width of electrical tape should be 4 cm on the wall to represent goal post.

Since goal post is wider, there should be 1 cm indentation from each side of goal post at the intersection points of the goal post and playfield lines.

The floor of the game field is the floor of the KKM Building and E-Block of the Electrical and Electronics Engineering Department.

Robot Standard

The width and length of the robot cannot be longer than $75\sqrt{3}/2$. The width and length constraint is determined according to widest wall distance. The size of the robot can not change during the game.

The colour of the robot has to be different than lines, walls and the ball.

There must be an onboard camera on the robot.

The robot can not fly.

The robot can have autonomy for not-crossing the opposite field and keeping a certain distance to the side walls.

Game Play Rules

The robots are placed on their own goal lines and the ball is at the center of the field at the beginning of the game.

Start signal of the game will be given by instructors.

The ball cannot be lifted intentionally by the robot during the game.

Throwing the ball out of the game field is foul.

Sending the ball to the opposite more than 20 seconds is foul.

Crossing to the opposite field is foul.

After foul, the ball is given to the opposite side (the one who not foul). The ball can be placed anywhere on its own field. The opposite side can also be anywhere on its own field after a foul.

After scoring goal, the ball is given to conceding side and the rule for placement of ball is the same as after foul.

The robot scoring 2 goals more than the opponent wins the game.

Robots can hit, push or otherwise drive the ball but not grasp, scoop or otherwise carry it.

Signed by:

Company Name:	Standards Com. Representative:	Signature:
1. Troy Tech	Hasan Özkara	
2. BACIO Dynamics	İrem Sultan Yıldız	
3. Aeternum	Alper Şahin	
4. Borg Cube	Şiyar Ramazan Vurucu	
5. WideScope Inc.	Alpay Fatih Kokundu	
6. Wingineers	Bedirhan Tavşan	
7. S1G6	Cahit Yusuf Taş	
8. Project Tyr	Oğuzhan Büyüksolak	
9. VISTECH	Alper Balcı	
10. Automata Technologies	Huzeyfe Hintoğlu	
11. Bs & Ms	Bayram Mert Altındağ	
12. Poro Inc.	Ali Birkan Dönmez	
13. Motto	Tayfun Aydın	
14.	Furkan Bahadır Elik	
15. ENBSS	Yasin Alperen Çelebi	

Standard Committee Coordinators:

1. Ali Birkan Dönmez (Moderator)
2. Bahadır Furkan Elik (Reporter)