TECHNOCRACY2019

The line follower robot is an autonomous robot that detects and follow a line. It will also need to solve some unique problems. It will have to follow a path which will consist of several challenges i.e. sharp turns, overlapping paths, zigzag line, line gap, triangular section etc.

Team specifications:

1. Maximum allowed team members is 3. For additional members, an extra fee will be introduced with the original registration fee.
2. There will be three rounds.
• Round 1: Selection round with a simpler version of the given track. The track will not contain any bridge or wall. Teams will be selected based on points. Point distribution may vary a little from the given one for this round.
• Round 2: Final round with the given track. The optional checkpoint will be disclosed three days before competition. It will be something similar to any of the other checkpoints.
• Round 3: Champions round with minor modifications of the given track. The top two teams with highest points will compete against each other.
3. For calibration purposes, one of the track will be available to the participants on competition day for 1 hour.

Rules & Regulations:

1. Before the competition starts, each team has to submit their bot.
2. After submitting the bot, the teams are not allowed to make any kind of changes to the robot.
3. In the time of race, only 1 member will be able to stay in the arena.
4. Points will be awarded only if the robot travels the whole path between two checkpoints and crosses the new checkpoint. No checkpoint can be skipped (except the optional ones).
5. Touching the bot during runtime is a compulsory restart. Restart is a must in case the bot gets out of track.
6. The bot must restart from the last completed checkpoint.

7. Max no of restarts: 5
8. Max allowed voltage difference between any two points of the circuitry is 24V. Every bot must have a power switch/kill switch.
9. No external communication can be used to control the bot.
10.Judges' decision will be final. So, no objections may be declared against judges' decision.

Robot specifications:

1. Bots must be self-contained, an autonomous ground wheeled not externally operated by wire or by remote radio control during the race. Each team has to bring its own power supply for robot. No additional equipment/parts will be supplied in the competition.
2. Weight: Max 3 kg
3. Height: Max 25 cm
4. Length: Max 25 cm
5. Breadth: Max 25 cm

6. During run the bot can neither be split into several parts nor can be reprogrammed.

7. Accidental detachment of an electronic or mechanical component can be reattached during the run by the participant, no new component is allowed to be introduced to the bot in this duration. Any time advantage will not be given.

The robot follows black line on the track as fast as possible

1. Contest description:
After being started, the robot has to run over the course and follow black line. The ranking is determined by
the time the robot needed to go from the start to the finish line. The time is measured from referee's signal
to the moment the foremost part of the robot crosses the finish line. The robot must be fully behind the start
lane before the race starts. If the robot loses the line, it must return to the line so that it does not shorten its
way thanks to the line loss. If the race time exceeds 3 minutes or if the robot leaves the playing field, the
referee terminates the race. The races are organized in several rounds. During the qualifications, robots proceed to next round if they successfully pass all obstacles

and finish the run. Robots with the best time in the last qualification round qualify for the finales. In the finale part, the races will be held on a knock-out basis. In case of a tie, a
repeated race may be ordered by the organizers. If time allows, the robots may repeat a run in qualification rounds (with priority for robots with less attempts in that round).

2. Robot:

The robot is fully autonomous and must not be dangerous or excessively annoying. Throughout the race (including the start) no external connection is allowed. The robot must not be touched
or interfered with in any way since the player starts it until the referee allows so. On its top side, an
emergency switch must be located. By pressing it all actuation must be switched off. The switch must be
big enough and well distinct so that it can be easily recognized, reached and used. A 10x7 cm space for
sticker marking must be reserved on the robot's top side.
Maximum size of the robot is 32(w)x32(h) cm, there is no limit on its length.

3. Playing field :///{{{{{{ PROBLEM}}}}}

Playing field ground is white. The track is marked by a black line, approx. 1.5 cm wide. The line does not
cross itself; however, it may split and re-join (in such case, the robot may take any of them; the paths can
be however of different length). The line may even end with a loop which reverts the robot back towards
the start. Starting and finishing lines are marked by two perpendicular marks 5 cm off the track. Minimal
distance between the line and playing field border is 15 cm. Minimal curve diameter is 10 cm. There could
be slight level differences on the playing field (but we will aim to have the playing field nicely flat).

There may be some obstacles on the track:

a) An object: There could be an object laid on the track. Its size is at least 10(w)x8(h)x2(l) cm, weight at
least 100 g. The robot may touch it but it must not move it.

b) Line cut-off: The line may be discontinued at any place for max. 20 cm. After the gap, the line may continue anywhere within ±30° from the original direction.

The playing field border is at least that far so that at both external angles the line could continue and the safety distance mentioned above is met. After passing the obstacle, the robot must continue to follow the line at latest at 30 cm from its end. There are no obstacles in the first qualification round. In every consecutive round, the obstacle count increases. For the time to be recorded, the robot must pass all obstacles.

4. Power of officials and liability

If a robot or a participant violates the rules, the referee may disqualify them from the race. He may also
disqualify the participant or the robot for further races.
No objections against the decisions of the referee or the organizers are allowed.
The organizers may change the rules without prior notice, e.g. based on number of participants, local
conditions etc.
The participants are responsible for their robots and their safety and will be liable for all damages caused
by them, their robots or their equipment.
The organizers will not be under any circumstances held liable or responsible for any accidents of the
participants or any damages caused by the participants, their robots or their equipment.

Arena Specification:

1. Track will be printed 'Black on White' surface and colorful T junctions.
2. Track line will have a min breadth of 3cm through the whole track.
3. Sharp turns will form 30°, 35°, 80° and 90° angles. There will be no angle smaller than 30°.
4. There will be curves and discontinuity in the line.
5. Bridge angle will be at most 45°.The autonomous bot will climb up the inclined bridge
following the line. On the bridge, the line will be lost and bot has to move forward following a wall placed on the bridge, then it needs to take 90 degree turn while following the wall on the bridge and get down again following the line. **See figure**

- **Curved bridge:** A semicircular bridge, autonomous bot has to cross it following the walls of the bridge. **See figure**
- **Plank: See figure**

6. **Start/Finish Zone: Black square** with dimensions **30cm X 30cm.** The autonomous bot must start from and finish the game at this zone. **See figure**
7. **Manual Start/Finish Zone: Black** square with dimensions **60cmX60cm.**The manual bot must start from and finish the game at this zone. **See figure**
8. There will be one optional checkpoint which will carry bonus points.
9. For the end-point, the bot must block the laser rays (height of the laser rays will be about 7cm from ground) for at least 5 secs in the tunnel to successfully complete the race.

10. **Autonomous Track:** 3cm **Black** line on white surface (width 30cm). Line may include various patterns like circle, triangle, square, zigzag, sharp turns like 900, 600, 450, 1200, 1350, line gaps. **See figure**

4. Contest procedure:

1. Total time allotted for a bot to complete the track is 5 minutes.
2. Two minutes of calibration time will be given before race.
3. Heats time is counted from the moment of crossing the start line by the robot until the moment of crossing the finish line by the robot.
4. Robot crosses the line when its front part touches or crosses the line.
5. Time of attempts should be fixed with electronic gates or by referee with the stopwatch depending on the availability of the equipment. In any case fixed time shall be final.
6. As soon as the robot crosses the start line, it should remain completely autonomous. Otherwise it will be disqualified.
7. Robot, wandering on the contest field should be disqualified.
8. It is counted that the robot left the competitive field, when any wheel, leg or caterpillar of the robot is completely off the field.

9. The robot is considered to have left the line, when no part of it is above the line.
The robot length in this case is measured by the wheel base.The line may be left only tangentially from the outside, provided the length of the section which the robot passes tangentially does not exceed three lengths of the robot body.

10. A team can take at most 5 restarts during run. Each restart will cause a penalty.
11. In some portion(s) of the track, if the bot is able to take shorter routes, it will be able to save significant amount of time. There will be enough signs in the track to help the bot identify such shortcuts. The challenge for the participant is to program his robot in such a way that it can take the shorter routes and stay ahead in time. Following is such a portion where taking shorter routes will result in taking less time to finish the track.
There may exist certain variations of this challenge. But they can be solved in a similar fashion. It should be mentioned, however, that participant can choose to take the longer route and still finish the track (Hint: The bot needs to shift its directional priorities).
12. There will be no cave present in the first round.
13. This is the signature problem of this year's track. In this problem, the bot needs to store some data and then evaluate the data to take directions at successive intersections.

Point distribution:

Activity	Points
Passing checkpoints 1 to 6	10*6 = 60
Endpoint (checkpoint 7)	20*1 = 20
Optional checkpoint	5*1 = 5
Each restart	-25

Necessary Figures: