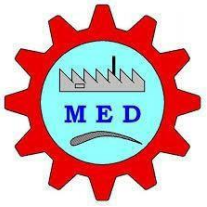

Department of Mechanical Engineering

at

The National Institute of Engineering

Along with

The Robotics Club @ NIE

presents

ROBORIKISHI

LEAD THE RING

DEATH RACE

Problem statement:

Design a wired/wireless manually controlled robot that should be able to travel on land, water **(multiple terrains).** The robot that traverses all the hurdles and completes the tracks in a minimum amount of time will be declared as the **'DEATH RACE CHAMPION'**.

Bot specification:

- The dimensions of the vehicle must be within **30cm*30cm*30cm** (l*b*h).
- The robot can be wired/ wireless.
- The maximum weight of the vehicle must be **5kg on board**.
- In the case of wired control, the wires should be slack all the time. The minimum length of the wire must be more than 4m.
- The power supply for the vehicle should not exceed **12V DC** between any two points in the circuit at any given time.
- The vehicle can only be powered by a battery. The power supply should be placed either on the vehicle or to be handheld by the pilot.
- The use of readymade chassis/ RC cars is not allowed.
- The use of IC engine or compressor is not allowed. All the robots must depend only on motors for their propulsion and control.
- Damaging the wires of the opponent will lead to disqualification.

Arena specifications:

- There will be total of two rounds. Each higher round will have obstacles with higher difficulty.
- The tracks will consist of various hurdles on its way. There will be hurdles like sand, stones, inclined, declined surfaces and other surprise elements. The track will have curves, to check the swiftness of the robot.

Rules:

- The participants should possess a valid identity card from their respective Institutions.
- The vehicle should undergo technical inspection one hour before the event.
- Teams must start their robots from the starting line only after a signal is given by the Referee. The timer starts immediately after the signal is given.
- The number of participants per team should not exceed 4.
- The bot should always remain inside the track. If 1 wheel of the bot leaves the track at any point in the time during the race, it will be considered as a "**PENALTY**" .
- During the "PENALTY" bots are required to be within the arena within 15 - 20cm of the arena from the point the bot leaves the track. Failing to do so shall add a greater number of PITFALLS based on the referee's decision.
- Each PENALTY spans for **10** seconds.
- The team is not allowed to manipulate the bot. If in case the team touches the bot during the race, it shall be considered as a "**HAND TOUCH"** and shall add 1minute to the total time. The bot once touched should be kept at the start of the previous obstacle such that all four wheels of the bot are touching the ground and not the obstacle.
- The team shall be allowed to repair the tyre or any mounting assembly or part for which a **HAND TOUCH** will be considered and a repair time of **1 minute** is given.
- The battery cannot be replaced after entering the track.
- The number of hurdles that could be skipped would be limited and would be declared on the day of the event. Skipping the hurdles will add **3 minutes** to the total time taken to finish the track.
- Only the pilot and a subordinate are allowed to move on the track, without disturbing the hurdles. If any other teammates are found on the track, then the team will be directly disqualified.
- Misbehaviour of a participant will lead to disqualification.
- We are not responsible for any damage to the bot that occurred on or off the event.
- If special circumstances, such as unforeseen problems or capabilities of a robot occur, rules may be modified.
- If there are less than 5 teams registered, the event will be cancelled.
- An attempt has maximum time duration of **10 minutes** for each round.

Judging Criteria:

- The total time taken (including the penalties and the skips) to complete the whole track for all the three rounds is solely considered. The robot which completes the tracks in the least time is declared as the winner.
- 40% of the total number of teams will be qualified for the second round. Rounding off will be done to the next digit. (Example : 40% of 11 teams would mean 4.4, hence 5 teams will be qualified).
- Wireless controlled robots will have some advantage in the tracks.
- In case of a tie then other factors such as no of pitfalls etc. are considered.
- The referee's decision will be final.

Line Following Robot

Problem statement:

The challenge is to drive through the track while following a black line against a white background and tackling the surprise challenges on the arena which will be disclosed on the day of the competition. The quickest and most intelligent robot will be declared as the winner.

Bot Specification:

- At any point in time and any configuration of the bot, it should fit inside a box with dimensions of **30cm*30cm*30cm** (l*b*h).
- The power supply should be on-board and maximum voltage between any two points on the circuit at any given time should not exceed **12V DC.**
- The bot should be fully autonomous.
- Use of readymade chassis or robotic kits in not allowed.
- A maximum of **5 sensors** can be used on the robot.

Arena Specifications:

- The track will be consisting of a black line of width **2.5cm to 4cm,** on a white background.
- The track may contain:
  - ✓ Wedges of inclination of less than 30º
  - ✓ Sharp Turns
  - ✓ Loops
  - ✓ Discontinuities
  - ✓ Other surprise elements
  - ✓ The track contains checkpoints at regular intervals

Rules:

- The team must start their robot at the start line when the signal is given by the Referee.
- The timer starts as soon as the signal is given.
- A small part of the track shall be disclosed, for calibration purpose, 30 minutes before the event.
- Once the calibration is done all the teams must submit their bots before the event and they won't be allowed to modify the bot before they place their bot on the track.
- If at any point of time the robot gets immobile or is touched by the participants, it would be considered as a **PITSTOP** and an opportunity will be given to repair or relocate the robot. PITSTOP shall add a penalty of **30 seconds**
- The contestant can relocate by placing the bot at any point on the track behind the last crossed checkpoint. The bot should be placed such that the bot's lateral axis is perpendicular to the track.
- **1 minute** will be given to repair the bot during the event.
- Participants are allowed to skip the checkpoint with a penalty of 1 minute. The maximum number of skips shall be disclosed on the day of event.
- Maximum of one person is allowed to touch the robot.
- The code can be modified only one time during the whole track.
- The robot must be brought in for specification check before one hour of the commencement of the event.
- Referee's decision will be final.

Fouls:

- The robot violating any of the rules described above will be disqualified from the competition.
- If the bot is found to be READYMADE, the team will be asked to present the code and reupload it during the event failing to which may lead to disqualification.
- Any kind of interference by the participant which affects the robot direction or speed will be considered as a pitstop and force the team to restart from the previous checkpoint.
- Robots or participants causing deliberate interference with other robots or damage to the field will be disqualified.
- Participants who misbehave may be asked to leave the competition area and risk being disqualified from the contest.

Judging Criteria:

- The only factor considered is the time taken to complete the whole track. The robot which completes the track in the least time is declared as the winner.
- In case if there is any tie between two teams then other factors such as number of pitstops taken etc. are considered.
- Referee's Decision will be final.

Robo Soccer

Objective:

Build a robot that can play soccer within the field boundaries, aiming to score as many goals as possible against an opponent. The game is played between two teams, each controlling one or more robots, on a predefined arena. The team with the highest score at the end of the match wins.

Bot Specifications:

- Each robot must fit within 30cm x 30cm x 30cm (L x B x H) with 5% tolerance.
- Maximum onboard weight of bot should not exceed 5 kg (additional 5% tolerance i.e. 250 grams).
- Robots can be wired or wireless. If wired, the wire must be at least 4m long and remain slack.
- Robots may use a maximum of 12V DC at any time. Only battery-powered robots are allowed. Battery voltage will -be inspected at motors before the event.
- Only electric motors are allowed; no IC engines or compressed air mechanisms.
- Use of pre-built RC cars or ready-made chassis is prohibited. The robot must be designed and assembled by the team.
- Robots may have mechanisms to push or flick the ball but cannot use suction or adhesion to hold onto the ball.
- Robots must pass a technical inspection 30 minutes before each match to ensure compliance with specifications.

Arena Specifications:

- The soccer field will measure approximately 8ft x 6ftm.
- Goals are 30cm wide on each side of the field.
- A lightweight, tennis ball will be used.

Gameplay Rules:

- The competition will be held in a **KNOCK OUT TOURNAMENT** format.
- The fixtures of match will be based on Draw-Fixing (Chit-Fixing) which shall be carried out before the event starts.
- If any team consisting of 2 or more robots get fixtures against each other, the fixture may be changed only during the 1st knock out tournament. Post 1st round, the fixtures on same team shall not be subjected to changes in any case.
- In case of odd number of participants, the final three teams shall have a tournament amongst themselves and one winner shall be pushed forward to the next round eliminating other 2 teams.
- Each team may have up to 4 participants.

- Robots begin in designated zones on their respective sides. The referee signals the start of the match, at which point the timer and gameplay begin.
- Robots cannot hold or grip the ball. They may only push, flick, or guide it.
- A goal is scored when the ball fully crosses the goal line. After a goal, the game restarts from the centre.
- Robots may block each other but should not attempt to damage or interfere with the control systems of the opposing robot.
- In case of a technical failure, a 1-minute timeout is allowed for repairs. Only one timeout is allowed per team per game.

Time Duration:

- Eliminators : Each half consisting of 1 minute 30 seconds with an interval of 30seconds
- Semi Finals : Each half consisting of 2 minutes with an interval of 1 minute
- Finals : Each half consisting of 2 minutes with an interval of 2 minute.

Tie Breaker:

- Eliminators: First to score wins
- Semi Finals : First to score 2 wins
- Finals : Overtime of 1 minute. If the tie remains then overtime of 30 seconds post which the time-based penalty will be carried.

Judging Criteria:

- The team with the most goals at the end of the match wins.
- In case of a tie, a sudden-death overtime starts
- The referee’s decision on penalties, time, and goals is final.