Alphanode 2019

RoboCTRL: Rules + Challenge

General Rules

1. **Team:**
   - Each school can register a maximum of one team for this event.
   - A team comprises of 2-3 students from class IX to XII.

2. **Materials:**
   - Teams must bring their own materials, spare parts, equipment and laptops. These will not be provided by the organizers.
   - Teams are free to use any materials including metal and plastic parts. The different components can be fastened using connectors, screws, glue, tape, etc.
   - Since the challenge requires autonomous programming, each robot will require a microcontroller. Only the controllers listed below are allowed:
     a) Arduino
     b) Raspberry Pi
     c) LEGO Mindstorms
     d) Other ATmega based controllers
   - The following types of sensors (all brands) are allowed:
     a) Color sensors
     b) Light sensors / LDRs
     c) Distance sensors (ultrasonic/infrared)
     d) Gyroscope sensors

3. **Software:**
   - Teams are free to use any programming language/IDE including but not limited to Arduino, NXT, EV3, LabView, RobotC, etc.
   - Teams must bring a laptop in order to make changes to the program on competition day.

4. **Regulations:**
   - The maximum dimensions of the robot before it starts the challenge must be within 40cm x 40cm x 40cm.
   - The number of motors and sensors to be used is not restricted.
   - The robot must be autonomous and finish the challenge by itself. Any radio communication, remote control and wired control systems are not allowed.
   - Bluetooth and Wi-Fi function, if present, must be switched off at all times.

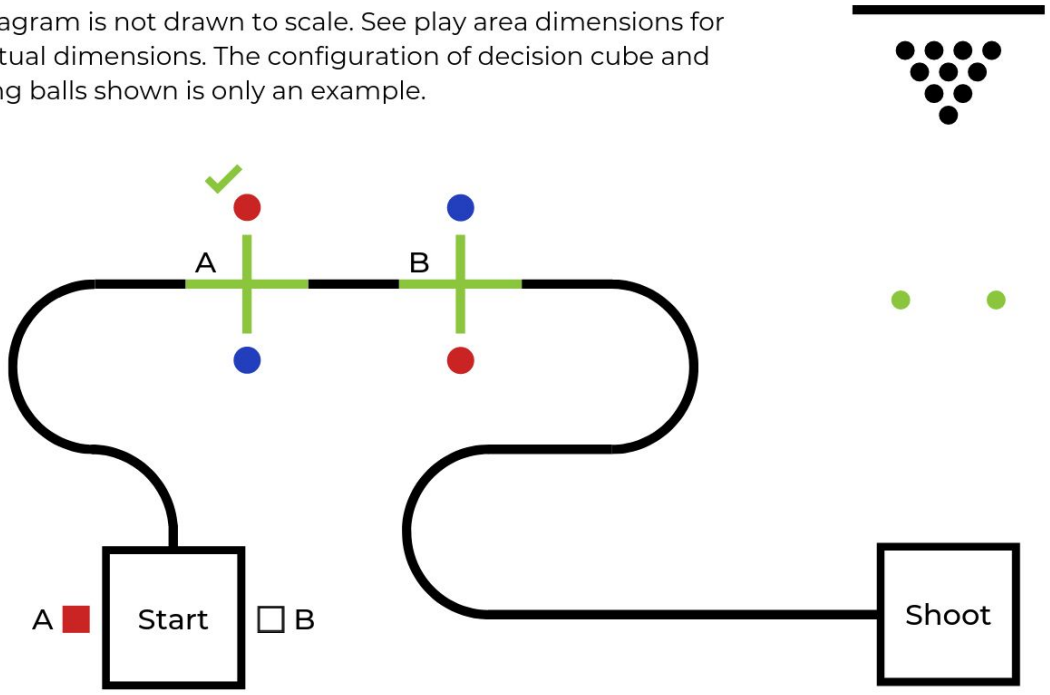
5. **Competition:**
   - Teams are allowed to make modifications to both the robot and the program on competition day.
   - Teams will get 30-60 minutes before the start of the competition for free practice, during which they may practice with the real game materials and calibrate sensors.
   - For the preliminary round, each team will get 2 runs and their scores will be added to prepare a ranking list.
   - For the final round, the top four ranked teams will get a single run which alone will decide the final standings.
   - Teams must submit a copy of their final program in order to be eligible for the awards.

Robowling

Introduction:

The challenge is to make a robot that plays the game of bowling. On its way to the bowling alley, the robot must autonomously identify and pick the suitable bowling ball, based on a “decision cube” whose color and position is randomized before each run. The robot must park in a “shooting area” before taking a shot. The robot that scores the most points wins (see scoring details below).

Note:
The diagram is not drawn to scale. See play area dimensions for the actual dimensions. The configuration of decision cube and bowling balls shown is only an example.



Game rules:

- Teams must place their robot in the start area. The challenge begins at the point when the judge gives the signal to start. Teams must play the program at this point.
- No interaction is allowed between the robot and the team members beyond this point. The entire challenge is autonomous.
- The robot must remain stationary for the first 15 seconds after the challenge has begun. During this time, the judge will randomly place a red or blue “decision cube” at either of the cube positions A or B.
- Cube position A corresponds to rack A while cube position B corresponds to rack B.
- A “rack” is a region where the guiding line is green instead of black. It has a bowling ball on either side of the line - one red, one blue. The order will be randomized before each run.
- Thus, there are a total of two possible cube positions and two possible cube colors (ie. four sets of color-position of decision cube) and two racks each with two bowling balls (ie. four bowling ball positions).
- After the 15 seconds are over, the robot is free to read the decision cube and start following the guiding line.
- The robot must pick up the ball whose color matches that of the decision cube from the rack that corresponds to the position of the decision cube.

- At the end of the guiding line is the “shooting area” where the robot must park itself and shoot the bowling ball from. The edge of the shooting area nearest to the bowling pins is the “shooting line.” If the robot crosses the shooting line, it receives a penalty.
- There are ten bowling pins at the end and two obstacle pins in the middle of the alley. The robot must try to knock out as many bowling pins as possible and avoid knocking out obstacle pins.

Note: Teams can choose to load the bowling ball onto the robot manually at the start of the game (this will help be particularly helpful for robots that do not have a mechanism to pick up the bowling ball or a program to sense the color/position of the bowling ball). However, in this case, teams will start with -50 points instead of 0.

The challenge ends when:

- The robot has taken its shot.
- Any team member touches the robot during the run.
- The robot has completely left the play area.
- A team member shouts “STOP” to end the run.
- Violation of the rules and regulations within.

Scoring:

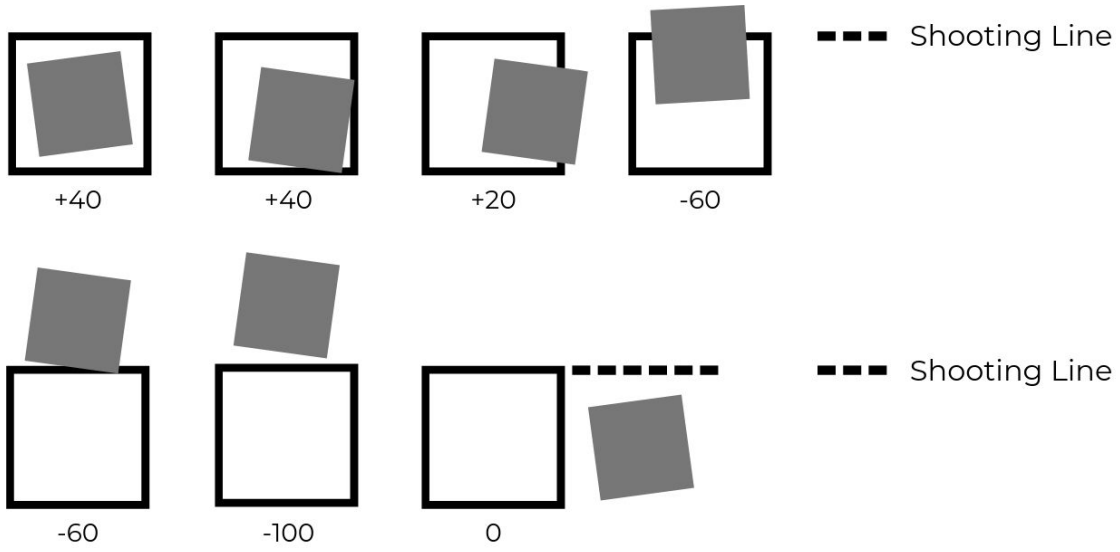
A team will be disqualified if:

- Any team member tries to interact with the robot or manually input the position or color of any game object.
- The program is started after the decision cube is placed.

S.No	Particulars	Points
1.a.	Correct bowling ball picked up	60
b.	Bowling ball of correct color picked up from the incorrect rack	30
c.	Bowling ball of incorrect color picked up from the correct rack	30
d.	Incorrect bowling ball picked up	10
e.	Ball was loaded onto the robot manually at the start of the game	-50
2.a.	Robot is parked completely in shooting area	40
b.	Robot is parked partially in shooting area, before the shooting line	20
c.	Robot is completely outside shooting area, before the shooting line	0
d.	Robot partially crosses the shooting line	-60
e.	Robot completely crosses the shooting line	-100
3.a.	Robot knocks down a bowling pin (10 in total)	10 x 10 = 100
b.	Robot knocks down an obstacle pin (2 in total)	-10 x 2 = -20
		Maximum score: 200

Eg. If a robot picks up a bowling ball of correct color from the incorrect rack, parks partially in the shooting area but before the shooting line and knocks down 8 bowling pins and 1 obstacle pin, it will receive a score of 30 + 20 + (10 x 8) + (-10 x 1) = 120.

Clarification for scoring point 2:



Details of game elements:

1. **Decision cube**
   There are two types of decision cubes - red and blue. All decision cubes have the same side length L, where 8 cm < L < 12 cm.

2. **Bowling ball**
   There are two types of bowling balls - red and blue. All bowling balls have the same radius R, where 8 cm < R < 12 cm.

3. **Bowling pin**
   Each bowling pin is of height H, where 25 cm < H < 35 cm.

Note: More details about the game elements will be provided when available on our Facebook page (facebook.com/node.dps).

Play area dimensions:

- The start area and the shooting area are squares of 40cm x 40cm.
- The distance of the decision cube from the center of the start area is 25cm.
- The distance of each bowling ball from the center of the guiding line is 25cm.
- The distance between bowling pins and the shooting area is between 3m and 5m.

For any queries, contact Prakhar Mittal at mittalprakhar57@gmail.com.