REPUBLIC OF TURKEY
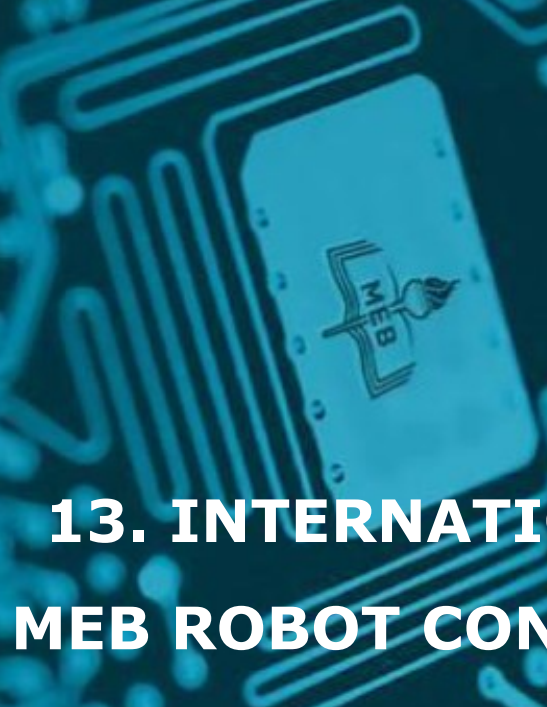
MINISTRY OF NATIONAL EDUCATION

The General Directorate of Technical and Vocational Education

13. INTERNATIONAL

MEB ROBOT CONTEST

MOBILE ROBOTS (ROBOTINO) CATEGORY

RULES

2019 – SAMSUN

1. Task Equipments

In this chapter, task equipments : Robotino (figure 1) and competition area (it is called shortly "Court" shown in figure 2) are introduced respectively.

1. Robotino:

Robotino which will be used in this competition is a mobile robot system produced by Festo for educational purpose. It is a robot that has inductive sensor at bottom to follow metal (for example aluminium band), 9 infrared distance sensors around its circumference , opto-electronic sensors to perceive contrast and a Wi-Fi camera for image processing , so it has ability to move every direction. Robotino is shown at Figure-1.

Figure 1

2. Court

It is the area where the competition will be held. It has 3 stages. First stage is a labyrinth consists of red and blue walls , second one is aluminium and black lines, last stage is a rectangular area which is created by aluminium tape. 3D view of the court is shown in Figure 2 and the technical drawing of the court is shown in
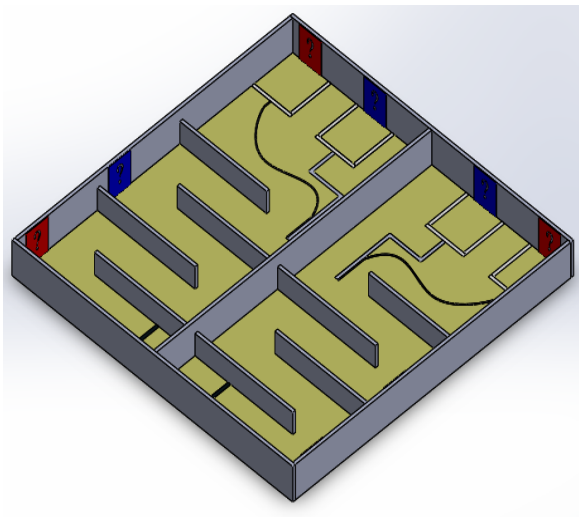
Appendix-1 as well.

Figure 2

2. Task Definition

Court is designed to allow two teams can race at the same time. For each team, there are 3 different stages on the court.

1. Step Starting , Labyrinth and Image processing

Robotino will start to competition in a square which is formed by aluminium lines located both left and right of middle bracket. Robotino should pass from labyrinth shown at figure-3 (it will be exacty the same as figure-3). Robotino should go out without touching the walls. There are walls indicated with red and blue colours inside the labyrinth. These signs will be kept visible to able to take image samples when compettitor testing their softwares. Just before the starting, colors will be determined by drawing lots. If color is red, robot will follow black line. If color is blue, robot will follow aliminium line. The other color on the wall will be ineffective by usinf different colored paper. Decision mechanism should be completely automonous. Competitors should create program which include two algorithms able to follow black or aliminium lines. Deciding which algorithm would run should depend on a condition. This condition should be defined by a variable and image processing algorithm should assign a value to this variable , so that this variable can direct which algorithm would run to follow correct line. Red and blue signes can be placed any wall of labyrinth regarding movement direction of robotino and view range of its camera.
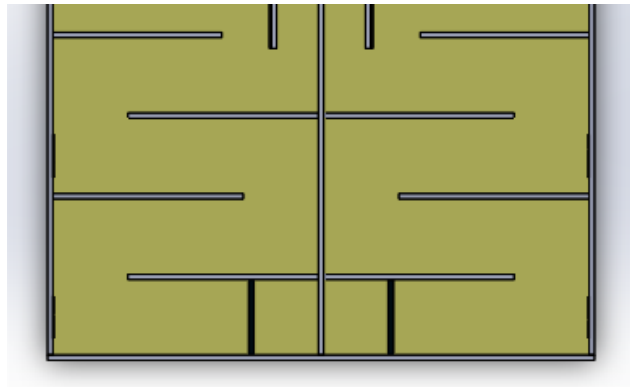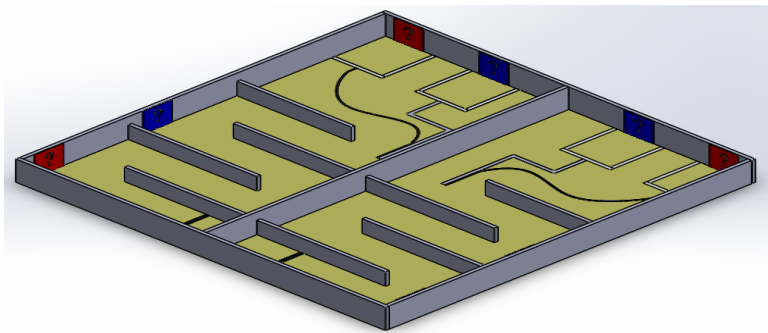

Figure 3

Figure 4

2. Step: Following the aluminium or black line

It is shown on Figure 5. After labyrinth, Robotino will follow aluminium line or black line (by using its sensors and camera) . The line that Robotino follows will be determined by drawing just before the competition. Robotino will decide automously which lines it should follow according to the image processsig algorithm which can capture and memorize the color on the wall. If color inside the labyrinth is red, robot will follow black line. If it is blue, robot will follow aliminium line. In case of Robotino going out from the line completely or judges observe that it is not follow the line (if using some inproper methods such as following the labyrinth's walls etc.) it is assumed that this task was not finished. Lines shown in Figure 5 are representative images. In the competition, band and lines may be placed with different angles. Lines will end with black tapes placed perpendicular. If competitors cannot create a program which memorizes the color inside the labyrinth (by using image processing algorithms) , they don't get score in this step.
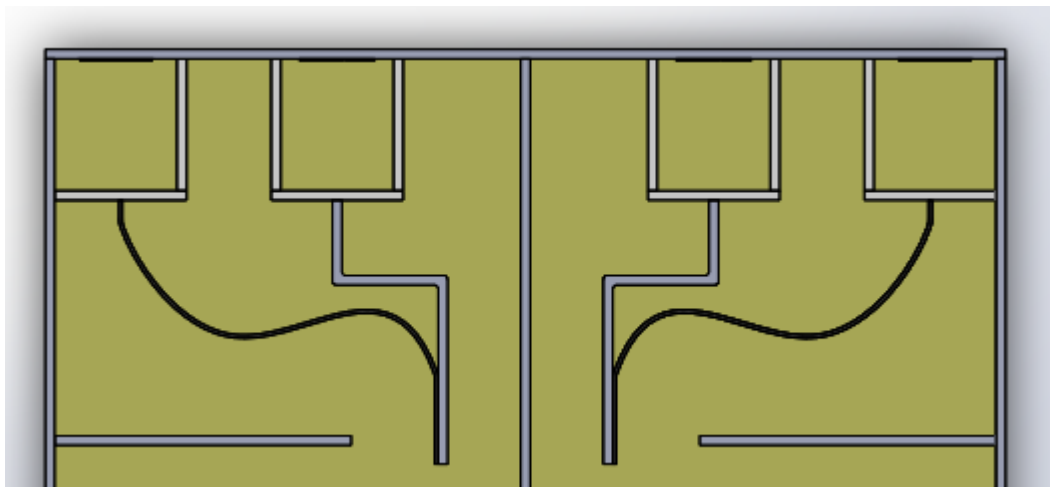

Figure 5

3. Step: Finish the task

After following aluminium line, the last step will start. Black line cross the aluminium line with 90 degree. Robotino will enter inside the square made by black tapes and turn around itself according to color on the wall. Wall will be marked with red or blue colours. If the color on the wall is same with the color memorized in step 1, robot willl turn around itself 2 times to direction of counterclockwise, if it is not, robot willl turn around itself 2 times to direction of clockwise. 10% angular tolerance (36 ^{o}) will be given because of considering the communication delay which can happen between computer and robotino. After this step , task will finish.
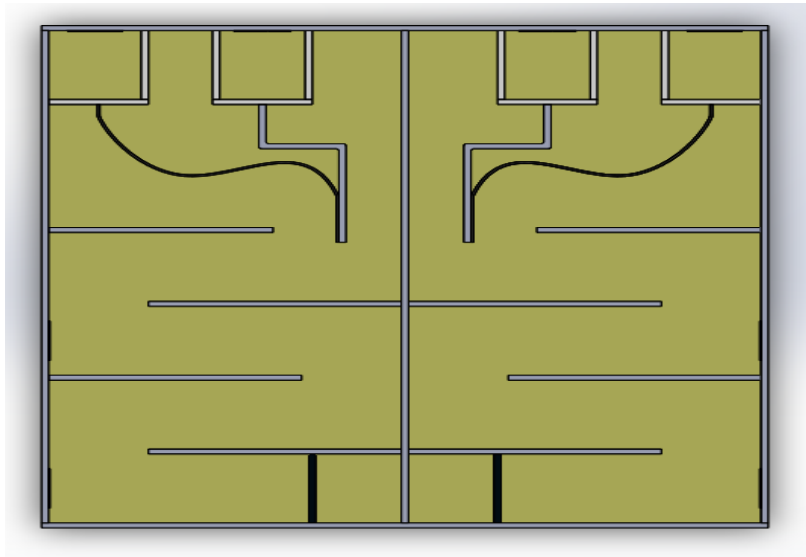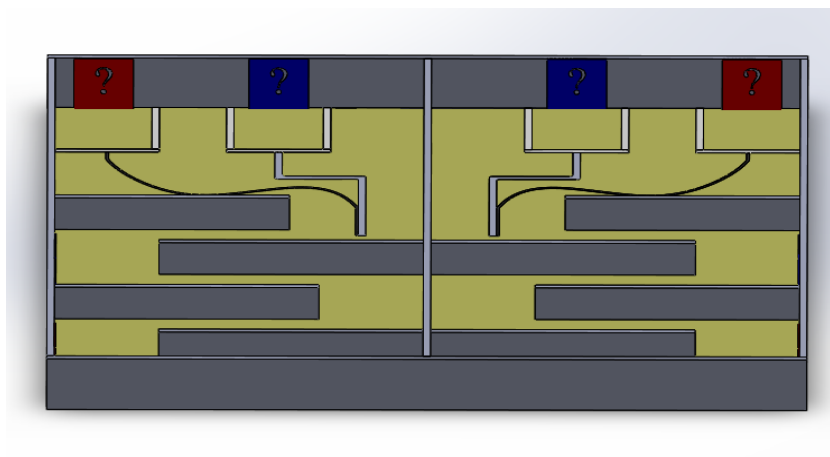
Figure 6

Figure 7

3. Rules

1. Competitors have 100 min. to prepare this test project.
2. The software "Robotino View" will be used in this competition.
3. Competitors will be warned maximum 3 times. If they receive 4.warning after getting the three warning of judge such as crashing or damaging to the court , they will be disqualified.
4. Competitors have only one right to try their test project.
5. Preparation time before testing :45 minutes. In this time, competitors can work on Robotino, court and sensors. Teams which are not ready at the end of 45 min will be eliminated.
6. Changing program is forbidden during the competition.
7. It is forbidden to damage to the court and robotino during the competition or preparation period. If it is happened, team might be disqualified by judge commitee.
8. Teams can stop their time at any time they wish. Scores which they get until this time is calculated.
9. The expert jury can decide to stop the competition in any negative situations.
10. Teams can be disqualified by the expert jury if they determine any similarities between programs

11. Competitors don't leave the competition area.
12. Competition consists of 3 steps. It is not obligatory to go in order of steps. If some steps cannot be passed succesfully or wish to ignore it, competitors can jump to another step.
13. **Jury board has the rights to modify the rules at any moment of the competition.**

4. Scores

Steps	Description	Score
1.Step: Labyrinth and image processing	Going out from the starting square completely	5
	Finishing labyrinth succesfully	25
2.Step: Following aluminium or black line	Finding aluminium or black line	5
	Following aluminium or black line succesfully according to memorizing process described in 1.step.	40
3.Step: Final	According to colours on the Wall, when robot turns around itself succesfully inside the square made by aluminium lines at the end of line	25

APPENDİX – 1

ÖLÇEK 1 : 20