

## JUNIOR SKILLS MALAYSIA 2021 MOBILE ROBOTICS

## **INTRODUCTION**

Theme for this year's competition is 'AgroBot'.

Sowing is the most important process in farming. It is a very tiring and time-consuming process that requires a lot of human effort. This year's challenge is to design and fabricate a fully automatic seed sowing robot that automates this task. Thus, the system could be in completely automated or manually controlled mechanism that can deliver the process using a smartly designed mechanical robotic system.

This is an individual-based competition. Competitor is required to assemble a complete mobile robotics system prior to the competition. Team will also need to generate a technical report (soft copy in PDF) summarizing the whole project. The report must be supported by pictures showing different angles of the robotic creation and examples of the program. (Please refer to the checklist of the project report attached)

# **COMPETITION SCHEDULE / TIMELINE**

NO	TENTATIVE SCHEDULE	DATE
1	Registration (refer to the link below)	17 October -7 November 2021
2	Project Submission (Preliminary Round)	17 October -7 November 2021
3	Judging Session (Preliminary Round)	8 – 9 November 2021
4	Team Call Back (for the Final Round)	10 -11 November 2021
5	Final Round Live Competition (3 hours)	13 November 2021
6	Results Announcement	13 November 2021



**Registration link** 



# **DESCRIPTION OF PROJECT AND TASKS**

The aim of the competition is moving the robot to sow the seeds into the poly bags within a designated planting area. The most accurate task delivered within the fastest time will be the winner.

Teams will then need to submit the project video via YouTube and set as 'Unlisted'. Competitors must paste the link into the registration form later.

There will be 2 rounds in the competition:

- Preliminary round
  - Competitors are required to record and submit an unedited video of their robot performing the given task (submit only the best video) and submit the link via Google Form. No LIVE session will be conducted with the judges in this round.
- Final round (Top-10 only)
  - Judges will be selecting the best 10 competitors from the Preliminary Round.
  - Competitors will be given a new challenge (based on the existing field) within a specific time given and they are required to run the robot autonomously.
  - They also need to record their robot performing the modified task and submit the latest video link to the judges before the given time ends.
  - In this round, there will be a LIVE session with the judges throughout the whole duration of the competition. (link and platform will be provided later)

## **REGULATIONS ON THE GAME FIELD AND MISSION OBJECTS**

- 1. The distance of the game area is 1000 mm long. (Please refer to the picture below).
- 2. The game field is suggested to be an empty ground (no specific base color or type of surface) without any covered wall (Picture below is just for illustration).
- 3. Competitors are allowed to use black / white line on the field to guide the autonomous robot upon maneuvers. (Competitor can add guidance line if necessary)
- 4. There are total of 4 seeds (table tennis balls) at the 'Pick-up Zone' and each ball will be placed within the rubber band area (Please refer to the picture below).
- **5.** There are 4 polybags (containers made from half-cut 500ml mineral water bottles, as picture below) at the 'Planting Zone'.
- 6. Position of the polybags will be placed in the center of the field (side by side and attaching to each other)



GAME FIELD



# **REGULATIONS ON THE ROBOT TASK**

- 1. After the robot and time started simultaneously, robot must move out form the Start / Finish Area and go to the 'Pick-up Zone' to pick the seeds.
- 2. Robot is allowed to carry one seed or all 4 seeds at a time depending on the design and strategies.
- 3. Next, robot will need to move from the 'Pick-up Zone' into the 'Planting Zone' and sow the seeds in the separate container. Each container will be plated with only one seed.
- 4. Then, robot is required to stop in the Finish Area as it started previously, and the mission is successfully completed.

## **REGULATIONS ON THE COMPETITION EVENT**

- 1. The competition consists of only 1 round.
- 2. Robot must move out from the 'Start / Finish Area to perform the task.
- 3. Location of mission objects (balls and containers) are fixed (please refer to the given picture).
- 4. The robot will have maximum of 3 minutes to complete the challenge.
- 5. Time begins when the participant runs the robot (manually or autonomous).
- 6. If a team starts the run early (robot in motion before timer begins) and/or a team stops the timer early (robot still in motion after timer stops), the judge will record the challenge time as 360 seconds.
- 7. There will be a preliminary round and final round.
- 8. In the preliminary round, teams are allowed to use an autonomous or manual-controlled robot, while for the final round, all robots must be fully automated.
- 9. In the final round, judges will be selecting only the best 10 teams from the preliminary round which perform their task successfully and the robot must move autonomous.
- 10. There will be a 'Surprise Rule' in the final round which only be revealed by the organiser during the competition day

## **REGULATIONS ON ROBOT PLATFORM**

- 1. The controller, motors and sensors used to assemble robots could be from any platform such as LEGO® Education, VEX, Arduino, Makeblock based systems.
- 2. Competitors are allowed to use any additional parts or components to enable robot performing their task.
- 3. Robot needs to perform several required tasks such as moving 'out and in' from the 'Start / Finish Area', gripping, lifting, and releasing the seeds.
- 4. Robot is not allowed to statically stay in one station to perform the task given.
- 5. It is not allowed to use screws, glues or tape or any other related material to fasten any object (for example seed) on robots. Non-compliance with these rules may result in disqualification.
- 6. Control software is open to any software and any firmware respective to

## **REGULATIONS ON ROBOT SPECIFICATION**

- 1. Dimensions and wight of the robot are not restricted.
- 2. Teams are allowed to use only one controller for each robot to complete all missions.
- 3. The number of motors and sensors to be used is not restricted as well.
- 4. It is not allowed for the teams to perform any actions or movements to interfere or assist the robot after the actions to start the robot is performed. Teams that violate this rule will get a score deduction.
- 5. For the preliminary round, robot can be manually operated or autonomous and for the final round, the robot must be fully autonomous.
- 6. A robot with an autonomous program to complete the "missions" by itself is an added advantage. However, any radio communication, remote control and wired control systems are also allowed.
- 7. Each robot is for one competitor only. You are not allowed to share your robot with the other competitors during the competition.



## YOUR ATTEMPT AND TIME ASSESSMENT

- 1. You can carry out as many attempts as you want but only upload the best attempt.
- 2. Maximum time for each attempt is 3 minutes.
- 3. Time is not counted if any competitor touches the robot or any mission object during the attempt.
- 4. Time is not counted if the robot has completely left the game table.
- 5. Complete time is when the robot has returned to the 'Start / Finish Area' after completing the mission.

## THE RANKING ORDER WILL BE DETERMINED AS FOLLOWS

- 1. Sum of the mission points collected by the robot
- 2. Fastest time recorded

## CHECKLIST OF THE PROJECT REPORT

REQUIREMENT	YES	NO
1. Acknowledgement		
2. Project Mission, Vision & Objective		
(a) Background		
(b) Robot functionality		
(c) Uniqueness and interactive behavior		
3. Designing and Building Process:		
(a) Concept and Implementation		
(b) Engineering and stability of the structures		
(c) Pictures of the project (at each stage)		
(d) Final model and pictures depicting different angles		
4. Programming:		
(a) Printed programming with explanations		
5. Project conclusion with the photo (Participant and the project)		



# **INSTRUCTIONS TO THE PARTICIPANTS**

## HOW TO SUBMIT THE PROJECT VIDEO

- 1. Competitors needs to record their robot performing the given task in an unedited video.
- 2. Competitors can do as many trials as they want and choose only the best performance to be uploaded.
- 3. Competitors then upload the best video in their google drive or youTube and then share the link before the given dateline
- 4. Video / youTube video standard filename: JSM2021\_MR\_TeamName
- 5. Competitors can share the video link via QR code given below



## HOW TO RECORD THE PROJECT

- 1. Competitors needs to record the task by using a handphone or any recording device. Please take note that the timer / stopwatch MUST be visible in the video.
- 2. TIMER can be download via this link: sasbadisls.com/timer
- 3. An assistant is can also assist to record the video





# EQUIPMENT, MACHINERY, INSTALLATIONS, AND MATERIALS REQUIRED

Competitors need to prepare all these items:

1. Robot platform from either LEGO, VEX, Makeblock, Arduino or any suitable robot platform including any additional mechanical or electronic parts needed to complete the task and software to program the robot.







2. Standard table tennis ball – 4 pcs (Approximately 50mm diameter)



3. Standard 500ml mineral water bottle cut into two - 4 pcs



4. Standard rubber band (approximately 50mm in diameter) – 4 pcs



5. Computer / laptop / any device that can be used for programming robot





6. Web camera



7. Handphone or any recording device to record the video





8. Watch to display time (need to be visible in video) link. Use to show the video is unedited and the timing.





9. Measuring tape. Use to show the distance between the seeds and the polybag is 1000mm. (need to be visible in video)



10. White / black line for marking and autonomous guidance. Competitor can add guidance lines if necessary.





11. Game field (to be set up by the competitor). No specific color of surface is set for the game field. This is up to the competitor to decide. The picture bellow is just for illustration (Only need to follow the placing of object and show the distance between the seeds and the polybag is 1000mm (1M) and mark the start and finish are. Do not have to follow the color)



12. Online video conference platform (for LIVE session during the final round). This will be announce later.

# **APPLICATIONS OR SOFTWARES**

Competitors are allowed to use any programming languages and software to program the robot according to the robot platform that used by them.



# **MARKING SCHEME**

This document is intended to be used to show how points (subjective and objective) should be awarded based upon the team / student demonstrable knowledge.

The total number of points of the task/module on all evaluation criteria makes 100.

### A. TASK

NO.	CRITERIAS	MARK	S	TIME
1	The robot completely out of the start/finish area		10	
2	The robot moves to pickup area		10	
3	The robot successfully lifted the first seed		10	
4	The robot successfully lifted the second seed		10	
5	The robot successfully lifted the third seed		10	
6	The robot successfully lifted the fourth seed		10	
7	Robot successfully carries the fourth seed in 1 meter		10	
8	The robot managed to put the first seed in right places		10	
9	The robot managed to put the second seed in right places		10	
10	The robot managed to put the third seed in right places		10	
11	The robot managed to put the fourth seed in right places		10	
12	Autonomous(bonus)		10	
13	Total time starting robot move out and return to the finish area			
TOTAL MARKS		/120		



## **B TECHNICAL REPORT**

REQUIREMENT	0	1	2	3
1.Acknowledgement.				
2. Project Mission, Vision & Objective.				
(a) Background.				
The report is a good summary of the project: the problems -				
Solutions - process – findings solutions				
(D) RODOT functionality.				
problem				
(c) Uniqueness and interactive behavior.				
The project is original, worthwhile and shows creative thinking /				
innovative and imaginative design / interesting and divergent				
3 Particulars of participant and mentor				
4. Designing and Building Process:				
(a) Concept and Implementation.				
The project shows evidence and good use of engineering				
concepts				
(b) Engineering and stability of the structures.				
The project (robots and structures) are strong, sturdy and the				
demonstration can be run repeatedly - parts don't detach - little				
need for repairs				
(c) Pictures of the project (at each stage).				
complete)				
(d) Final model and pictures depicting different angles.				
Complete robot have been showed at different angles.				
5. Programming:				
(a) Printed programming with explanations.				
(Manual/Automation)				
I he programming options used make sense, work reliably, are				
relevant in terms of their use, complexity and design.				
FERGENTAGE				

Scale to indicate:

0 – Not submit 1 – Not Complete 2 - Complete 3 - Excellent				
	0 – Not submit	1 – Not Complete	2 - Complete	3 - Excellent



#### PRELIMINARY ROUND

SECTION		POINTS			
OLOTION			OBJECTIVE	TOTAL	
A	Task		/	70	
В	Technical Report	/		30	
				100	

## **FINAL ROUND**

SECTION	CRITERIA	POINTS		
OLOHION	UNITENIA	JUDGEMENT	OBJECTIVE	TOTAL
A	Task		/	100
				100



# **APPENDIX**







