



IESL ROBOGAMES 2019

University Category - Task Specification

1. Eligibility

- Participants are advised to form a team of up to 5 undergraduates.
- Any number of teams from a university can enroll in the competition.
- All team members should be undergraduates of the same university at the time of their participation in the competition.
- Each team should provide valid identification documents from their university on the competition day to prove their eligibility to participate in the competition.

2. Challenge - Hayabusa Challenge

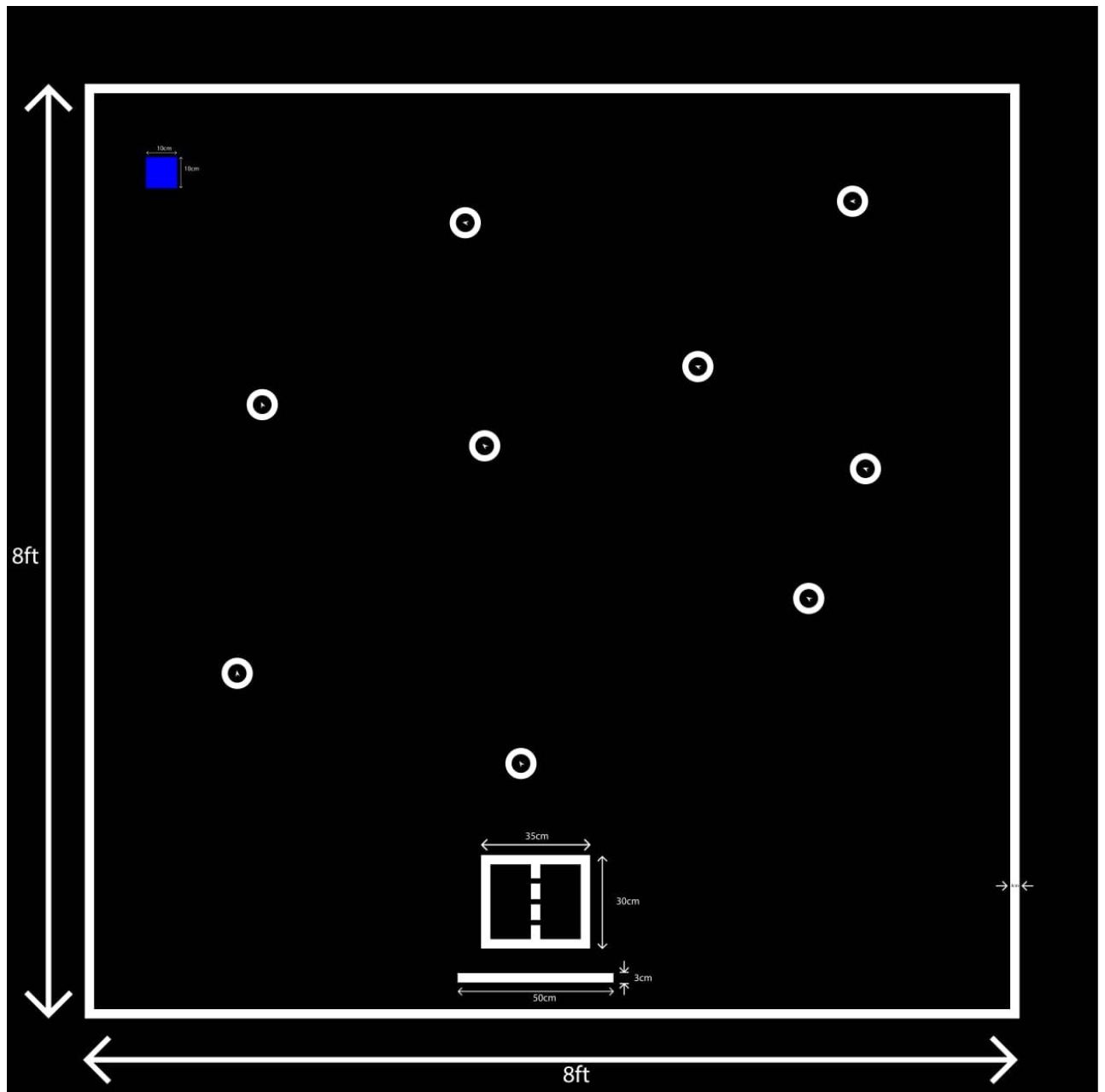
- “**Hayabusa**” ("Peregrine Falcon") was a robotic spacecraft developed by the Japan Aerospace Exploration Agency (JAXA) to return a sample of material from a small near-Earth asteroid named 25143 Itokawa to Earth for further analysis. Hayabusa was launched on 9 May 2003 and landed on the asteroid in November 2005 and was collecting samples in the form of tiny grains of asteroidal material. Suddenly, all communications with Hayabusa was lost in June 2019 and there is no method to retrieve the latest set of data from the spacecraft without being on sight. Since it is assumed that another asteroid has collided with 25143 Itokawa, Hayabusa must be severely damaged and not functioning. JAXA will launch “**Ravana**” spacecraft to retrieve the lost data of Hayabusa from 25143 Itokawa.
- The competitors are asked to build a robot that will be landed on 25143 Itokawa to find and retrieve the blackbox of Hayabusa, in which the robot should navigate autonomously.

3. Robot Specification

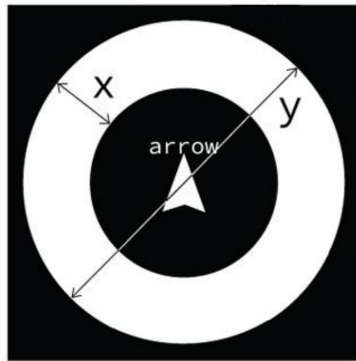
- Dimensions of the robot must not exceed 25 cm × 20 cm (length × width).
- Robot must be completely built by the team itself with their own design ideas.
- Robot should have a clearly indicated “ON/OFF” or “START” switch.

- Once the robot is switched on, it should be self-navigating. Wireless communication and remote controlled robots are not allowed in the competition (Robot should have the intelligence to navigate without any outside help or command).
- No off-the-shelf kits (commercial robot kits) are allowed except processing boards (i.e. Arduino or equivalent, Raspberry Pi, etc.), sensor modules and drive gears. If you have any doubt, contact the organizing team.
- After starting an attempt, the only interaction of the participants with the robot should be to stop the robot if necessary.
- It is encouraged to have a landing mechanism for the robot, but not compulsory. Additional marks will be given for the landing mechanism.
- Robots should be able to land on the landing zone from a height (which will be depending on the weight of the robot) without damaging the platform.
- Any robot with the potential threat of damaging the game platform will not be allowed to compete.
- Robots should work under any ambient light conditions.
- Calibration should be done at the start for light conditions if necessary.
- There are no height restrictions on the robot.

4. Platform Specification



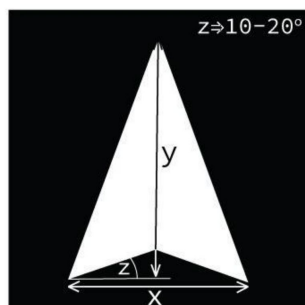
Circle Containing the Arrow



$x \Rightarrow 2.5-3.5\text{cm}$ $y \Rightarrow 10.5-11.5\text{cm}$

- A circle will have a white outer line, black inner area line, and an arrow inside the black circle of the junction to give directions.

Arrow



$x \Rightarrow 1.4-1.6\text{cm}$ $y \Rightarrow 1.8-2.1\text{cm}$

- Considering the arena a grid of 2ft x 2ft squares, arrows will be placed in a maximum of 9 squares.
- Arrows at every location will be pointed at the blackbox from the given position.

Measurements

- Landing Zone - 30cm x 35cm
- Lines in Landing Zone - 3cm
- Lines in the Returning Path - 3cm
- Wall at Landing Zone
 - Height - 25cm & Length - 50cm
- Black Box Square - 10cm x 10cm
- Boundary Line - 3cm
- Arrow - $x \Rightarrow 1.4 - 1.6\text{ cm}$ & $y \Rightarrow 1.8 - 2.1\text{ cm}$
- Circle consists of an Arrow (diameter) - 10cm

- Floor has a black finished area.
 - All the laid tracks will be white including the arrows.
 - Landing zone and the wall at the landing zone will be white.
 - The location of the blackbox will be of blue color.
 - Positions of the arrows will be different in the arena at the competition.
 - The line lengths will not be exactly the same as the figure but the overall design will be similar to the figure.
- Above given measurements will vary at some points in the range of $\pm 3\text{mm}$
- The actual arena at the competition will not be the same as above but will have similar characteristics.

5. Arena Description

- Arena will be 8ft x 8ft and it will consist of uneven surfaces which are used to simulate and represent the real life scenario of an asteroid.
- Arena Boarder
 - The border of the arena will be marked with a 3cm thick white solid line finished with matte.
- Arena Floor
 - Matte finished floor which is black in color.
- Lines in Landing Zone and Circles
 - White line with a thickness range of 2.7-3.3cm.
- Arrow
 - Following image depicts the dimensions of the arrow.

6. Task Procedure

- After your team name is called for the competition you are allowed to have one test attempt for your robot which is limited to 10 minutes.
- After the test attempt you will have 2 more attempts which are used to give you marks. Maximum score of given two attempts will be taken as the score of the current round.
- All robots will be collected by the organizers 10 minutes before the round begins. Robots will only be returned to the competitors after the round is completed.
- Steps should be followed to complete the task,
 - i. Start the robot.
 - On the command of the supervisor the robot's ON switch is triggered and it's put into full autonomous mode.

- ii. Place the robot.
 - Robot will be placed above the landing zone from a defined height.
- iii. Land the robot.
 - Landing should happen in the landing zone marked on the arena.
- iv. Locate the arrows in the arena
 - Several arrows (maximum of 9) pointing in the direction of the blackbox will be there to assist the robot to find the blackbox.
- v. Find the blackbox
 - The blackbox of Hayabusa is placed in the area and the robot should be able to locate it autonomously.
- vi. Retrieve the blackbox.(made with a magnetic material)(less than 50g)
 - Blackbox can be retrieved using a metal plate.
- vii. Return to the landing zone.
 - The robot is expected to find and retrieve the blackbox and then return to the landing zone with the blackbox.
- Crossing the boundary line will result in reduction of marks.
- Marks will be given to reaching each station.

7. Timing Measurements

- The task will be timed from the time the ON button of the robot is pressed to the time when the robot reaches the landing zone with the blackbox.
- Time taken to complete the task will be considered when giving marks.
- Time taken for the task should be less than 10 minutes and if the robot exceeds the time limit of 10 minutes your robot will be removed from the arena.

→ Grading Criteria will be released after registration deadline.