IOE ROBOCON 2018

NATIONAL ROBOT CONTEST

THEME & RULES

“Ujyalo Nepal”

National Robot Contest 2018
Host Organizing Committee

http://robocon.ioe.edu.np


IOE
ROBOCON
2018
UJYALO NEPAL
National Level Robotics Competition

Quick Guide

Table of Contents

“Ujyalo Nepal”

Game Concept

The credit to modernization of today’s world goes to the vast array of energy resources that are available all around us. For the past four centuries, the world ran on the energy harnessed from natural world of fuel-wood, refined oil and petroleum products. Still about 75% of the world’s energy sources comprise of these non-renewable resources. Surely, one day these resources will exhaust because the rate of exploitation of these resources is far more than the rate of their formation. Moreover, the environmental damage and the pollutants they produce is immense which is validated by the climate change and global warming clearly visible today. Hence the world is tilting towards renewable resources nowadays. They are clean energy and non-polluting resources like wind, solar, biomass, tidal, hydro, etc.

In context of the world, solar energy has taken greatest strides in the past decade so is the case in Nepal. Surely, Nepal is more rich in water resources and more capable in hydro power generation than solar. But, taking the effects of building such plants on the damage it causes to aquatic flora and fauna and also nearby vegetation, solar can be taken as one of the major alternatives to follow in the line of renewable energy resources. However, only solar cells to power the electrical appliances doesn’t guarantee their perfect and efficient operation. For attaining the maximum efficiency from the solar cells, they need to be constantly cleaned such that the intensity of sunlight is not compromised in conversion of energy that can be harnessed form it.

Based on the facts above, the game of **IOE Robocon2018** is designed in order to create awareness regarding constant cleansing of the solar panel for the maximum energy that we can harness from it. Each team has to build two robots – a **Carrier Robot** (**C**a**R**) and a **Cleaning Robot** (**C**lea**R**). CaR should carry CleaR to Solar Farm Zone and Street Light Zone after going through Switch Zone such that CleaR cleans the panels and achieves a fully glown lamp at the end. Hence, the theme of IOE Robocon 2018 is “Ujyalo Nepal”.

Ideas

Main ideas in designing the rules:

1. The team utilizes limited resources to design robots' mechanisms and strategies to accomplish the assigned tasks.
2. The automatic control technique is emphasized in this game.
3. The game is challenging for the contestants.
4. The game is easy to understand and entertains the spectators.
5. The winner of each game is not predictable until the end of the game.
6. The game matches the solar cleaning practices applied all over the world.

The Contest Theme

"Ujyalo Nepal"

Outline of the contest:

A match is contested between **Red**and**Blue**teams. It lasts for 5 minutes at most.

Each team consists of two robots – a **Carrier Robot** (**C**a**R**) and a **Cleaning Robot** (**C**lea**R**). Robots start from **Start.** Then the robots run along five zones;**Switch**,**Docking**, **Solar Farm**, **Solar Panel** and **End Zone**, and aim for a **Glowing Lamp**at **Lamp Zone**.

Firstly, CaR and CleaR start from the **Start Zone –** CaR carrying CleaR.CaR should switch on the light over Solar Panel pushing a button at the**Switch Zone**table**.** Then it should reach **Docking Zone** and CleaRshould get on the **Solar Farm Zone** to clean off of at least fiverubbishes (foam blocks) placed on it. After that, CaR should take CleaR to the **End Zone** and lift it to the solar panel in the **Street Light Zone** such that it cleans the panel too. With sufficient light intensity on the panel reached form the light above, the lamp in the **Lamp Zone** will glow fully bright and achieve "**झलल्ल**". The first team to achieve "**झलल्ल**" wins the match.

The importance of Safety

Safety is one of the most important elements in the sustainable development of the IOE Robocon.

The safety of the designed robots is the first and foremost issue for the safety principle of the contest. The participating teams, as the robot designers, are responsible for the safety of their robots.

The teams must work and cooperate closely with the organizers to ensure the utmost safety of the contest.

Safety must always be the top priority and it must be considered by all people involved in the contest including officials, participants and spectators in all circumstances.

Teams are required to pay sufficient attention to the safety of their robots before applying to take part in the contest.

Team members must wear running shoes with rubber sole, helmets, and safety goggles during the matches and test runs.

Rules

1. Terms and Definitions

Terms and definitions which are used in the rules of IOE Robocon 2018 are given here.

Term	Definition
Carrying Robot (CaR)	Either a semi-autonomous or fully autonomous robot that carries cleaning robot.
Cleaning Robot (CleaR)	A fully autonomous robot that cleans solar panal.
Actuator	A device that creates motion; for examples, motor, pneumatic piston, hydraulic piston, solenoid
Steering	An action that turns heading direction of a robot
Driving	An action that creates front motion of a robot
Semi-Autonomous	Ability to work independently for some actions and also work according to commands from an operator
Fully autonomous	Ability to work independently without any helps from an operator

2. Game Procedure and Competition Tasks

Once the game has begun, each team has to complete the tasks in the following sequences:

2.1. Setting of robots

2.1.1. One minute is given for setting of the robots before the game starts.

2.1.2. At most, three team members of each team can engage in setting of the robots. Pit crew cannot join setting.

2.1.3. Any teams that fail to complete setting of the robots within one minute can resume the setting again once the game starts.

2.2. Deployment of Robots

2.2.1. Robots must be started in the **Start Zone**.

3. Retries of Robots

3.1.1. A retry can be made only after the referee's permission.
3.1.2. Only the operator's call for retry is considered by referee.
3.1.3. Team members are allowed to touch the robots while preparing for a retry.
3.1.4. Retries of robots can be made as many times as necessary.
3.1.5. A retry is compulsory if CaR falls out of the traveling path or CleaR falls out of CaR and leads to violation.
3.1.6. A retry is compulsory if any robot conducts any violations.
3.1.7. The referee may ask a team to restart the game from last checkpoint if any robot's behavior is deemed uncontrolled and conditions like falling of batteries from robot, smoke due to short circuits, etc. occurs.
3.1.8. Restart position after a retry of Robot is assigned as follows:
    3.1.8.1. A retry of robots before reaching Switch Zone is made at Robot Start Zone only.
    3.1.8.2. A retry of robots if task - "Switch On" missed after reaching Switch Zone is made at Check point 1.
    3.1.8.3. A retry of robots after task - "Switch On"and before reaching Docking Zone is made Check Point 1.
    3.1.8.4. A retry of CleaR afterrobots reaching Docking Zoneand before CleaR entering Black zone of Solar Farm Zone is made inDocking Zone. CleaR needs to be set up on CaR again.
    3.1.8.5. A retry of CleaR after entering Solar Farm Zone and before embarking on CaRis made anywhere in its Black part.
    3.1.8.6. A retry of CleaR before embarking on CaR is made at anywhere in its Black zone.
    3.1.8.7. A retry of robots after checkpoint 2and before reaching checkpoint 3 is made at checkpoint 2.
    3.1.8.8. A retry of robots after checkpoint 2 and before CleaR getting on the Solar Panel is made at checkpoint 3.

Reaching a zone refers to any part of a Robot touching that zone.
Strategies premised on the use of retries are allowed.

4. Scoring Scheme

4.1. Tasks

1.	Start zone to Switch Zone	100 pts
2.	Switch On	50 pts
3.	Switch Zone to Docking Zone	100 pts
4.	CleaR gets on Solar Farm Zone	100 pts
5.	Removing Rubbishes	50 pts each
6.	CleaR embarks on CaR	100 pts
7.	Docking Zone to End Zone	100 pts
8.	CleaR on Solar Panel	100 pts
9.	Lamp Glows in Lamp Zone	100 pts
	Total Points	**1000**

4.2. Description

4.2.1. **Start zone to Switch Zone**: CaR carries CleaR to the Switch Zone

4.2.2. **Switch On**: CaR switches on the light over Solar Panel by pushing the button on Switch Zone table.

4.2.3. **Switch Zone to Docking Zone**: CaR carries CleaR to Docking Zone.

4.2.4. **CleaR gets on Solar Farm Zone**: CleaR gets on the Black part of the Solar Farm Zone form CaR.

4.2.5. **Removing Rubbishes**: CleaR removes at least 5 foam blocks while tracing the path on the solar farm. More blocks cleared only adds to more points. (Though Total points is 1000.)

4.2.6. **CleaR embarks on CaR**: CleaR gets on CaR from the Black zone of Solar Farm Zone.

4.2.7. **Docking Zone to End Zone**: Robots reach the final End Zone and CaR lifts CleaR near the Solar Panel.

4.2.8. **CleaR gets on Solar Panel**: CleaR gets on the Solar Panel in the Street Light Zone to clean it off.

4.2.9. **Lamp Glows in Lamp Zone**: After suitable light intensity reaches on the Solar Panel Lamp in the Lamp Zone glows fully bright.

*** Tasks must be completed in listed order in order to score.**
*** Points are given only once per each task.**

5. The Game Result

5.1.1. The game result is announced at the end of the 5 minutes' match after the referee checks and confirms the completed tasks and the faulty actions of the robots.

5.1.2. The match will end when:

5.1.2.1. One of the teams achieves "झलल्ल".

5.1.2.2. The time of 5 minutes' end.

6. Deciding the Winner

6.1.1. **The team that successfully cleans the Solar Panel to gain required intensity such that the Lamp glows bright to achieve "झलल्ल", wins the match. Points for success in completion of all tasks and the total game point is 1000.**

6.1.2. In case of a draw, the winner is decided based on the following order.

6.1.2.1 The team that gets the last earning score earlier.

6.1.2.2 The team whose total weight of the robots is lighter.

6.1.2.3 The team that is selected by the referee as the winner of that match.

6.1.3. Deciding the team/s advancing from the group

The team/s advancing from the group stage will be decided by the following conditions listed out in their priority order.

6.1.3.1 No. of wins

6.1.3.2 No. of "**झलल्ल**"

6.1.3.3 Least time to achieve "**झलल्ल**"

6.1.3.4 Points scored

6.1.3.5 Greater number of points obtained in the match between the teams in the group (head to head)

6.1.3.6 Judge panel decision

7. Robots Design and Operation

7.1. Regulations for Robot

7.1.1. Each team has to build **2 robots**.

7.1.2. Robots cannot be split into sub-units and connected by flexible cords.

7.1.3. The robots in the contest must be built by the team members from the same university/college/polytechnic.

7.1.4. **Weight of the Robot**

The total weight of the robots, controllerand cable, primary set of batteries, and any equipment or devices used in the entire contest must not exceed **25 kg**. However, the back-up set of batteries of the same type, weight and voltage as the primary set of batteries, is exempted.

7.1.5. **Power sources of the robots**

7.1.5.1. Each team must prepare its own power sources.

7.1.5.2. The voltage of the power sources used by robot must not exceed **DC 24V**.

7.1.5.3. The pressure of the compressed air power must be not more than **6 bars.**

7.1.5.4. The organizer has the right to declare and prohibit any dangerous and inappropriate power sources.

7.2. Carrying Robot (CaR)

7.2.1. CaR can be eithermanual or fully autonomous robot.

7.2.2. It must have its dimension no larger than **1000 mm in width, length and height** at the beginning of the game. However, the robot can **extend up tolength 1200 mm, breadth 1200 mm and height 1500 mm** while game run.

7.2.3. The robot is allowed to expand, stretch or extend as long as the dimension is still within the dimension limit.

7.3. Cleaning Robot (CleaR)

7.3.1. CleaR must be fully autonomous.

7.3.2. It must have its dimensions no larger than **300mm in width, length and height** at the beginning of the game. However, it can **extend up to length 500mm,breadth 500mm and height 500mm** while the game run.

7.3.3. The robot is allowed to expand, stretch or extend as long as the dimension is still within the dimension limit.

7.4. Manual CaR Operation

7.4.1. The operator is allowed to operate CaRfor all of its tasks.
7.4.2. The operator can be inside the game field for manual operation of CaR.
7.4.3. If CaR is operated by the operator through a connected cable. The length of cable from CaR to the controller must be in between **1,000 mm** and **3,000 mm**.
7.4.4. An infrared, visible ray, sonar, sound, or wireless radio frequency remote control is prohibited. The operator is not allowed to ride on CaR.

7.5. Fully autonomous CaR and CleaR operation

7.5.1. If CaR is designed as a fully autonomous robot, all team members must be outside the game field except during start operation or a retry.
7.5.2. If CleaR needs to be turned on after automatic CaR reaches Docking Zone or End Zone, the team can ask permission to the referee and enter the gamefield to turn it on.
7.5.3. During Solar Panel cleaning task of CleaR, all team members must be outside the game field.

7.6. Examination of the robots

7.6.1. Participating robots will be examined on the game day prior to contest. The team that fails the examination is not allowed to participate in the contest.
7.6.2. Details of what to be examined and how will be provided at a later date.

8. Violations

If a violation occurs, **50 points** will be immediately deducted.A retry is compulsory after each violation. The violations are categorized as follows:

8.1.1. Any parts of robots move out of the game field.
8.1.2. Any parts of the robots enter the opposing team area or the space above it.
8.1.3. Any part of robots comes in contact with the guard fences around the game field.
8.1.4. Any team members touch any parts of their robots except controller ofCaR. However, the team members are allowed to touch the robot during retries. The operator is allowed to touch the CleaRat Docking Zone and End Zone to turn it on.
8.1.5. Any part of CaR (including extension cable) touches the green lime zone.
8.1.6. CaR does not follow the path defined by white strip.
8.1.7. The CleaR falls of Solar Farm Zone and Solar Paneland touches the green lime zone or accident guard protection.
8.1.8. The team makes a false start. The game (both teams) will be restarted.
8.1.9. Other actions that infringe on the rules without mentioning in the disqualification are considered as violations.

9. Disqualifications

A team will be disqualified if it commits any of the following actions during the match:

10.1.1 The team damages or tries to damage the field, facilities, equipment or opponent's Robot.
10.1.2 The robot is deemed dangerous or hazardous to any personnel.
10.1.3 The team performs any acts that are not in the spirit of fair play.
10.1.4 The team fails to obey instructions or warnings issued by the referees.
10.1.5 The team has made false start for three times in the same match.

10. Safety Issues of the Robots

10.1.1. All robots must be designed and manufactured as to pose no danger of any kinds to any persons in the venue.

10.1.2. All robots must be designed and manufactured as to cause no damage to any robots of the opposing team or the field.

11. Safety rules

11.1.1. The use of explosives, fire or dangerous chemicals is prohibited.
11.1.2. If a laser is used, it must be of class 1. In designing and preparing the laser, full care must be taken to protect all persons at the venue from harm during all procedures. In particular, the beams must be so oriented that they cannot shine into the eyes of the spectators.

12. Teams

12.1.1. Two teams (Red and Blue teams) compete in each match.
12.1.2. A team consists of three students, called team members, and one instructor who all belong to the same college, university or polytechnic. The three students of the team are entitled to participate in the match.
12.1.3. In addition, two members of pit crews are allowed to assist in the pit area and to carry the robots to the field, but cannot participate in the match including setting. The members of the pit crews must be students of the same college, university or polytechnic as the team.
12.1.4. Participation of graduate students is not permitted.

13. Others

13.1.1. The legitimacy of any actions not provided in this rule book will be subject to discretion of the referees.
13.1.2. The dimensions, weights, etc., of the gamefield, facilities and equipmentdescribed in this rule book have a **margin of error of plus or minus 7%** unless otherwise stated. However, the dimensions and weights of the robots as shown in the rule book are the maximum and cannot be tolerated.
13.1.3. All questions should be addressed to the official website of the IOE Robocon, http://robocon.ioe.edu.np. FAQ section will be provided on the site.
13.1.4. Notification of any additions and/or corrections to this rule book will be made on the official web site.
13.1.5. The referees may demand additional explanations on safety issues when the safety of robot is deemed to be in question.

14. Game Field Designations and Dimension

Figure 1 Top View of Game Field

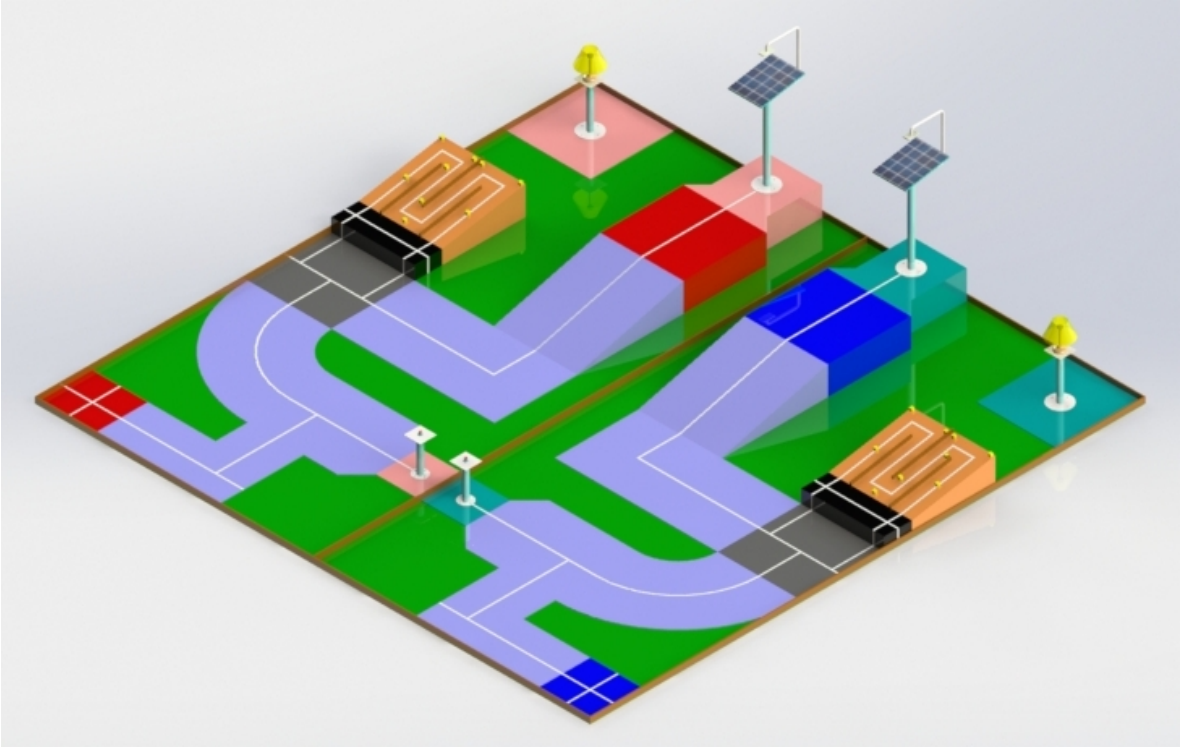

Figure 2 Isometric View of Game Field

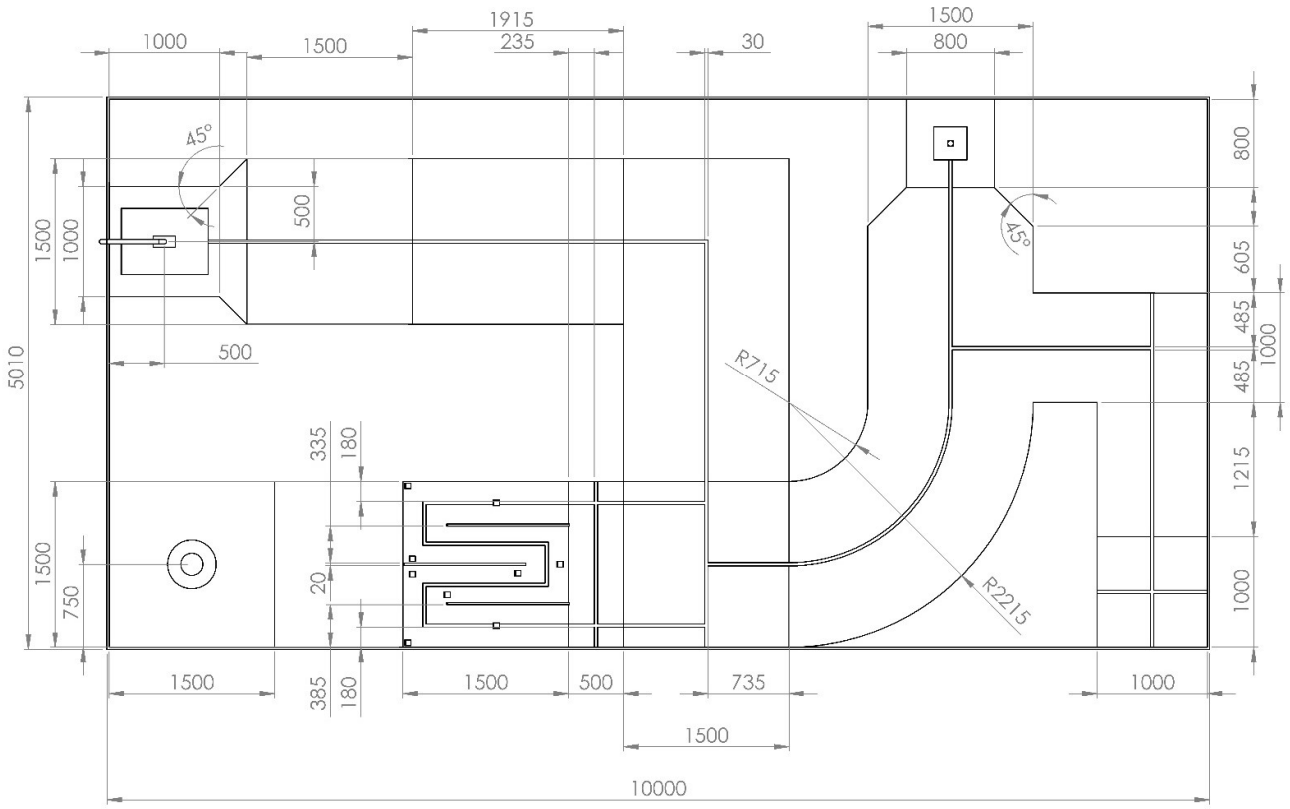

Figure 3 Dimensions of Half Gamefield (Top View)

(All dimensions are in mm)