SLIIT UNI

THE KNOWLEDGE UNIVERSITY

Annual SLIIT

Robot Competition

University Category – Final Round
Technical Specification

Organized By
Department of Electrical and Electronic Engineering
Faculty of 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

23rd August 2021

Publishing the Preliminary round Technical Specification

12th September 2021

Deadline to register teams for the competition

15th September 2021

Deadline to submit for the Preliminary Round files

15th September 2021

Announcing the teams selected to the Final Round

Publishing the Technical Specification of the Final Round

28th September 2021

Submission deadline for Robot and code of final task.

30th September 2021

Virtual Final Round Competition

University Category Awards

Gold Award and the First Prize	- **Rs. 50,000**
Silver award and the second prize	- **Rs. 30,000**
Bronze award and the third prize	- **Rs. 20,000**

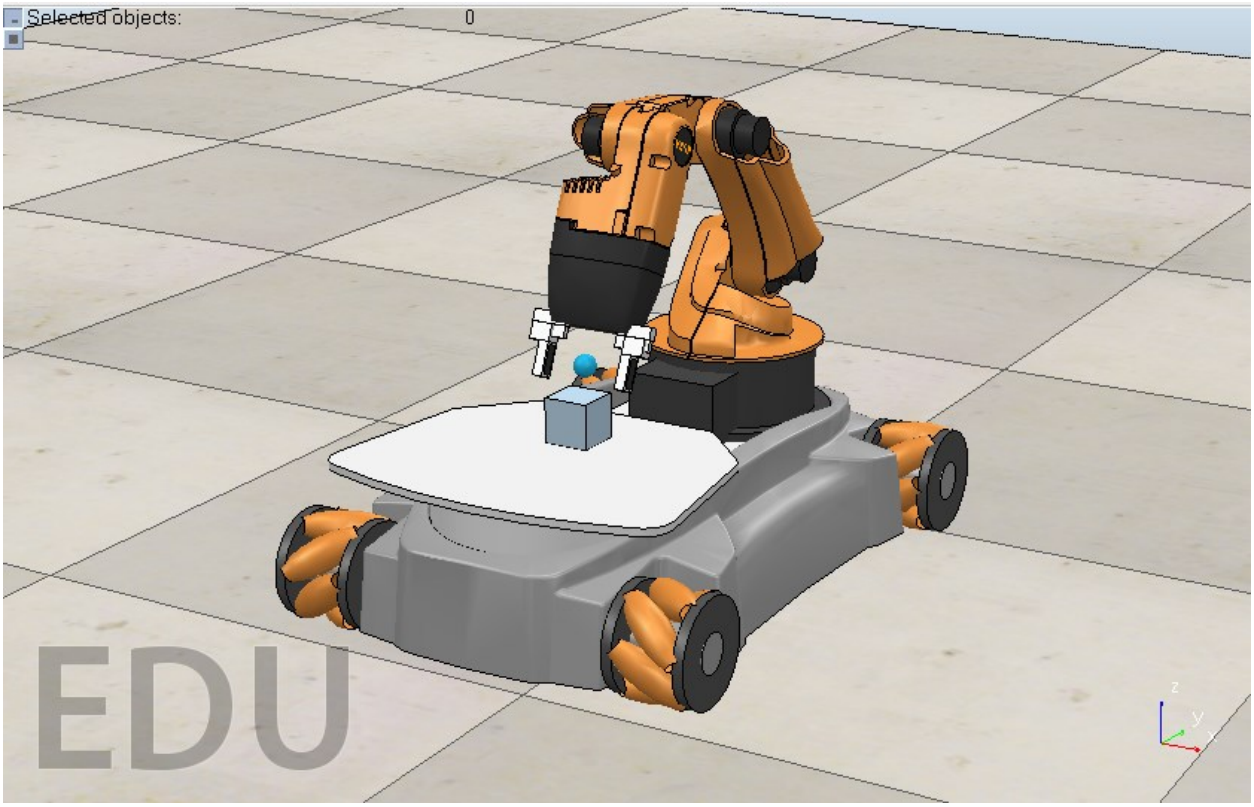
2 complementary cash prizes will be awarded

Platform

The Students will have to use the Robot Simulator, CoppeliaSim EDU (**Same software used for the completion of Task 1**) for the completion of the Task 2. It is a software which is ideal for multi-robot application simulation and the controllers can be written in Lua, C/C++, Python, Java, Matlab or Octave. The Software is compatible with Windows, macOS, and Linux. The EDU version of the software can be downloaded by visiting the manufacturers website.
(https://www.coppeliarobotics.com/)

Robot Specifications

The Participants are required to use the "**Kuka YouBot**" robot to complete the tasks. An inbuilt robot model is readily available in the CoppeliaSim EDU Software, Mobile robots category.



The Contestants may design and modify the robot controller using **any preferred coding language** – Lua, C/C++, Java, MATLAB, Python or any other compatible programming language.

The **Robot Specifications** are as follows.

- Number of wheels: 4
- Wheel type: Omni wheels
- Overall Length: 580 mm
- Overall Width: 380 mm
- Overall Height: 140 mm
- Minimum velocity: 0.01 m/s
- Maximum velocity: 0.8 m/s

Arm Specifications.

- No. of Axis: 5
- Height: 655 mm
- Work envelope: 0.513 m^2
- Position repeatability: 1 mm
- Axis Speed: 90 deg/s

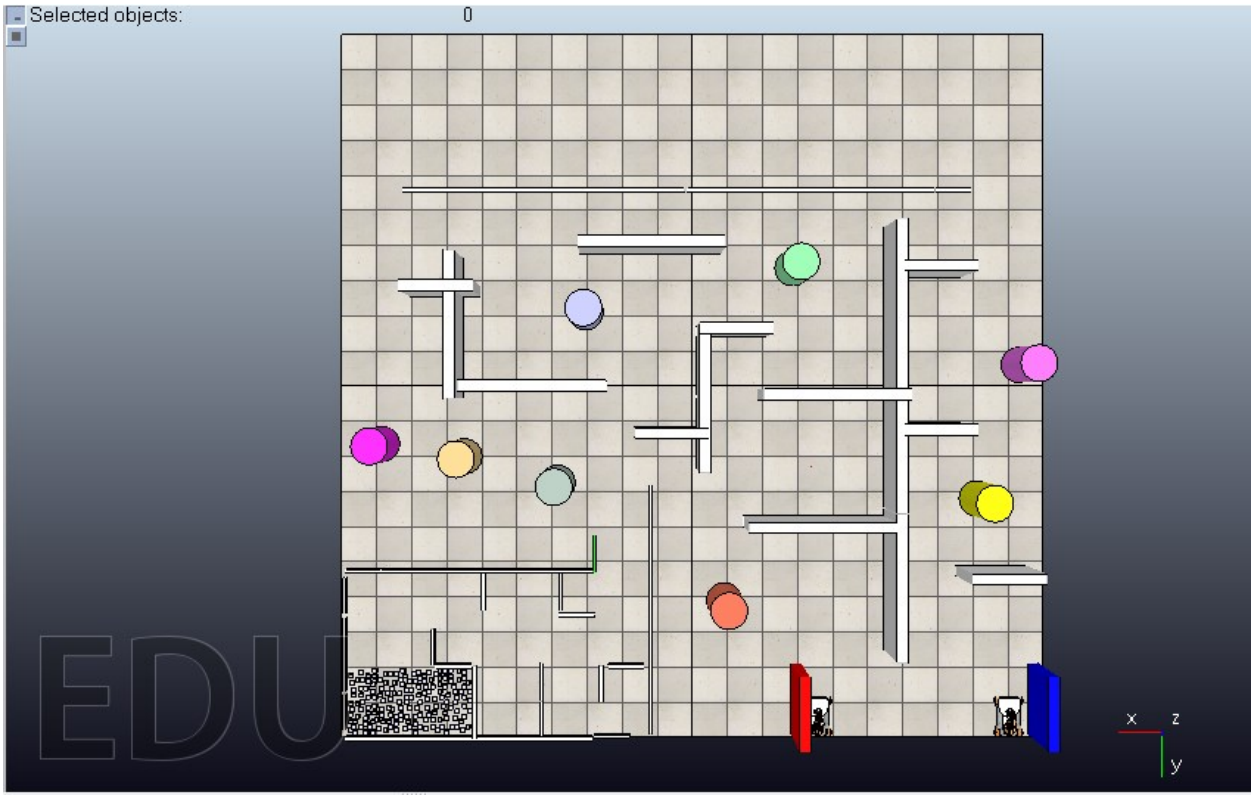
Object Specifications

The objects used for the design are cuboids with a side length of 6mm. The required objects have been already provided to you in the given model (.ttt file). The entire design consists of a total of 171 cubicles. However you have been provided with 174 cubicles which you can freely utilize. You are free to use any object dynamic properties based on your requirement. More details about the objects and usage have been included under the Task section. The workspace area is 15 x 15 m^2.

Task Guidelines.

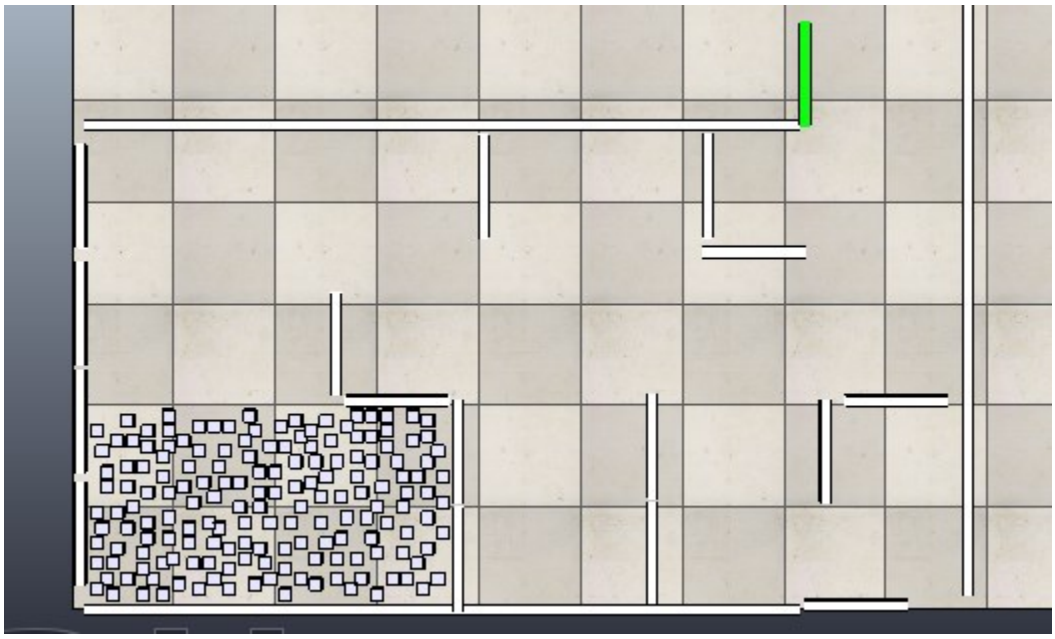
As the final task you have been asked to model the "ROBOFEST" wording using 6 x 6 x 6 cm^3 cubicles. This task involves autonomous navigation, maze solving along with pick and place using a manipulator mounted on the mobile robot. You need to complete the task within 25 minutes and the team completing the task taking the minimum duration will win.

The below shown environment model will be given to the contestants.

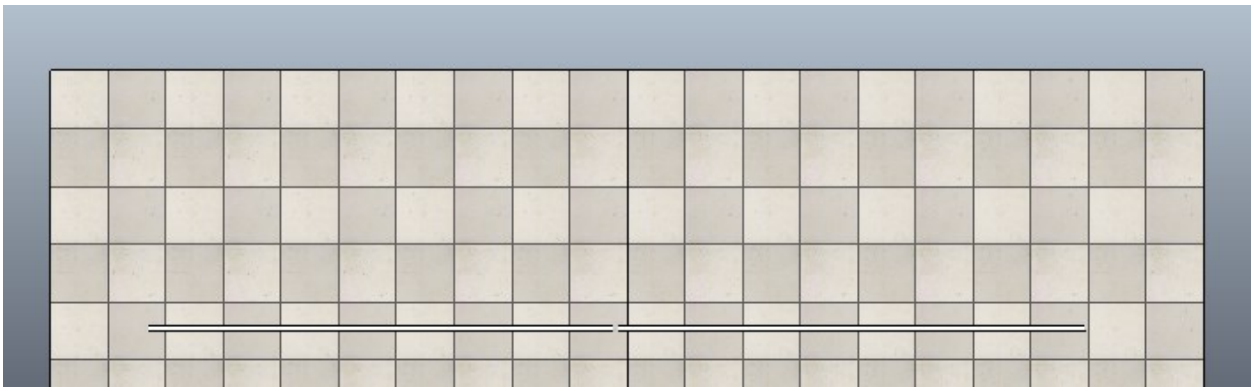


You are given the chance to use **two Kuka YouBots** simultaneously to complete this process.

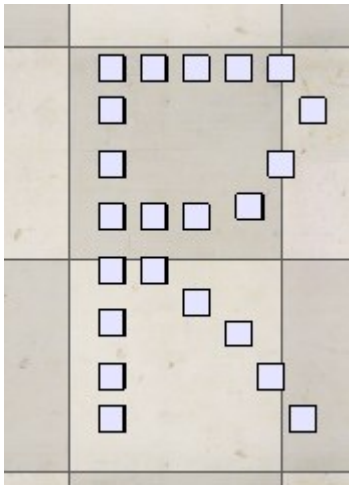
You'll have to pick the cubes required for your task by solving the maze given in the left bottom corner. The maze has been attached below for your reference.



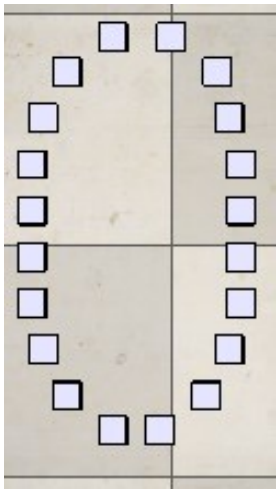
You need to construct the ROBOFEST wordings in the top corner of the platform. You are not allowed to exceed the area separated by the outer-wall (demonstrated below). You are expected to utilize the given area to reduce the time taken to complete the process.



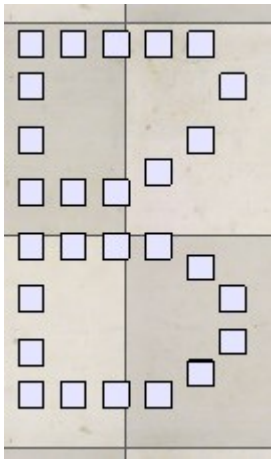
You are expected to model the letters as shown below using the given number of blocks.



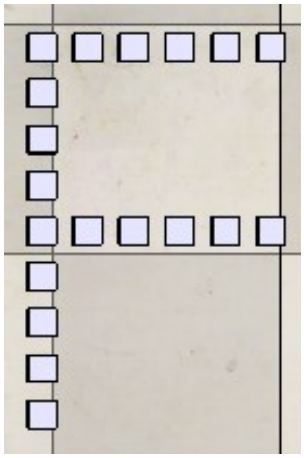
R – 22 blocks



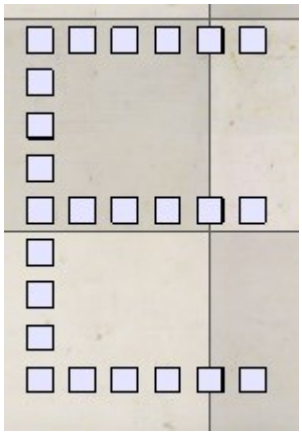
O – 20 blocks



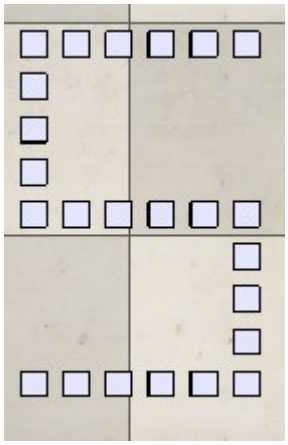
B – 27 Blocks



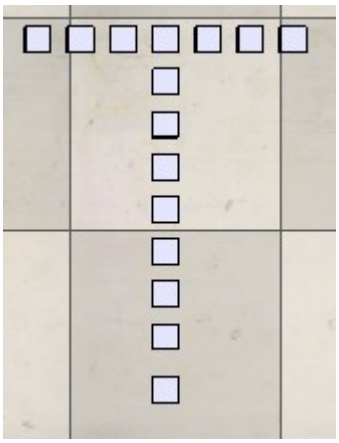
F – 19 Blocks



E – 24 Blocks



S – 24 Blocks



T – 15 Blocks

You have to model the letters in the given workspace by using the above mentioned minimum block count. **This will require a total of 171 blocks**. This is the recommended block count for you to use to create the model. You have been given some additional number of blocks in the mini-maze and you can use only the required number of blocks for your design. This too has been done to further differentiate the outcomes of the groups. If required, you can use additional number of blocks. But please note **no additional marks or bonus marks would be given** if the required limited number of blocks are exceeded and then only the task completion and the duration taken will be considered as key elements for the evaluation.

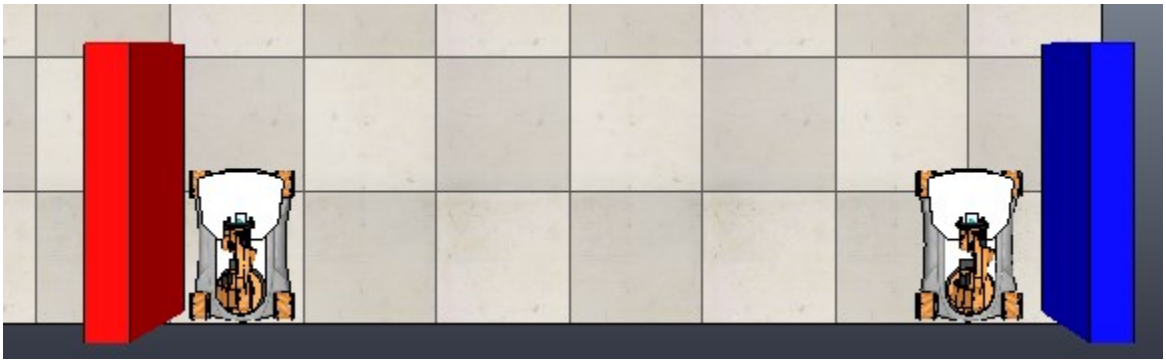
You can download the environment from the provided link below:

https://drive.google.com/drive/folders/1o3qHpE1YlZS0kZNxUbvatdzNmsLZqYKT?usp=sharing

Rules, Limitations and Special Guidelines.

Apart from the above mentioned tasks, please consider the following limitations and guidelines as well.

- **You are by no means allowed to change or alter the positions of the obstacles, walls, or dimensions of the environment provided. Doing so would result in disqualifying your submission.**
- **The time-limit for your video is 25 mins. The task should not exceed 25 mins.**
- **You are not allowed to speed-up the video by any sort. Altering the video speed would disqualify your submission.**
- You cannot use more than two Kuka YouBots to complete the task.
- You are free to determine the sequence of operation as per your preference.
- The robots need to be kept near the red and blue reference walls as their initial starting position.



- You cannot exceed the mobile robot motor speeds beyond **6000rpm**.
- The manipulator joint speed cannot exceed **180 deg/s.**

Robot and Code Submission

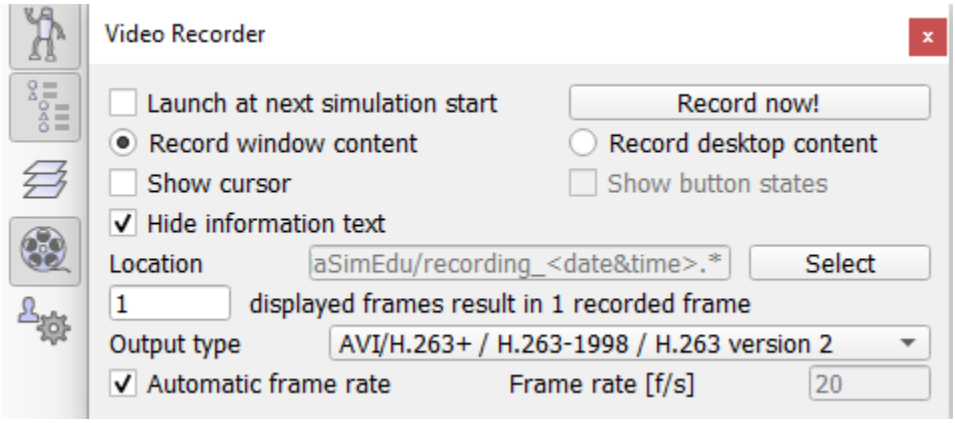
1. CoppeliaSim scene file

You need to submit the coppeliaSim scene file (Project file) the process you have created. It will be in the format of .ttt.

Instructions: Go to: File => Save Scene as => CoppeliaSim Scene

2. Process Recording Video

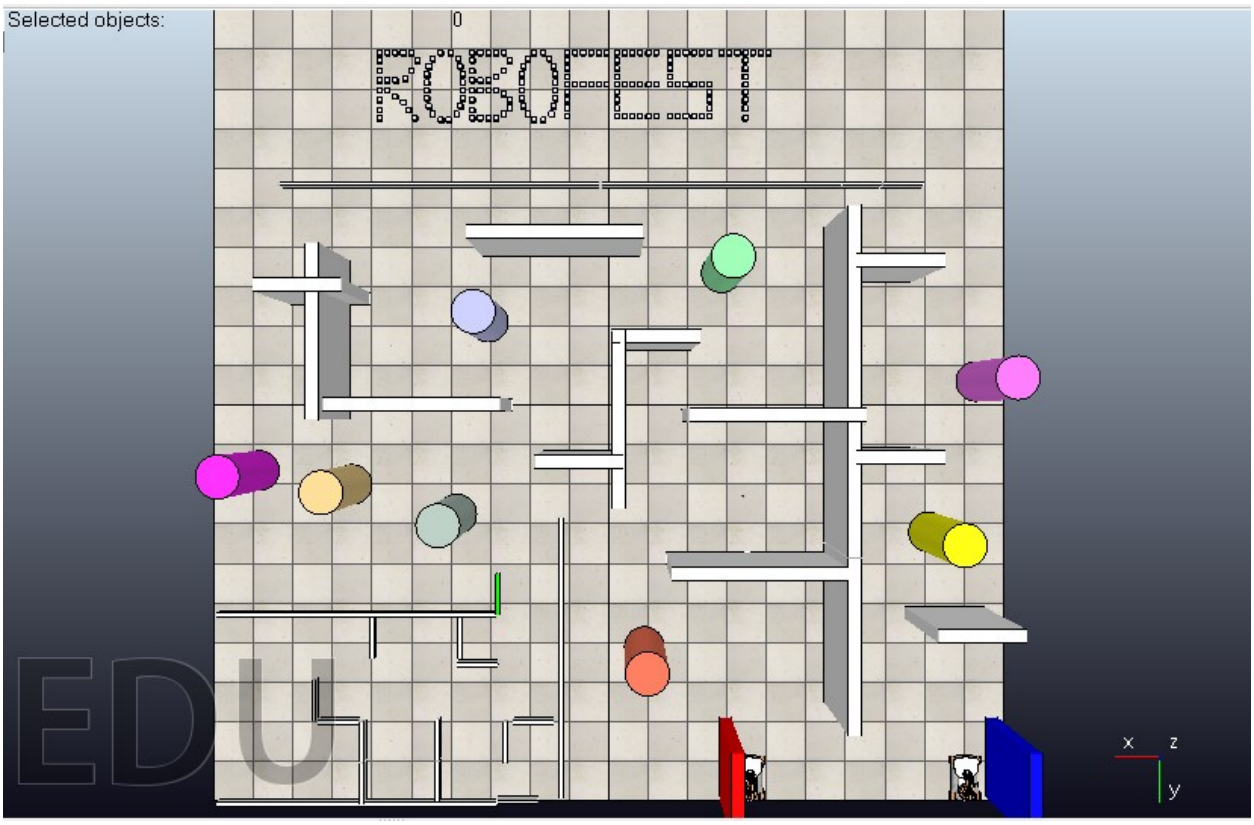
You are required to submit a text file of your code and a “CoppeliaSim Scene”. You can record the simulation using the record tool available in the software.



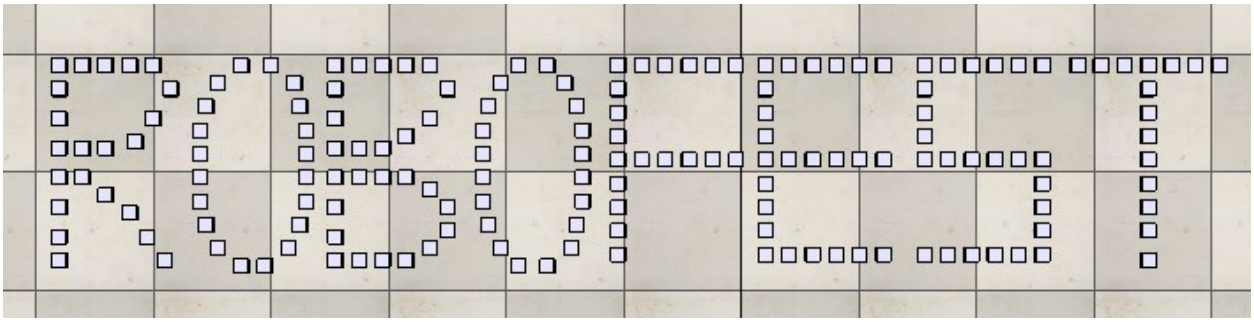
Evaluation Criteria

The key element that will be considered for the evaluation is the time taken for the completion of the task. The time will be counted from the start of movement of the robot until the last block of the wording is placed.

Apart from that the judges can also consider factors such as navigation techniques and algorithms used in completing the process as well.



The above shown image is an example of the expected final outcome of this task.



Guidelines for file submission of the Final Task.

Submission Summary:

The participants must complete and submit the Final Task on or before midnight on the 28th of September through the links below. In summary, the submissions are as follows:

1. Final Task Submission
    a. CoppeliaSim Scene file (.ttt file)
    b. Video Recording of the process. (Preferably recorded using the CoppeliaSim recorder.)

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

The video file must be uploaded, UNZIPPED, into the video submission link.

All other files (project files) need to be zipped into one file before making the submission into the file submission link.

Both files need to be renamed in the following format:

Team Name_University Name.zip

Team Name_University Name.mp4

Example: Pheonix_SLIIT.Zip Pheonix_SLIIT.mp4

You may use the University Name abbreviations as the name.

Example: ElectroBot_UoM

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:

Video Submission: https://www.dropbox.com/request/vFboJyeXwG3GmGCMprSo

File Submission: https://www.dropbox.com/request/HfkIxqKKSt3SxynHYArZ

Deadline for submission of files is midnight on the 28th of September.

Team Organization

The same team that took part in the Task 1 must participate in the final round as well.

Contact Us

For more information and clarifications please contact:

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