SLIIT UNI
THE KNOWLEDGE UNIVERSITY

Annual SLIIT

Robot Competition
School Competition – Preliminary Round
Technical Specification

Organized By

Department of Electrical and Electronic Engineering
Sri Lanka Institute of Information Technology

ROBOFEST 2021

The Faculty of Engineering of Sri Lanka Institute of Information Technology is holding its annual robotic festival, **ROBOFEST 2021.**

ROBOFEST 2021 is open to students from schools and universities. Students will be given a chance to participate in the competition by combining the practical application of science and technology with fun, intense energy, and excitement of a championship-sporting event.

Timeline

17th August 2021

    Publishing the Preliminary round Technical Specification

12th September 2021

    Deadline to register teams for the competition

23rd September 2021

    Deadline to submit for the Preliminary Round (Task 1 and Task 2)

28th September 2021

    Announcing the teams selected to the Final Round

    Publishing the Technical Specification of the Final Round

30th September 2021

    Submission deadline for Robot and code of final task (by 9.00 a.m.)

    Virtual Final Round Competition

School Level Awards

    Gold Award and the First Prize   - **Rs. 30,000**
    Silver award and the second prize   - **Rs. 20,000**
    Bronze award and the third prize   - **Rs. 15,000**
    2 complementary cash prizes will be awarded

Robot Development

School Competition – Preliminary Round

ROBOFEST 2021 will include a school competition, open to students from schools' island-wide. The competition will be held on the virtual open-source platform – **Webots R2021b**. The software is freely available on (https://cyberbotics.com/). Participants should use the inbuilt **e-puck line following robot** to complete the tasks of the competition. The components (original sensors and motors) of the robot should not be modified. This competition will challenge the participants capability in strategic thinking and algorithm manipulation of the existing robot to complete the tasks.

Preliminary Round

The participants should be able to design a working algorithm capable of navigating a line as specified in section 2.0 (Playing field). The scoring is explained in detail in section 4.0 (Scoring). In the preliminary round the participants will be asked to submit a video of the robot completing the task and the robot code as specified in Section 3.0 (Submission).

All updates of the competition will be announced through email and the official website - http://www.robofest.lk/

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1.0 Robot Specifications

1. Participants will use the software Webots R2021b from https://cyberbotics.com/. Use the world 'e-puck_line.wbt' as the foundation of the task (C:\Program Files\Webots\projects\robots\gctronic\e-puck\worlds\e-puck_line.wbt)

2. The e-puck robot is an inbuilt line following robot which should be used to implement the team's strategies and algorithms. **No modification can be done on the physical aspects of the robot. No other robot can be used to complete the task other than e-puck robot.**

3. Participants may modify the coding using any preferred coding language – C/C++, Java, MATLAB or Python.

4. The robot must be self-navigating with no potential for remote control.

5. The robot must be able to detect and follow the lines to complete the tasks as specified.

2.0 Playing Field

The participants must complete and submit both Task 1 and Task 2 before or on the 23rd of September through the links that will be provided. In summary the submissions are as follows:

1. Task 1 Submission
    a. Maximum 5-minute video as specified in section 3.1
    b. Submission of robot (and code) as specified in section 3.2

2. Task 2 Submission
    a. Submission of robot (and code) as specified in section 3.2

2.1 Task 1 – Video and Robot Submission Task

The playing field will be 0.9m x 0.9m, with 4 walls of 0.01m thickness and 0.05m in height, enclosing the map. The robot must successfully navigate through the maze from the start to the specified end, using the left path or the right path to reach the end. The teams will obtain points when successfully completing different sections of the playing field. At the end of the path the robot must "park" itself such that it faces the path again (make a 180 degree turn and stop) as shown in figure 4.

The floor of the playing field is white in colour while all the lines are black and the alternative paths are grey. Teams may use the alternative path, but the scoring given for using the alternative path is lower.

Figure 1 shows the playing field. The participants must load this image to the platform as specified in Section 2.1.2.

Participants can download the playing field image using this link: https://shorturl.at/jJNOS

Figure 1: Playing field

2.1.1 Loading the e-puck line following world

Participants must use the already existing e-puck line following world available in the Webots software as the foundation in completing the task. Teams should not change the pre-existing e-puck model. All changes should be made solely on the code. Participants may load the world as follows:

File > Open World > Select destination "*C:\Program Files\Webots\projects\robots\gctronic\e-puck\worlds\e-puck_line.wbt*"

Teams must remove the 3 obstacles from the field before adding the playing field image.

2.1.2 Loading the playing field image to the platform in Webots

Once the correct world is selected as specified in section 2.1.1, participants can add the relevant path by selecting the image by following the steps below.

Use the scene tree as shown in figure 2 to navigate through the path:

RectangleArena "rectangle arena" > floorAppearance PBRAppearance > baseColorMap Image Texture > url

Click the link shown under "url" and use the window below to select the image of the playing field.

Figure 2: Using Scene Tree window to upload the playing field

2.2 Task 2 – Line following Robot Submission Task

Task 2 consists of a typical line following task. The objective of this task is to evaluate the team's capability in building a robot with autonomous navigation for a typical line following path. Participants must use the same Webots platform and the e-puck robot to complete this task. Similar to task 1, the objective is to reach a specific end point from a given start.

The robot will have to start navigation from the "start circular" and continue to navigate through different geometrical paths by following the black line. The path may contain **curved paths, 90º angles, dead ends** and **"T" junctions**. Some of the possible pathways are illustrated in figure 3 below. The robot should always follow the line to reach the end. The "end square" will denote the end of the task and the robot should park itself on the black end square facing the path (that is, turned towards the path it entered from, a 180-degree turn) as shown in figure 4.

Figure 3: Possible pathways of the line that may appear in the path

Figure 4: Successful Parking - Robot Facing the Path

Figure 5 (below) is a sample path that maybe used for the path of Task 2. The actual path used will not be published to the teams. The teams must design strategic algorithms to complete the task.

Figure 5: Sample Task 2 Path

Participants can download the sample playing field image using this link:
https://shorturl.at/jJNOS

3.0 Submissions
3.1   Video Submission

Each team must submit a video of their robot completing task 1 by the given deadline. The participants should use the inbuilt video recording tool of the Webots software as highlighted in figure 6 below:

Figure 6: Record simulation button

Please ensure that the complete playing field is visible before recording the video. Also ensure that the video does not exceed 5-minutes.

The following settings should be selected when recording the video as shown in figure 7 below:

- Resolution: 854x480 (480p)
- Quality: 99
- Video acceleration: 1.00
- Video caption: show acceleration value (tick the box as shown below)
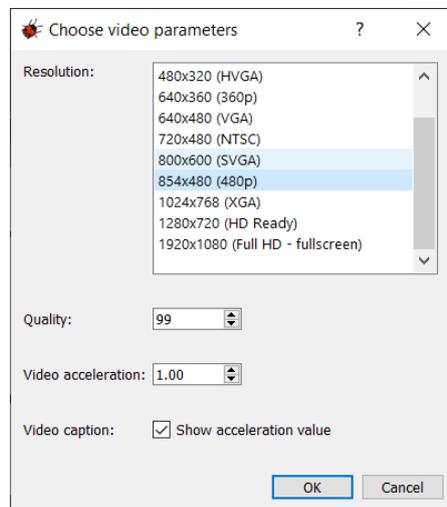
Figure 7: Settings to record the video

Rename your video file in the following format: *E-puck_Task 1_Team Name.mp4*

Example: E-puck_Task 1_Pheonix.mp4

Please refer Section 3.3 for submission guidelines for completed task files.

3.2   Robot and Code Submission

It is compulsory to submit the robot (.wbo file) and the code (.c) file for tasks 1 and 2.

You can export your robot using the export option as shown below:

For Robot exporting:

Right click on the e-puck module you have made modifications to and click export. Save the file in the following format: *E-puck_Task No_Team Name.wbo*
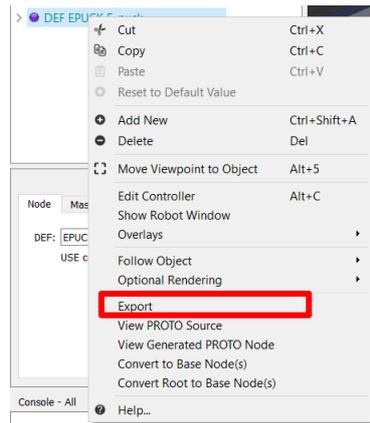
Example: E-Puck_ Task 1_Team Pheonix.wbo

Figure 8: Exporting the e-puck robot

For Code exporting:

Use the save button on the text editor to save the code file (c file if you are using c language) and save the file in the following format: *E-puck_Task No_Team Name.c*

Example: E-Puck_ Task 1_Team Phoenix.c
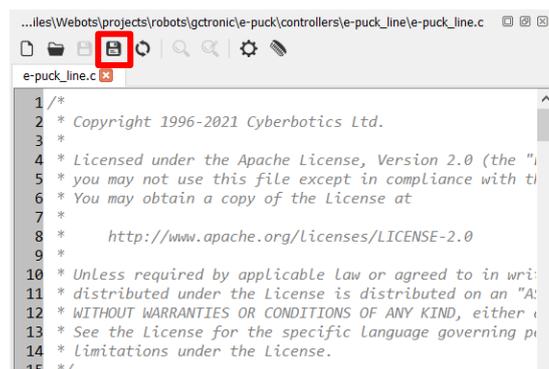
Figure 9: Saving the Code file

Please refer Section 3.3 for submission guidelines for completed task files.

3.3   Guidelines for file submission of Task 1 and Task 2

Submission Summary:

The participants must complete and submit both Task 1 and Task 2 on or before the 23rd of September through the links that will be provided. In summary, the submissions are as follows:

1. Task 1 Submission
    a. Maximum 5-minute video as specified in section 3.1
    b. Submission of robot (and code) as specified in section 3.2

2. Task 2 Submission
    a. Submission of robot (and code) as specified in section 3.2

It is compulsory for all teams to submit all files as mentioned in this section.

Please note that all files (video, robot and code files, all 5 files) need to be zipped into one file before making the submission.

The zipped file needs to be renamed in the following format:

Team Name_School Name.zip

Example: Pheonix_St. Benedicts' School.Zip

Teams may make several submissions. However, the last submission will be considered as the final submission for the competition.

Submission link for the Zip file: https://shorturl.at/dvOTU

Deadline for submission of the zip file is 23rd September 2021.

4.0 Scoring

Timing and **accuracy** of the robot will be a key criterion in selecting the winners for the next round. The robot should always follow the line. The participants who complete the task with the most accuracy will be selected for the final round. Penalties may be given if the robot leaves the path.

Task 1 Scoring:

The points will be allocated according to the successful navigation of the sections of the playing field. The points will be distributed among each section navigated, according to the complexity. As a result of dead ends being present, penalties will not be given for the robot leaving the path and joining the path again. Marks will be given for successfully parking the robot at the end as specified in section 2.1.

Task 2 Scoring:

The top teams (that scored the highest) from Task 1 will be chosen to compete in Task 2. In the instance a clear winner cannot be determined, the code will also be considered for point allocation. Teams who fail to complete Task 2 may be eliminated from the competition. Teams who successfully complete Task 2 will be chosen as finalists.

5.0 Team Organization

This section provides teams with the necessary information on how to form a team, fill the following form to register for the event.

5.1 Forming a Team

1. Create a Team with a maximum of **five members**.
2. Make up your own **Team Name.**
3. The **Name of the teacher** that will accompany the team should also be included in the application form.
4. The applicants should have contact details of their school principal (e-mail and contact number), or else applicants will not be able to register
5. Students must submit a colour photo to confirm their identity. Headshots are ideal for the members photograph. The photos must be in JPG format

5.2 Please fill out the following google form

https://forms.gle/azYXMkzzuDEPiT9p9

Deadline for Applications: 12th September 2021

For further details visit www.robofest.lk **and** **https://www.facebook.com/RobofestSLIIT**

Contact Us

For more information and clarifications please contact:

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