



Trace the Track (Line following robot)



Problem Statement

In the age of automation and intelligent systems, autonomous navigation is a cornerstone of modern robotics. The “Trace the Track” challenge invites participants to design and build an autonomous line-following robot capable of navigating a complex track with precision, speed, and stability. The robot must detect and follow a black line on a white surface, overcoming sharp turns, intersections, and deceptive paths without human intervention. This competition aims to test participants’ understanding of embedded systems, sensor integration, control algorithms, and mechanical design.

Objectives

- Develop a fully autonomous robot that can follow a black line on a white surface.
 - Navigate through a track with varying complexity including curves, intersections, and misleading paths.
 - Optimize for speed, accuracy, and robustness.
-

Technical Specifications

1. Track Design

- **Surface Material:** White vinyl sheet or foam board (minimum 3 mm thickness)
- **Line Width:** 2 cm $\pm$ 0.5 cm (black electrical tape or matte black paint)
- **Track Features:**
 - Straight paths Curve turns
 - No Loops and No dead ends

2. Robot Constraints

- **Dimensions:** Max 20 cm $\times$ 20 cm $\times$ 20 cm (L $\times$ W $\times$ H)
 - **Weight Limit:** 2 kg (optional)
 - **Power Supply:** Onboard battery only (no external power or tethering)
 - **Control:** Fully autonomous; no remote control or external computation allowed
 - **Sensors Allowed:**
 - IR sensors (reflective or break-beam)
 - **Microcontrollers:** Arduino, ESP32
 - **Actuators:** DC motors, servo motors, or stepper motors
-



Competition Format

- Basic track with straight lines and gentle curves
- Objective: Complete the track within a time limit
- Advanced track with intersections, misleading paths, and speed zones
- Objective: Fastest and most accurate completion

Time Limit

- Each team gets **2 attempts per round**
- Best time out of two attempts is considered
- Maximum time per attempt: **3 minutes**

Judging Criteria

Criteria	Description	Weightage
Completion Time	Time taken to complete the track	40%
Line Tracking Accuracy	Ability to stay on the line without deviation or correction	30%
Design & Innovation	Mechanical design, sensor placement, algorithm creativity	20%
Stability & Control	Smoothness of motion, no jerks or skidding	10%

Rules & Regulations

- Robots must start autonomously upon signal (e.g., button press or IR trigger).
- If the robot deviates from the track for more than **5 seconds**, the attempt is disqualified.
- Touching or manually adjusting the robot during a run results in a **penalty or disqualification**.
- The robot must not damage the track or surroundings.

Team Composition

- 1 to 3 members per team
 - Open to students from **Grade 3-10**
-

Awards & Recognition

- 🏆 **Trace the Track** – Fastest and most accurate bot
- 🧠 **Innovation Award** – Most creative design or algorithm
- 🛠️ **Best Engineering** – Clean build, robust design, and documentation
- 🎯 **Precision Tracker** – Highest accuracy in line following



Event Logistics

- **Venue:** Cambridge International School, Akurdi, PCMC, Pune.
Google maps location: <https://share.google/9rHx8Pm8lYo0yYLow>
 - **Date:** Sunday, 16th November 2025
 - **Registration Fee:** ₹1500 per team & ₹1000 for Individual participation
 - **Last Date to Register:** 10th Nov, 2025
 - **Contact:** 9730480960, Motionrobotics@gmail.com ,
 - **Website:** www.motionrobotics.in
-