PETROLEUM CLUB SKIKDA

LINE FOLLOWER

specification doc

SUMMARY

CHALLENGE *description*

PARTICIPANTS MUST DESIGN AND PROGRAM AN AUTONOMOUS ROBOT CAPABLE OF FOLLOWING A PREDEFINED TRACK. THE PATH INCLUDES SHARP TURNS, INTERRUPTIONS IN THE LINE, AND SECTIONS WHERE THE ROBOT MUST MAKE INTELLIGENT DECISIONS TO ADAPT TO THE ENVIRONMENT.

EACH TEAM WILL BE EVALUATED BASED ON SPEED, TRACKING ACCURACY, AND THE ROBOT'S ABILITY TO ADAPT. PENALTIES WILL BE IMPOSED FOR DEVIATIONS FROM THE TRACK, NAVIGATION ERRORS, OR EXTERNAL INTERVENTIONS TO CORRECT THE ROBOT'S PATH MORE THAN ONCE. THE ULTIMATE GOAL? TO REACH THE FINISH LINE IN THE SHORTEST TIME AND WITH THE MOST COMPLETE PATH POSSIBLE.

COMPETITION *structure*

STAGE 1

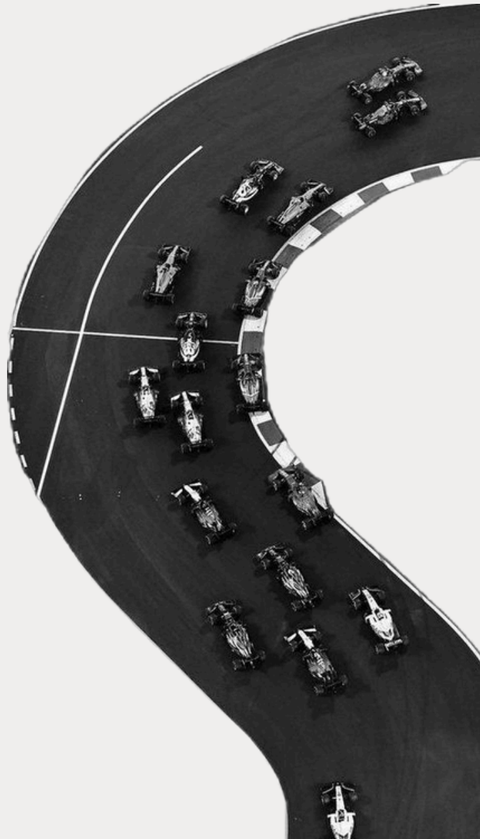
TEAMS COMPETE IN PAIRS (TEAM VS TEAM) ON TWO COURSES OF THE SAME SHAPE AT THE SAME TIME, WITH SPEED AND ACCURACY OF NAVIGATION DETERMINING THE TOP TEN QUALIFIERS.

STAGE 2

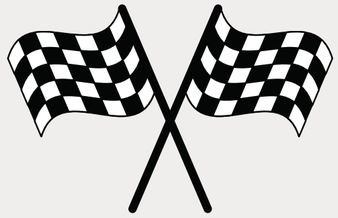
THE FINALISTS FACE AN ADVANCED, MORE CHALLENGING COURSE, PUSHING THEIR ROBOTS' CAPABILITIES TO THE LIMIT. USING THE SAME EVALUATION CRITERIA, THE TOP THREE WINNERS ARE CROWNED BASED ON PERFORMANCE.

1st TRAJECTORY *Overview*

STARTS AT THE TOP RIGHT, MARKED "START".
GOES DOWN VERTICALLY, THEN CURVES LEFTWARD IN A SEMI-CIRCLE.
MOVES UP, THEN LOOPS RIGHT IN A SEMI-CIRCLE.
DROPS DOWN VERTICALLY NEAR THE CENTER.
CURVES LEFT, FORMS A U-TURN, AND GOES UP AGAIN.
TAKES ANOTHER U-TURN RIGHT, THEN MOVES DOWNWARD.
ENDS AT THE BOTTOM RIGHT, MARKED "END"



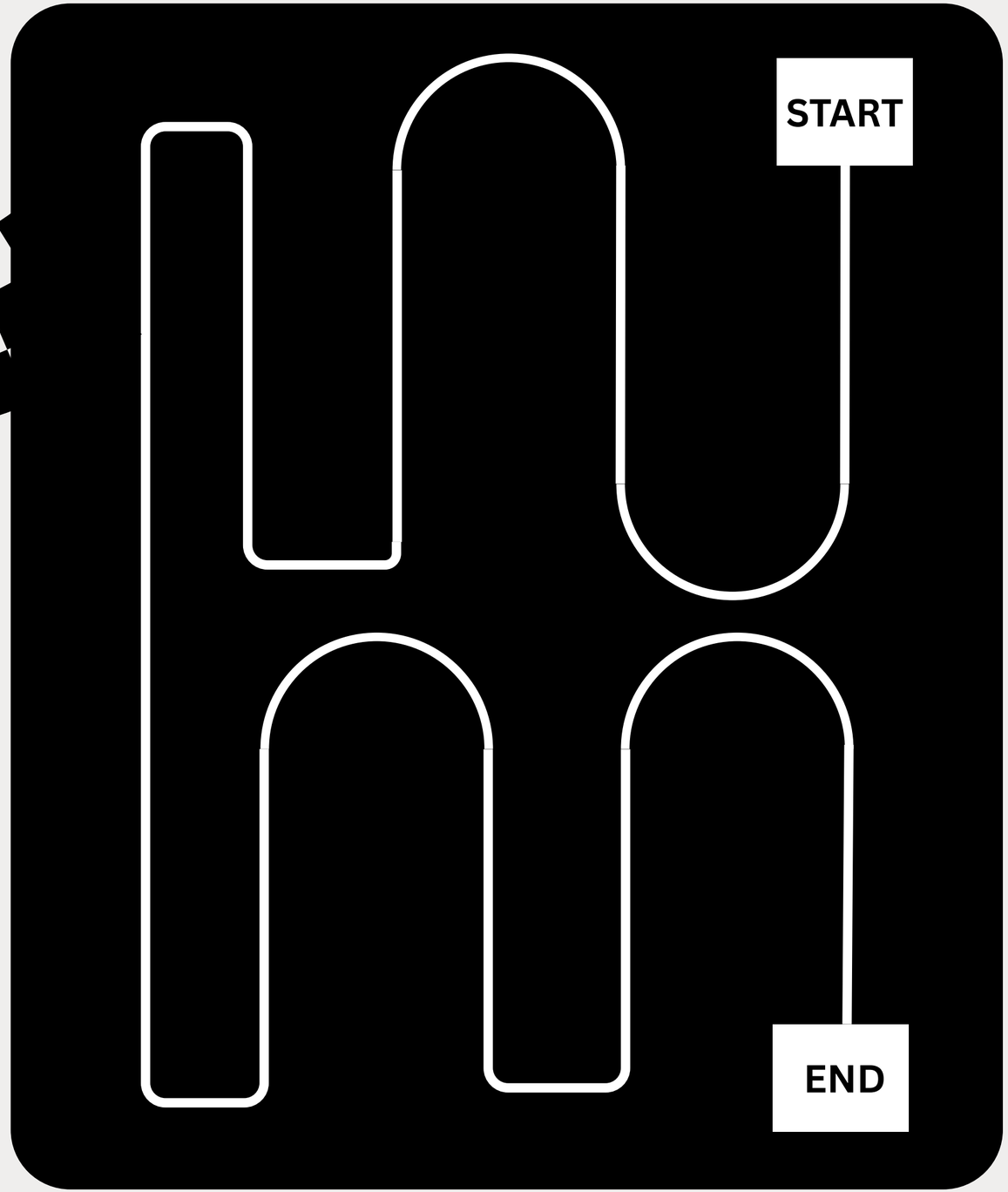
MESURMENTS :



TOTAL WIDTH OF THE MAP: 2.2 M
WIDTH OF THE PATH LINE: 60 CM
DIAMETER OF CURVED SECTIONS (LOOPS): 40CM
DISTANCE FROM START TO END (LINEAR): 149CM
NUMBER OF VERTICAL SEGMENTS: 9
NUMBER OF CURVED TURNS: 8 TURNS

FIRST TRAJECTORY

showcase



2nd TRAJECTORY

Overview

START :

THE ROBOT LAUNCHES FROM THE LOWER RIGHT CORNER OF THE MAP WITHIN A DESIGNATED **25CM X 25CM** STARTING ZONE, READY TO TAKE ON THE CHALLENGE AHEAD.

1

THE ROBOT BEGINS IT'S JOURNEY BY MOVING STEADILY ALONG A STRAIGHT PATH , MEASURING 290 CM IN LENGTH AND 2 CM IN WIDTH.

2

UPON COMPLETING THE STRAIGHT SECTION, THE ROBOT TRANSITIONS INTO A CURVED PASSAGE FEATURING A CHALLENGING ZIGZAG SEGMENT . THE PATHWAY NARROWS BEFORE EXPANDING INTO A 60 CM DIAMETER CIRCULAR ZONE .

2nd TRAJECTORY *Overview*

3

AFTER NAVIGATING THE LARGE CIRCLE, THE ROBOT EXECUTES A LEFT TURN AND ENTERS A SMALLER CIRCULAR AREA WITH A 40 CM DIAMETER, CONTINUING ITS PRECISE MANEUVERING.

4

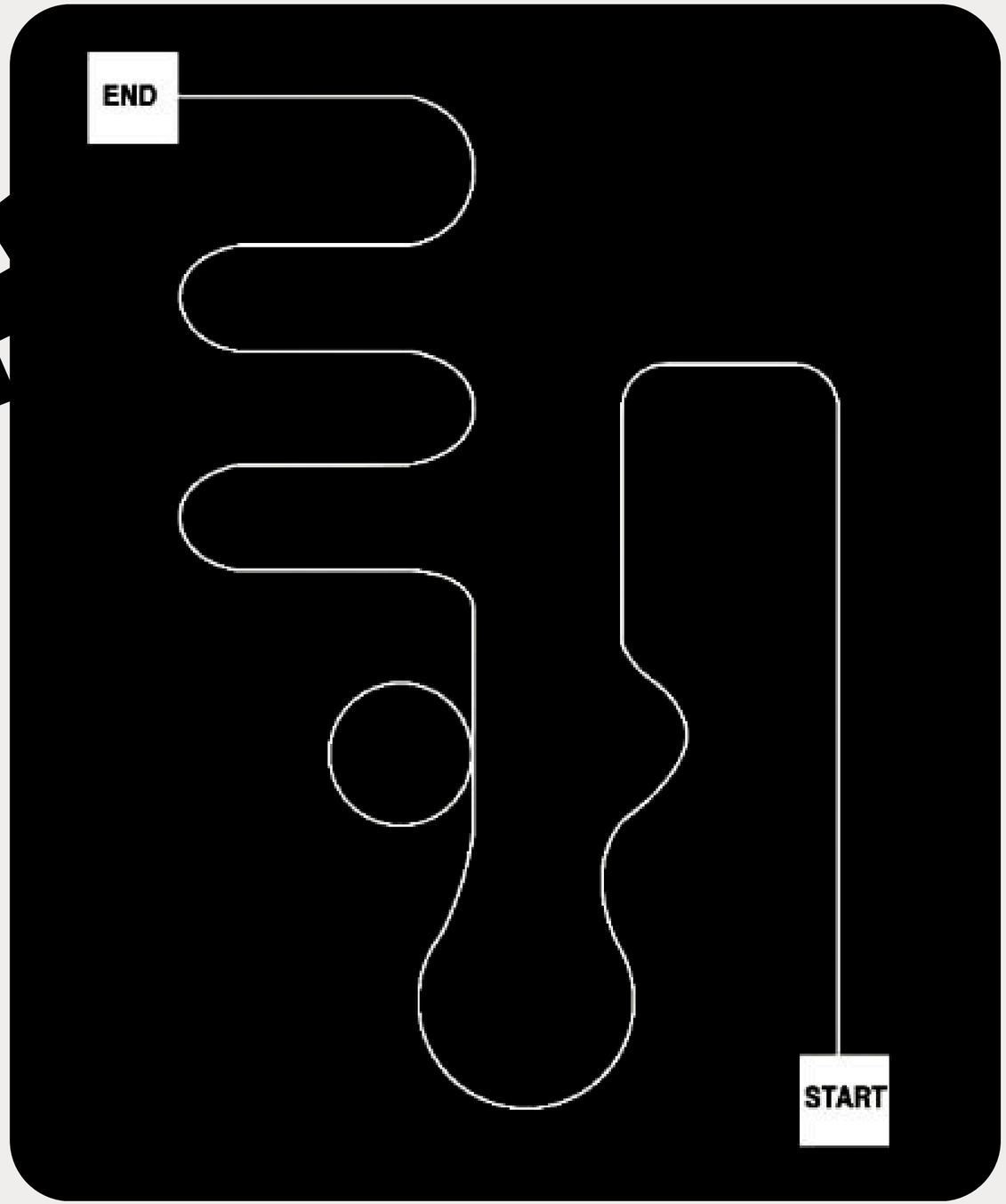
THE ROBOT EXITS THE SMALL CIRCLE AND ENTERS A WINDING PATH CONSISTING OF FOUR CONSECUTIVE SERPENTINE CURVES, EACH **30 CM** LONG. SPANNING **120 CM** IN TOTAL LENGTH AND **80 CM** IN WIDTH, THIS SECTION CHALLENGES THE ROBOT'S ABILITY TO NAVIGATE FLUIDLY THROUGH THE CURVES AS IT PROGRESSES TOWARD THE UPPER LEFT OF THE MAP.

5

UPON COMPLETING THE STRAIGHT SECTION, THE ROBOT TRANSITIONS INTO A CURVED PASSAGE FEATURING A CHALLENGING ZIGZAG SEGMENT . THE PATHWAY NARROWS BEFORE EXPANDING INTO A **60 CM** DIAMETER CIRCULAR ZONE .

SECOND TRAJECTORY

showcase



ROBOT *showcase*

A FULLY PROGRAMMABLE AUTONOMOUS LINE-FOLLOWING ROBOT, EQUIPPED WITH ALL THE NECESSARY COMPONENTS FOR THE SMOOTH EXECUTION OF THE COMPETITION:

- A QTR8 MODULE FOR LINE TRACKING.
- AN NRF MODULE FOR COMMUNICATION.

NOTE : PARTICIPENTS WILL RECEIVE A DETAILED FILE ABOUT ROBOT'S SPECIFICATION

- Robot dimensions: width: Less than 20 cm, length: Less than 20cm, height: Less than 20 cm.
- The robot is controlled only through its own program.
- Participants are prohibited from sending any program to it after the competition begins
- After the start of the competition, sending new programs is strictly prohibited. Any attempt to do so will result in disqualification.
- During the competition, no communication with anyone outside the team is allowed for help. All requests must be made to the referees.
- Any complaint or appeal must be submitted by the team leader directly to the referees to avoid conflicts.

THE APPROVALS

- In this competition, participants will bring their own line-following robot and will have 2 hours for testing . Mechanical and electronic design will not be required.
- Each team will have two hours allocated for testing prior to the start of the competition. A queue system will be in place, allowing each team to test their code twice, with a maximum of five minutes per test.
- Please note that any team failing to appear within two minutes of being called will be automatically disqualified. Likewise, any team that argues with a jury member will also be disqualified.
- Additionally, jury members will ask participants questions about their robot's program to evaluate both their understanding and the quality of the work.

OUR CONTACT

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ROBOT SPECIFICATION SHEET

LINE FOLLOWER ROBOT REQUIREMENTS – AUTONOMOUS MODE

1. Mechanical Specifications :

- **Maximum Dimensions:**
  - Width : ≤ 20 cm
  - Length : ≤ 20 cm
  - Height : ≤ 20 cm
- **Weight:**
  - No specific limit, but excessive weight may affect stability.
- **Construction:**
  - Robot must not include sharp or abrasive elements that could damage the track.

2. Electronic Components:

2.1. Line Tracking Sensor:

- QTR8 Module (or equivalent)
- Must detect high contrast (e.g., black line on white background or vice versa)
- Sensors must not have onboard decision-making processors
- It is prohibited to integrate any type of camera with the robot.

2.2.Microcontroller:

- Any allowed (e.g., Arduino, STM32, ESP32).
- Must run a standalone, pre-uploaded program.
- No programming during or after the run.

2.3. Communication Module (Optional):

- NRF24L01+ or similar.
- Permitted only for telemetry or debugging.
- No command reception or wireless reprogramming allowed.

2.4. Power Supply:

- Battery-powered only (Li-ion, LiPo, or AA).
- No external power allowed during operation.
- Batteries must be safely secured and insulated.

3. Programming Constraints:

- Robot must operate fully autonomously during the race.
- No human input or remote control once the race begins.
- Code must be uploaded before the competition.
- Only one program per robot is allowed; no remote mode-switching.

4. Track Compatibility:

- Robot must be able to follow a white line on a black background.
- Track may include:
    - Curves
    - T-junctions
    - Forks and intersections
- Minimum turn radius: approximately 10 cm.

5. Inspection Checklist (Before Approval):

- Robot dimensions within limit.
- Confirmed autonomous behavior.
- No remote control or command input .
- Code timestamp is before race start.
- Robot construction is stable and safe.
- Team has filled out the technical info sheet.

6. Disqualification Criteria:

- Code upload or modification after race begins.
- Robot exceeds size limits.
- Use of remote control or external commands.
- Unsafe construction.
- Robot doesn't appear at scheduled test time.
- Failure to follow jury rules or disruptive behavior.
- Robot remains idle or doesn't follow the line for over 30 seconds.

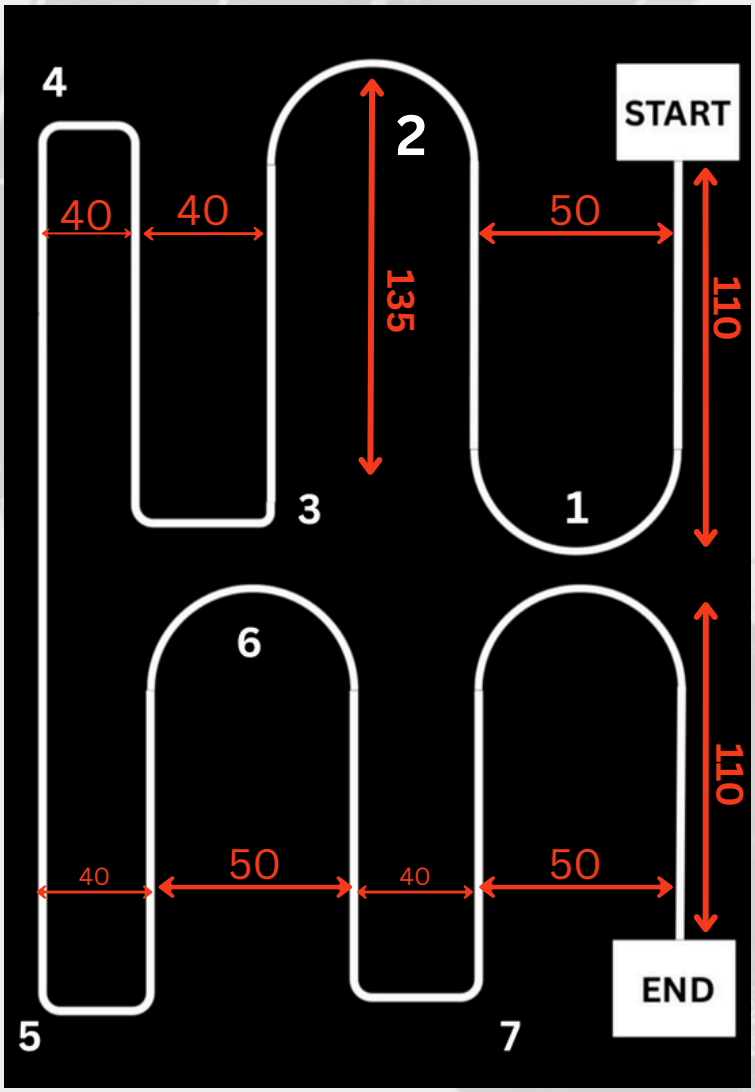
7. Robot Technical Sheet (To be completed by participants):

Team name	
Robot name	
Microcontroller Used	
Sensor Type & Count	
Battery Type & Voltage	
Wireless Module (if any)	
Code Upload Date/Time	

8. Map dimensions:

- All units are in centimeters, cm.

The first map :



The 2nd map :