ROBOTICS AND ARTIFICIAL INTELLIGENCE FOUNDATION (RAAIF)

AI NANO ROBO MISSION – PROBLEM STATEMENT

Introduction

"Tiny Robots, Big Impact"

PROBLEM STATEMENT

"Saving Lives with Nano Robots"

Nano robots are futuristic machines envisioned to travel inside human blood vessels and perform critical tasks such as **removing dangerous blood clots**. In this competition, students will design a **miniature nano-inspired robot (max size: 12 cm × 12 cm × 12 cm)** that can **navigate a maze shaped like blood vessels** and perform a **clot removal task**.

EVENT FORMAT

- This game will have 2 rounds
- The nano-robots will be allowed inside the maze shaped like blood vessels and it should remove the blood clot and transport it out of the maze.

- The robot should have the capability of identifying the difference between healthy cell and blood clot cell (Healthy cell will be White colour Semi-spherical object & the blood clot cell will be Red Colour Semi-spherical object)

Specification of the cells

- Healthy Cell   = White Semi-spherical – 4cm dia (3D printed) < 10gms
- Blood Clot cell = Red Semi-Spherical – 4cm dia (3D Printed),

Round 1

- The first round will be Qualifiers
- The robot must **enter the maze** (blood vessel system).
- Navigate through **curved and branching paths** (simulating veins and arteries).
- Reach the **"clot site"** (a marked obstacle/object blocking the path).
- **Remove or collect the clot object** (e.g., Red Semi-Spherical –4cm dia (3D Printed), >10gms)
- Carry/transport the clot safely to the **"treatment zone"** (designated target at the maze exit).
- The first round will have only one clot cell, there will be no healthy cell inside the vessel.
- **The total time for first round is 3 mins**
- The robot must be fully autonomous. No remote control/external interventions are allowed for this category
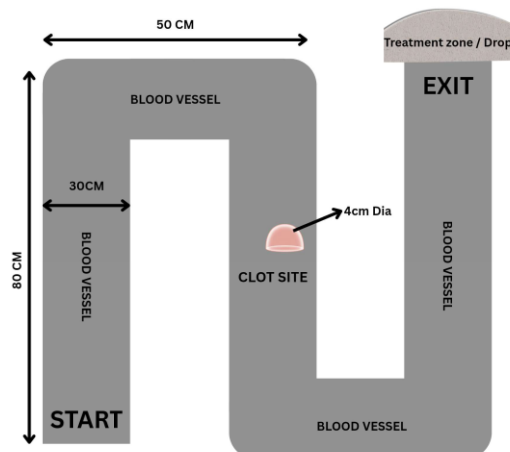
Round 2

- The second round will be the finals.
- Only the qualified teams from the qualifier will enter the finals.
- The nano-robot must **enter the maze** (blood vessel system).
- Navigate through **curved and branching paths** (simulating veins and arteries).
- Reach the **cell site** where **two objects** are placed in this round:
- A **blood clot cell** (e.g., Red Semi-Spherical – 4cm dia (3D Printed), >10gms)
- A **healthy cell** (e.g., Health Cell = White Semi-spherical 4cm dia (3D printed) , <10gms)
- The cells will be placed one after another / zig-zag or in any order with an adequate space between both.
- The robot must **identify and differentiate** between the two cells.
- **Pick up only the blood clot cells** while leaving the healthy cells untouched.
- Carry/transport the clot cells safely through the remaining maze.
- **Deliver the clot cells** to the **treatment zone** (designated area at the maze exit).
- Ensure the healthy cell remains undisturbed in its original position.
- **The total time for final round is 5 mins**
- There will be three blood clot cells placed in any order inside the path
- Any number of healthy cells will also be present inside the blood vessel.
- The robot must have the ability to remove all the three blood clot cells without disturbing the healthy cells
- The robot must be fully autonomous. No remote control/external interventions are allowed in this category
- Scoring Criteria :
  - Picking correct clot cells = Each clot cell carries 10 points
  - Wrong object picked = No points will be given
  - Healthy cell being disturbed or displaced = -5 points for each
  - Human touch (autonomous category) = –5 points for every touch
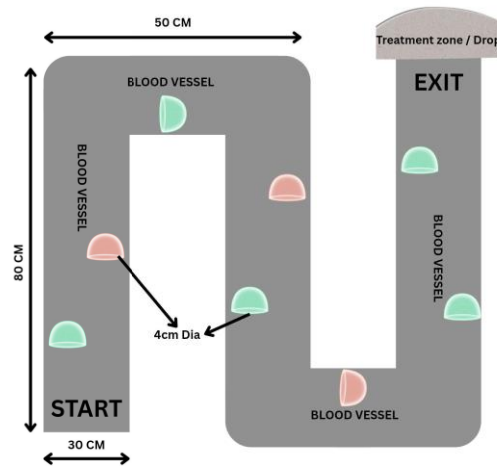
EXTRA POINTS WILL BE AWARDED ON THE BASIS OF

- Miniature of the robot size (If it's less than the given dimension 12x12x12cm)
- Perfection in colour detection
- Knowledge in design and the logic of the functionality
- Innovation

RULES AND REGULATIONS

- **The dimension of the robot should not exceed 12x12x12 cm**
- The weight of the bot should not exceed 1kg.
- Battery should be onboard and should not exceed12v.
- Prohibited: combustible materials, sharp objects, projectiles, high-power lasers, liquids.
- Each Team should have 4 members only. Students should bring their valid school ID cards.
- Participants should bring their own charging equipment for the battery and tools for repairing
- Robot should not be touched without the permission of judges, if touched without the knowledge of Judge will lead to disqualification.
- Judges decision will be final.

- A team should have a leader or a spokesperson to interact with media, RAAIF and other audience.