ROBOGAMES 2023

IARC

"I know a lot about artificial intelligence, but not as much as it knows about me."

- Dave Waters

INTRO:

This event is about an autonomous robot built by the participants from scratch. The robot is judged based on its ability to perform usual tasks. The event considers the precision level in the design and fabrication of the bot and intelligent use of sensors and coding. This is one of the flagship events of Techkriti, witnessing a large participation from across the country and also around the globe. It saw the footfall of 40+ teams in the final round last time.

GENERAL RULES:

- Each team can have a maximum of 6 participants.
- A team may consist of students from different colleges.
- Certificates of Excellence will be awarded to the top three teams.
- Bots should not be disassembled until the results are declared.
- When a team is called for a match, they must report within five minutes.
- **The arena shown is just for reference**. It may be different from what is shown here, but the tasks will remain the same.
- The organizers reserve the right to change the rules as they deem fit.
- The judge's decision will be the final decision.

- Change in rules, if any, will be highlighted on the website and notified to the registered teams on prior notice.

Event Structure:

The event would be conducted in three rounds:-

- National Qualifiers
- National Finals
- International Finals

This competition also has a Zonal Component.Winners from the zonal round(Technocruise) shall be given direct entry into the National Finals.

For the problem statement of Zonals visit our website of Technocruise ([link here](#)).

PROBLEM STATEMENT:

- You shall place your bot at 'start' in any direction, in order to perform line following.
- In the path, there will be several nodes that you have to decode. The description of the nodes is mentioned below.

  - The node will be a 2 x 2 matrix that you have to sense with sensors and have to store that matrix.

○ You have to convert that matrix into a 4-bit binary number. If the number in binary form is ABCD with A, B, C, & D as the bits detected, the following will be the order of bits.
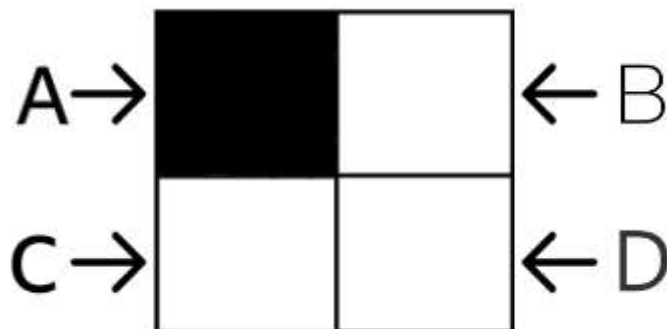

Fig. : Top view of Node

○ For example in the above figure a value will be 1000 with A = 1, B = 0, C = 0, & D = 0.
○ Your bot should display the value of each node in real-time on an LCD screen. This data can also be displayed on a mobile or laptop screen via wireless communication between both. (assign points to it)
○ Your bot will cross a node by first encountering C & D cells and then A & B cells.
○ A and C cells are present on the left side of the node, whereas B and D cells are present on the right side of the node. Here left and right are with respect to the left and right side of line following.

● There would be many dead ends in the path and which would be denoted by a cubic wooden obstacle. The robot has to detect it and avoid touching it. Failure to do so would result in deduction of points.

- After reaching point A by following the line robot will encounter a node which it has to detect and decode it into speed by the below-mentioned method. Then it has to travel to another point B by following the black line at a speed less than the decoded value, failure to do so would result in deduction of points. In case the bot crosses the line, human intervention would be allowed but points would be deducted for it.

    - You have to convert that binary number into a decimal number and if the decimal number is x then you have to travel at a speed less than equal to 1.5 * x cm/s.

- After reaching point B bot will again encounter a node with value 0000 and it would denote that the speed limit is over. The bot has to follow the line again, according to the same rules as mentioned above. It would then reach point C.

- After reaching C it would again detect a node that would be decoded into an angle (**θ**), the formula for which is mentioned below.

    - If the obtained number after decoding and converting it to decimal is x then the correct lane would be at an angle of **x*10 degrees**.

    - You can find the correct lane at this angle in clockwise as well as in anticlockwise direction.

- Bot then has to follow a circle and has to reach a lane at angle **θ** from the lane where you left for following the line.

- Following the lane at the decoded angle would result in a path to the goal point.

- Following the above directions, the bot would reach the Finish area. There it has to show the message "FINISH" on an LCD display.

NOTE:

- A robot has to detect a total of 3 nodes in its path.

ARENA:
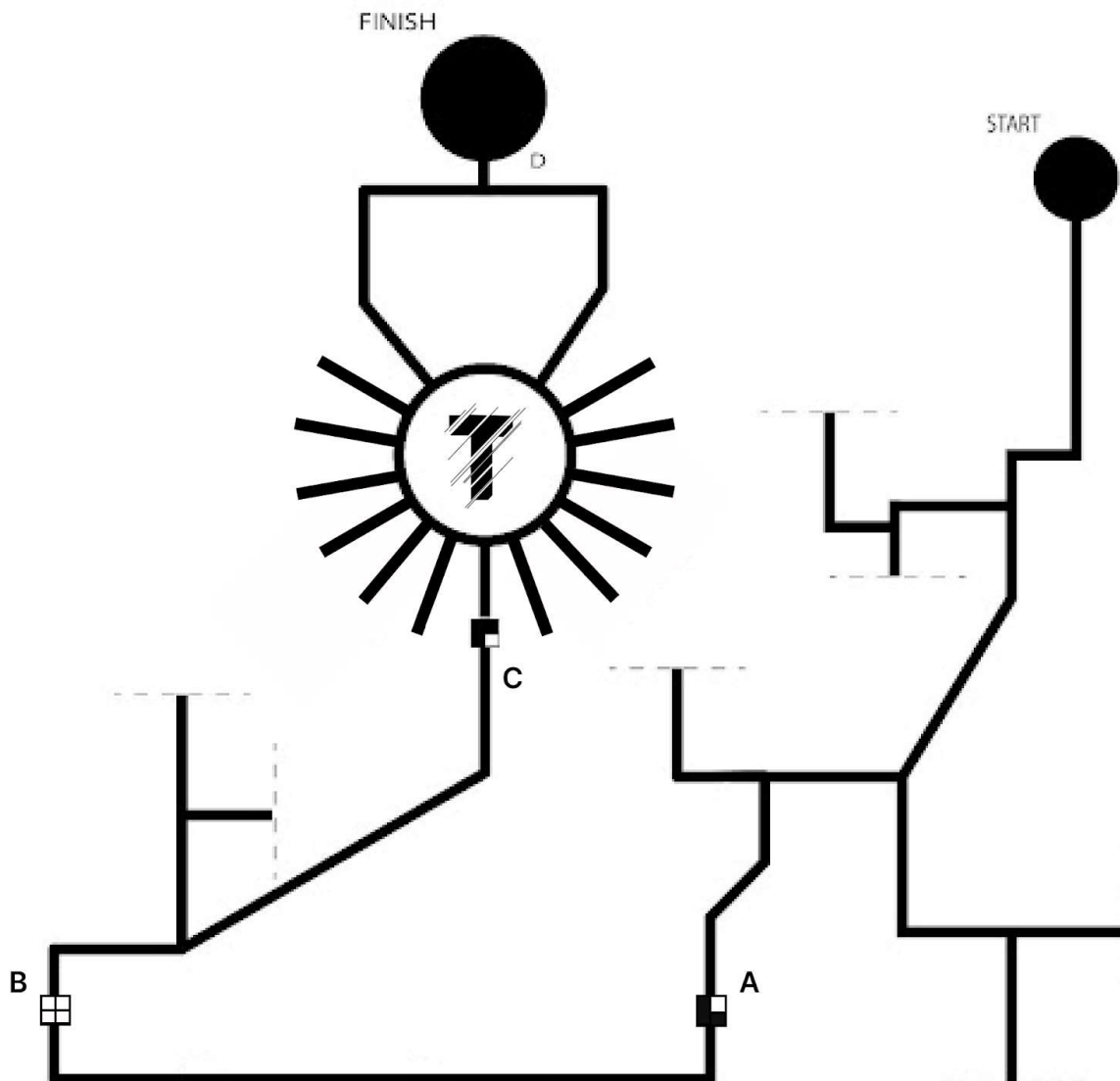
- The width of the black line is 3 cm.
- The size of each node is 6cm x 6cm and each square in the node has dimensions 3cm x 3cm.
- The size of dead-end cubic obstacles is 150mm x 150mm x 150mm.
- The distance between nodes B and C can be anything from 50 cm to 150cm.
- All checkpoints (including start and end points) are circular of dimension 30cm and are would be black in color.
- The radius of the circle encircling Techkriti logo is 200mm.

Robot Controls:

- You have to let go of the bot at the beginning of the trial and no human intervention is allowed thereafter. If human intervention is necessary ,the bot has to start from the previous checkpoint. Maximum of two human interventions are allowed per run.
- The judges can ask for an explanation for any mechanism of the bot and there would be an immediate disqualification of defaulters.

Specifications:

- During the whole event, the bot must fit within a square of 250x250x250(mm)(l x b x h).
- The Robot must be stable and able to move on its own. A bot not fulfilling these criteria will be disqualified.
- The bots should be able to follow the line according to event specifications.
- Each team has to bring its own power supply for its robots. The voltage difference between any two points on the bot must not exceed 24 volts.
- Teams are advised to use an onboard power supply. In case they are using external power supply they will be responsible for any problem created by entanglement of wires.
- Bot's code will be checked for hard coding before the trial.

Point system:

- Time taken in seconds from Start to A = t1 (Line following)
- Time taken in seconds from A to B = t2 (Run under the Speed limit and line following)
- Time taken in seconds from B to C = t3 (Line following)
- Time taken in seconds from C to Finish= t4 (Curved Line following)

Final Score = $(500 - T) - P - R + C1 + C2 + C3 + C4 - 50 * H$

where

- $R = 10 * (bot\_speed - limit)$, if $bot\_speed > limit$; else R =0
- C1 = 50 if correct value of node1 displayed on screen
- C2 = 50 if correct value of node2 displayed on screen
- C3 = 50 if correct value of node3 displayed on screen
- C4 = 50 if "FINISH" is displayed on screen after reaching the finish area
- P = 50 if penalty occurs 1 time, P=100 if penalty occurs more than 1 time, else P=0 (Here penalty refers when bot touches dead end)
- H refers to number of human interventions
- T = t1 + t2 + t3 + t4

NOTE:

- Changes, if any, will be highlighted on the website and will also be mailed to all the registered participants. However, you are suggested to keep checking the website regularly.

Abstract:

Once registered, in order to qualify for the event, all the teams need to submit a PDF document of the abstract in the format mentioned below. Link of abstract.

NOTE:

- Abstract can be submitted only once from the team leader's dashboard.
- Abstract should be of size less than 3MB in .pdf format.
- Team leader has to confirm the Tech ID of all registered members before submitting the abstract.
- If you have not been able to submit an abstract by the deadline, contact the managers. The late submission will be accepted only if the reason for the same is found legit.

Contacts:

For any queries, contact any of the event managers or mail us at robogames@techkriti.org
For updates, follow: https://www.facebook.com/techkriti.iitk/

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