

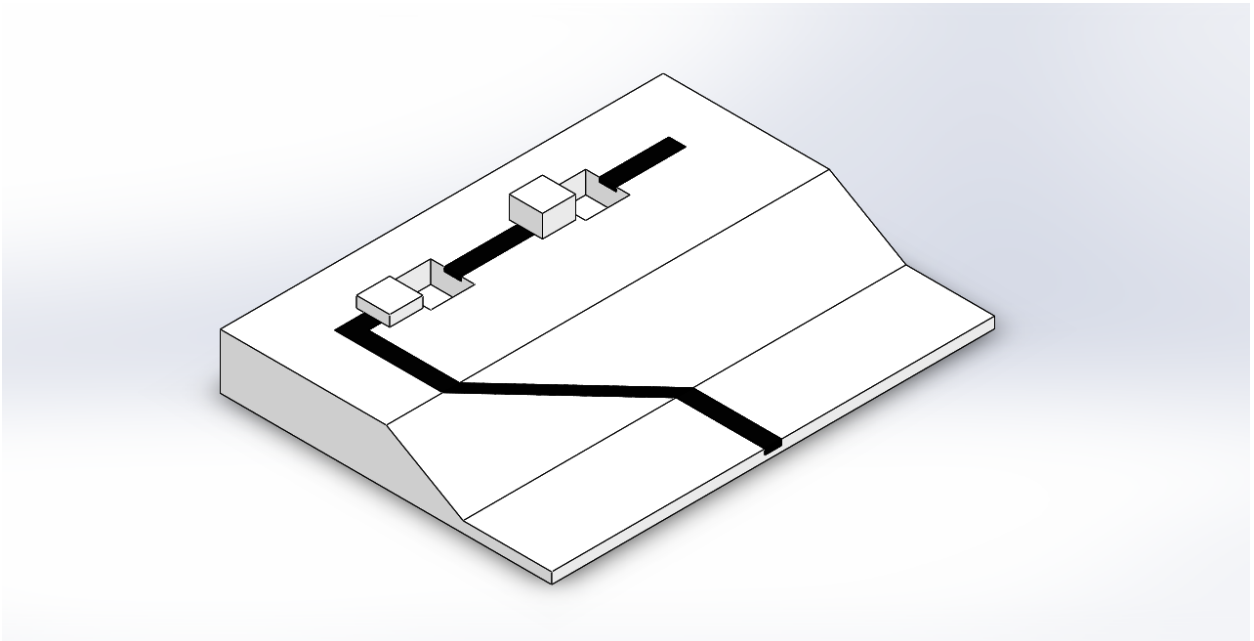
## ***Line Following***

### ***The Task***

Fabricate an autonomous machine capable of following a black line on a white background while completing certain tasks on the way. The task simulates the problem of developing autonomous cleaning machines: the robots will have to clear stray objects off the track by pushing them into bins.

### ***Arena***

- The track will consist of 3cm thick black lines on a white background involving broken lines, curved paths, sharp turns etc.
- The track shall involve crossovers (i.e. places where the line crosses itself).
- Switchbacks and hairpins are possible, but the adjacent sections of the line shall be no closer together than 15cm when measured from the center of each line.
- The line course shall have 1 or more sharp right-angle, but no angle will be greater than 90 degrees.
- Each check point will be marked by a 30cm long and 3cm thick black line perpendicular to the path.
- All markers, bins and objects will be along the path and placed symmetrically about it.
- The stray objects will be white blocks of sizes 10cm x 10cm x 10cm and 10cm x 10cm x 5cm (lxbxh).
- The depth of each bin is 10cm and its size is 15cmx15cm.
- Weight of each Block is approximately 25gm.
- The path can also go over inclines of inclinations up to 25 degrees.



### ***Machine Specifications***

- The machine must fit in a box of 30cm x 30cm (no limit on height) at the start; its dimensions can change as the run proceeds.
- Potential difference between any two points in the circuits must not exceed 18V throughout the contest.
- Use of non-electric power sources is not allowed for locomotion, you may use them for any other purpose provided it conforms to the other rules.
- The robot must be completely autonomous and must not receive any outside assistance once the run has started. Hard coding the bots is strictly prohibited.
- Teams are allowed to use ready-made micro-controller boards, sensor kits etc. However kits like Lego kits are not allowed.
- Machines which disintegrate during a match or damage the arena shall be immediately disqualified.
- The decision of the organizers shall be final and binding in case of any disputes. If you find any loop hole in the rules, it's always better to have its legitimacy verified by us instead of being disappointed at the venue.

### ***Event Structure***

- The event shall consist of two stages: the preliminary stage and the final stage.
- Top teams from the preliminary stage will qualify for the final stage, points scored in the prelims being the criteria for advancement.

### ***Game Rules***

- Every machine must start from its starting zone at the start of a match in the specified direction only.
- The operator may abort the run at any time.
- 1 minute is allotted for sensor adjustment and calibration prior to each run.
- Every run is allotted a maximum of 3 minutes after the 1 minute calibration period, after which the run must be aborted if it's not complete.
- There will be various check points along the track. If any participant touches the robots during its run then it would be considered a hand touch and the robot will have to start again from the last check point covered. Please note that the timer and points counter shall NOT be reset.
- Teams can take any number of hand touches; there is no penalty for a hand touch, but ONLY after the consent of the organizers. However, number of hand touches taken will be used as a tie-break criterion if two teams happen to have the same scores.
- The methods of covering the check points and completing the tasks are at the discretion of the teams. No points will be deducted if the team leaves out any of the non-mandatory check points.
- In the preliminary rounds, the robots will have to traverse the entire track without performing any tasks, points scored in doing so as per the following formula being the sole criteria for progression to the next stage.

**Points Scored = 180 - (time taken) + 10x (no. of checkpoints covered) + 20x (no. of objects cleared)**

- In the final stage, robots will be required to traverse the entire track while moving all stray objects on the track into designated bins.
- Only one team will try to complete the task at a time.
- Tie break criterion: minimum time, then minimum number of hand touches.

### ***General Rules***

- The teams must report on time for their slots failing which they shall be immediately disqualified.
- Only two members of the teams will be allowed to handle and operate the robot.
- Stepping onto the arena without the consent of the organizers is strictly prohibited, failing which might lead to disqualification.
- The teams must pass a security check of the robots prior to a match; use of flammables, explosive, combustive or otherwise hazardous processes is not allowed.
- Participants are not allowed to keep anything inside the arena other than their robot.
- Use of any device that disrupts the functioning of other robots is strictly prohibited.

- The machine must be completely autonomous; any kind of outside assistance might lead to disqualification.
- Only the points and time recorded by the organizers shall be considered and their decision shall be final and binding in case of any disputes.
- The organizers reserve the right to change any or all of the above rules without prior intimation, however any change shall be reflected over here and promptly communicated to all registered participants.

### ***Team Composition and Registration***

- A team must not have more than 4 members.
- Each team member must produce a valid ID card of his/her respective educational institute at the venue.
- A team can comprise of members from different educational institutes.
- A team once registered cannot register again, even with a different name.