NRC

National Robotics Competition 2007

Organisers

SASBADI

KEMENTERIAN PELAJARAN MALAYSIA

PUSAT SAINS NEGARA

MOSTI

Official Battery

Energizer

National Robotics Competition 2007

VISION
To provide a powerful learning platform to enable students to cope with skills that are essential for success in the 21st century.

MISSION
To develop and strengthen critical and creative thinking and social skills that are essential prerequisites for success in further studies and future careers. These skills include:

a) Problem-solving skills
b) Creative thinking skills
c) Interpersonal communication skills
d) Collaborative teamwork skills

OBJECTIVES

1. To help students build a solid foundation in mathematics, science, technology, design and ICT through hands-on experience or investigation.
1. To train students to work together to solve challenging problems in a spirit of cooperation and collaboration.
2. To enable students to develop logical and systematic thinking as they plan and implement programmes through the programming of robots.
3. To enhance students creativity in problem solving and raise their awareness of the many possible ways of arriving at a desired outcome.
4. To promote competition in robotics amongst Malaysian school students as a healthy and fulfilling pastime.

BUILDING NOW THE SKILLS FOR THE FUTURE

National Robotics Competition 2007

RULES AND REGULATIONS

General Guidelines

1. This competition is open to all school students below the age of 18.
2. Each team has to create an autonomous robot to participate in the events.
3. A school team should comprise 2 or 3 students and one teacher.
4. Each school can send a **maximum of 5 teams** for each category.
5. All rules and regulations are subject to change without any prior notice.
6. The official competition robotics kits are as follows:
    a. RCX Category : LEGO® MindStorms For School Team Challenge Set (9794)
    b. NXT Category : LEGO® MindStorms Education NXT Base Set (9797)
    c. Open Category: Teams can use ANY material including Non- LEGO® products. However, the final design should include at least 50% LEGO® material, and the controller must be either RCX or NXT.

Competition Format

1. RCX Category Event

Category	Ages	Competition Field
Primary School	Up to 12	Robot Courier
Lower Secondary	13-15	Robot Bulldozer
Upper Secondary	16-18	Robot Transporter

**The events and format for the Final Competition may be different from the above. Information will be given to the finalists at a later date.*

2. NXT Category Event

Category	Ages	Competition Field
Primary School	Up to 12	Robot Explorer
Secondary School	13-18	Robot Discoverer

**The events and format for the Final Competition may be different from the above. Information will be given to the finalists at a later date.*

3. Open Category Event

Theme : Science Fiction
Ages : Up to 18 years old

**The events and format for the Final Competition may be different from the above. Information will be given to the finalists at a later date.*

Competitors for the National Robotics Competition (NRC) 2007 Finals

1. The champions of the zone competitions.
2. 2 wild card entries, based on overall performance.

Definitions

1. "Competition Field" is defined as the white flat and level floor for the robots to run on. All competition fields will have an overall dimension not exceeding 1220mm×2440mm.
2. "Track line" is defined as the black line of 25mm (width) that is laid down on the competition field. Unless specifically stated otherwise, robots must be calibrated to recognize and follow the track line. The calibration can be done during the trial period.
3. "Match" is defined as the particular duration of competition of the robot, either in the time trial or the elimination round which results in a score being awarded to the robot.
4. "Round" is defined as a collection of matches competed under the same specific competition field and rules that are scheduled to provide an equal, fair and competitive chance for all the robots entering the competition.
5. "Tournament" is defined as a total of all the rounds under the same competition field and rules.
6. "Operator" is defined as a student member of the team designated to start and stop the robot in a match.
7. "Match Area" is defined as the area of each competition field condoned off from spectators, non-competing teams and non-operators of competing teams of a particular match.
8. "Robots" - The Robots designed for the NRC 2007 RCX Category event must be autonomous robots. Teams are given 1 hour and 30 minutes before each round to build and test their robots. During Round 1, robots must be built from scratch. Thus, pre-built robots are not allowed in the competition area. For subsequent rounds, teams may modify the robots they built during Round 1. Once the competition starts, team members are not allowed to touch their robot again.

National Robotics Competition 2007

ZONE COMPETITION SCHEDULE

01 January 2007	Registration Opens
30 May 2007	Registration Closes
15 March until 30 May 2007	Briefing on the NRC Zone Competition

1. ZONE A : Perlis, Kedah
   Date: 12 June 2007
   Venue: Kedah

2. ZONE B : Pulau Pinang
   Date: 14 June 2007
   Venue: Pulau Pinang

3. ZONE C : Perak
   Date: May 2007 (State Science Carnival)
   Venue: Gerik, Perak

4. ZONE D : Selangor
   Date: June 2007 (State Science Carnival)
   Venue: Klang, Selangor

5. ZONE E : Kuala Lumpur, WP Putrajaya
   Date: 25 – 26 June 2007
   Venue: Stadium Titiwangsa, Dewan Bandaraya Kuala Lumpur

6. ZONE F : Negeri Sembilan
   Date: 20 June 2007
   Venue: Seremban, Negeri Sembilan

7. ZONE G : Melaka
   Date: 18 June 2007
   Venue: Melaka

8. ZONE H : Johor
   Date: July 2007 (State Science Carnival)
   Venue: Johor Bahru

9. ZONE I : Pahang
   Date: July 2007
   Venue: Temerloh

10. ZONE J : Terengganu
    Date: July 2007 (State Science Carnival)
    Venue: Kuala Terengganu

11. ZONE K : Kelantan
    Date: July 2007 (State Science Carnival)
    Venue: Kota Bahru

12. ZONE L : Sarawak
    Date: July 2007 (State Science Carnival)
    Venue: Kuching

13. ZONE M : Sabah, WP Labuan
    Date: July 2007
    Venue: Kota Kinabalu

- ***The organisers reserve the right to make changes to the NRC 2007 programme and dates.***

National Robotics Competition 2007

FINAL COMPETITION SCHEDULE

Date**:** 20 – 23 August 2007
Venue: Kuala Terengganu

**** The organisers reserve the right to make changes to the NRC 2007 programme and dates.***

National Robotics Competition 2007

ZONE COMPETITION AWARDS STRUCTURE

1. **RCX Category Events**

Primary School Category
Event – Robot Courier
GOLD Winner: Trophy, Medal and 1 set 9648 Education Resource Set worth RM430
SILVER Winner: Trophy and Medal
BRONZE Winner: Trophy and Medal

Lower Secondary Category
Event – Robot Bulldozer
GOLD Winner: Trophy, Medal and 1 set 9648 Education Resource Set worth RM430
SILVER Winner: Trophy and Medal
BRONZE Winner: Trophy and Medal

Upper Secondary Category
Event – Robot Transporter
GOLD Winner: Trophy, Medal and 1 set 9648 Education Resource Set worth RM430
SILVER Winner: Trophy and Medal
BRONZE Winner: Trophy and Medal

Medals will be awarded to all members of the winning teams and certificates of participation will be awarded to all participants.

2. **NXT Category Events**

Primary School Category
Event – Robot Explorer
GOLD Winner: Trophy, Medal and 1 set 9648 Education Resource Set worth RM430
SILVER Winner: Trophy and Medal
BRONZE Winner: Trophy and Medal

Secondary School Category
Event – Robot Discoverer
GOLD Winner: Trophy, Medal and 1 set 9648 Education Resource Set worth RM430
SILVER Winner: Trophy and Medal
BRONZE Winner: Trophy and Medal

Medals will be awarded to all members of the winning teams and certificates of participation will be awarded to all participants.

3. **Open Category**

Event – Robot "Science Fiction"
GOLD Winner: Trophy, Medal and 1 set 9648 Education Resource Set worth RM430
SILVER Winner: Trophy and Medal
BRONZE Winner: Trophy and Medal

Medals will be awarded to all members of the winning teams and certificates of participation will be awarded to all participants.

National Robotics Competition 2007

FINAL COMPETITION AWARDS STRUCTURE

1. **RCX Category Events**

Primary School Category
Event – Robot Courier
GOLD Winner: LEGO Trophy, Medal, RM1,000 Cash, 1 set 9797 NXT Education worth RM1,850
Full sponsorship to 2007 WRO Taipei, Taiwan
SILVER Winner: LEGO Trophy, Medal, RM500 Cash
BRONZE Winner: LEGO Trophy, Medal, RM300 Cash

Lower Secondary Category
Event – Robot Bulldozer
GOLD Winner: LEGO Trophy, Medal, RM1,000 Cash, 1 set 9797 NXT Education worth RM1,850
Full sponsorship to 2007 WRO Taipei, Taiwan
SILVER Winner: LEGO Trophy, Medal, RM500 Cash
BRONZE Winner: LEGO Trophy, Medal, RM300 Cash

Upper Secondary Category
Event – Robot Transporter
GOLD Winner: LEGO Trophy, Medal, RM1,000 Cash, 1 set 9797 NXT Education worth RM1,850
Full sponsorship to 2007 WRO Taipei, Taiwan
SILVER Winner: LEGO Trophy, Medal, RM500 Cash
BRONZE Winner: LEGO Trophy, Medal, RM300 Cash

Medals will be awarded to all members of the winning teams and certificates of participation will be awarded to all participants.

2. **NXT Category Events**

Primary School Category
Event – Robot Explorer
GOLD Winner: LEGO Trophy, Medal, RM1,000 Cash, 1 set 9797 NXT Education worth RM1,850
Full sponsorship to 2007 WRO Taipei, Taiwan
SILVER Winner: LEGO Trophy, Medal, RM500 Cash
BRONZE Winner: LEGO Trophy, Medal, RM300 Cash

Secondary School Category
Event – Robot Discoverer
GOLD Winner: LEGO Trophy, Medal, RM1,000 Cash, 1 set 9797 NXT Education worth RM1,850
Full sponsorship to 2007 WRO Taipei, Taiwan
SILVER Winner: LEGO Trophy, Medal, RM500 Cash
BRONZE Winner: LEGO Trophy, Medal, RM300 Cash

Medals will be awarded to all members of the winning teams and certificates of participation will be awarded to all participants.

3. **Open Category**

Event – Robot "Science Fiction"
GOLD Winner: LEGO Trophy, Medal, RM1,000 Cash, 1 set 9797 NXT Education worth RM1,850
SILVER Winner: LEGO Trophy, Medal, RM500 Cash
BRONZE Winner: LEGO Trophy, Medal, RM300 Cash

Medals will be awarded to all members of the winning teams and certificates of participation will be awarded to all participants.

National Robotics Competition 2007

RCX CATEGORY EVENT

General Rules

1. Teams participating in the NRC 2007 RCX Category Event must use the LEGO® MindStorms for School Team Challenge sets (any colour is acceptable as long as it is from the 9794 series) in the competition.
2. Teams are to observe the following:

    a. 1 RCX (NXT is **NOT** allowed in RCX Category Event), 3 motors (5225), 3 light sensors, 2 touch sensors and 1 angle sensor are allowed.
    b. The teams must use the ROBOLAB (any version) as the official programming language for the RCX Category Event.
    c. The dimensions of the robot must **not exceed 250mm × 250mm × 250mm** in size (including any extended part after any automatic transformation), including installed batteries.
    d. All teams should bring their own competition kits, computers, batteries, adaptors and any other items that they need for the competition. Teams should not use any flammable materials as part of their design.
    e. Teams are **allowed to pre-program the robot or store the program inside the laptop** before the competition.
    f. All teams must use AA batteries with a total output voltage not exceeding 9V.

3. The team is not allowed to modify any part of the competition kit and the ROBOLAB software such as the motor, RCX, sensor and Firmware. If the judges detect any changes in the competition kit, the team will be disqualified automatically.
4. Competition Field: The Competition Field Maps illustrated in the rules are for demonstration only. Before the competition, the NRC Organisation Committee will provide SEVERAL competition fields with different variations that are allowed by the rules for teams to practise and test their robots.
5. Only the operator of the competing team is allowed into the match area during the match.
6. Miss-tracking: A robot is declared "miss-track" when all its wheels are on the same side of the track line. Miss-tracking will result in immediate disqualification from the match for the robot concerned (but not necessarily for its opponent).
7. Miss-colouring: A robot is declared "miss-colour" when it fails to do specific tasks associated with a colour patch. "Miss-colouring" will result in the immediate disqualification from the match for the robot concerned (but not necessarily for its opponent).
8. Team members and the mentor / teacher must not intervene or interfere with the operation of the robot of their own team or that of the opponents, physically or remotely. Interference will result in an immediate disqualification.
9. Robots: The Robots designed for the NRC 2007 RCX Category event must be autonomous robots. Teams are given **1 hour and 30 minutes before the competition in Round 1** to build and test their robots. During Round 1, robots must be **built from scratch** (all the parts must be apart). Thus, pre-built robots are not allowed in the competition area. In subsequent rounds, teams may modify the robots they built in Round 1. Once the competition starts, team members are not allowed to touch their robot again.
10. Inspection: After the **1 hour and 30 minutes** preparation, robots will be quarantined at a specific area for detailed inspection of materials used. Once the robots are placed in the quarantine area, teams are not allowed to touch their robots until it is their turn to compete.
11. Objections: Teams are expected to obey the competition rules to maintain an orderly and friendly competition. In the event of **a valid objection**, teams **must fill in and submit the objection form** to the Head Judge to settle the dispute within **the shortest time possible**. The Head Judge and referees have the ultimate authority during the National Robotics Competition. **Their decisions are final**. Referees will not review recorded replays after the match is over.
12. Competition Venue: In the quarantine area of the RCX Category competition, only the students and organizers are allowed. No teachers and/or parents can enter the restricted area.
13. The competition kit and/or construction materials, particularly of the winning teams, will be randomly checked at the end of the competition.
14. In the event of a conflict in the translation of the rules, the English version is considered the correct and final version.

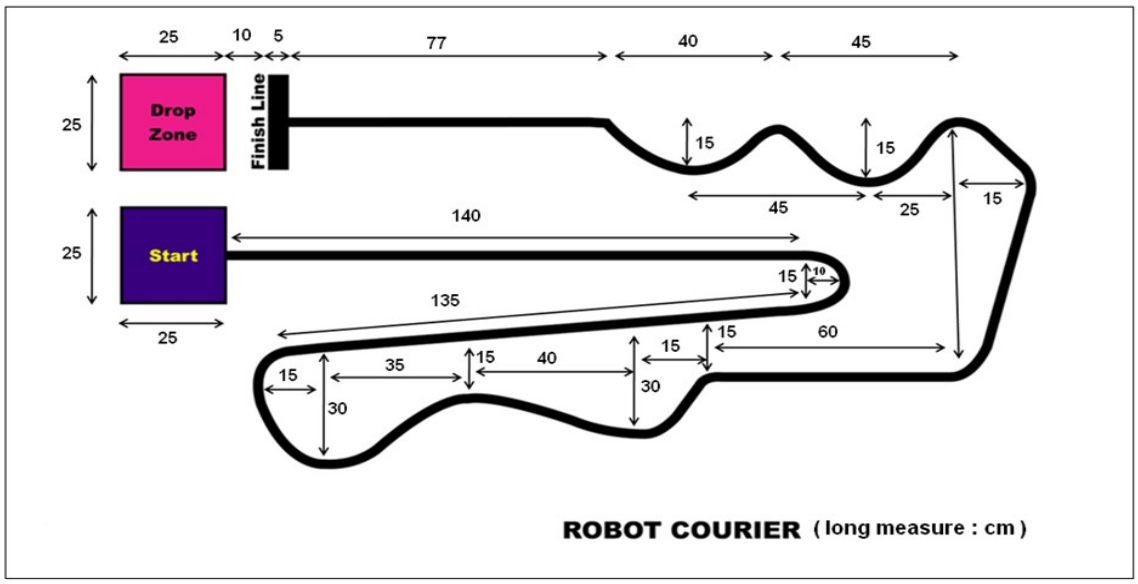
National Robotics Competition 2007

RCX CATEGORY EVENT 1

ZONE COMPETITION: PRIMARY SCHOOL CATEGORY

Event: Robot Courier

Competition Field



Competition Field Specifications

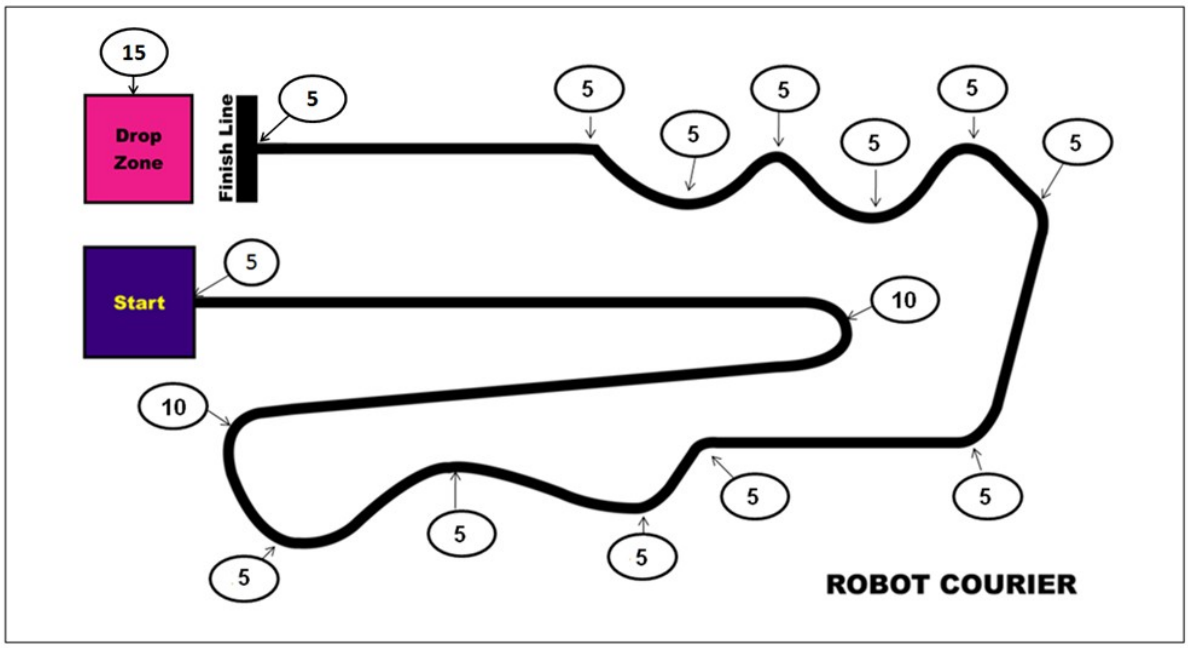
1. The size of the competition Field is 1220mm x 2440mm. The base of the field is white and the black lines on the field have a width of 18-25mm. (For details, see photo).
2. The size of the Start Box and the Drop Zone is 250mm by 250mm. In the Drop Zone is placed an open box which has a size not exceed 250mm by 250mm by 150mm and is lined at the base with a piece of sponge.

Objective of the Game

To design an autonomous robot to carry a ping pong ball from the Start Box to the Drop Zone within 90 seconds. The robot must follow the black line throughout the track and stop at the Finish line.

Rules and Regulations of the Game

1. The robot starts from the Start Box, and **no part of the robot can cross the Start Box limits**.
2. The robot will be measured without the ping pong ball.
3. The robot must follow the black line throughout the whole track and **GAME OVER** will be announced when the **robot's 4 wheels are on either side of the track**.
4. The robot can **continue** with the event even when the ping pong ball falls from the robot. However, the robot **cannot be restarted**.
5. The robot may react to the sign boards provided for slowing down or speeding up the robot (not compulsory).
6. The robot must **stop** at the Finish Line before attempting to shoot the ball into the Drop Zone, and no part of the robot can cross the Finish Line.
7. The time will be recorded once the ping pong ball **touches the sponge** of the Drop Zone.
8. Once the judge signals "Incomplete Game" or "Game Over", the team operator should stop the robot immediately.



Scoring System

1. This game has 16 checkpoints with a total of 100 points.

   a) 5 points for 13 checkpoints
   b) 10 points for 2 checkpoints
   c) 15 points for 1 checkpoint
   d) The basic rule for obtaining the points is that they must be obtained sequentially. This means that a robot can only obtain points when passing through the checkpoints on the correct path.

2. If the mission is completed within the time limit, the team that is the **fastest** (with the shortest time taken) is the winner.
3. Incomplete Game:

   a) The robot that did not pass any checkpoint will not be given any points.
   b) During the competition, the game is considered "game over" should the robot's 4 wheels be on either side of the track. However, point will be awarded for the checkpoints previously.
   c) Points for the Finish Line will not be awarded if any part of the robot crosses the Finish Line.

4. If the mission is completed, but exceeds 90 seconds, the extra time taken will be subtracted from the final total score, with precision kept at 2 decimal places. For example, if the time taken is 100 seconds, then 10 points will be subtracted from the total score.
5. The maximum number of points that can be subtracted is 10 points.
6. The best time from the two trials during the competition will be the final score.
7. In the event of a tie, the robot with the lightest mass (excluding batteries) wins.

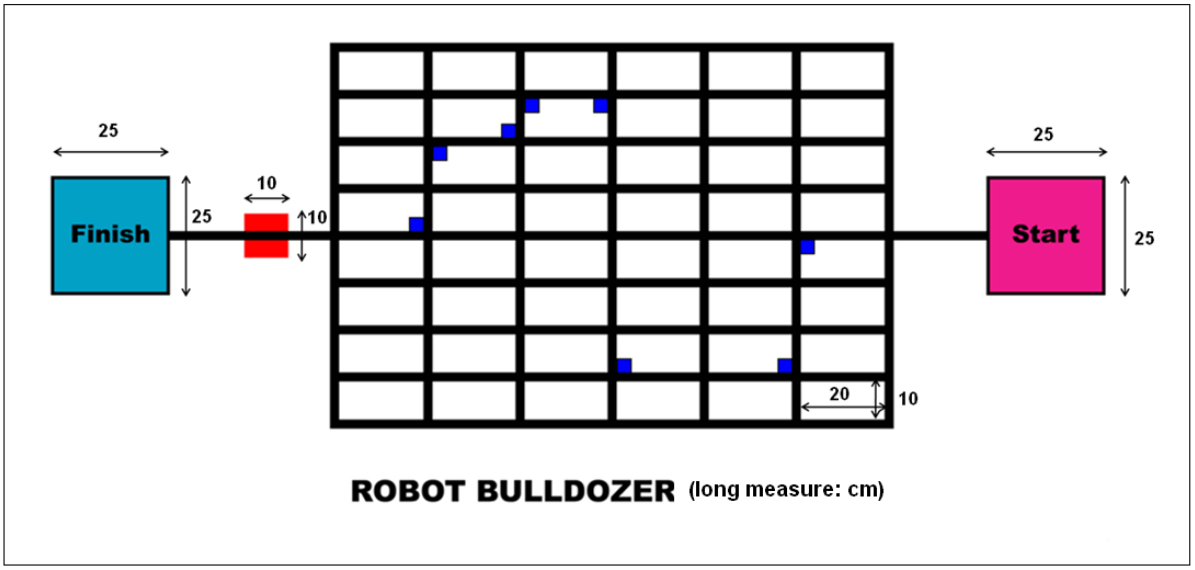
National Robotics Competition 2007

RCX CATEGORY EVENT 2

ZONE COMPETITION: LOWER SECONDARY CATEGORY

Event: Robot Bulldozer

Competition Field



Competition Field Specifications

1. The size of the competition field is 1220mm x 2440mm. The base of the field is white and the black lines on the field have a width of 18-25mm. (For details, see photo).
2. The size of the Start Box and the Finish Box is 250mm by 250mm.
3. The size of the colour patch must not exceed 50mm by 50mm.
4. The red box in the competition field represents 12 x 12 studs of LEGO® bricks in 2 layers.

Objective of the Game

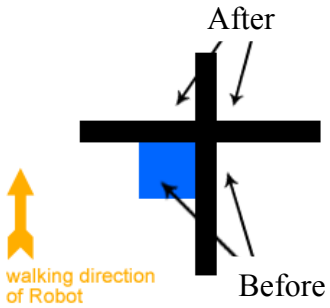
To design an autonomous robot that can follow the track line from the Start Box and turn or cross at the intersection according to the traffic lights represented by the colour patches, to arrive at the specified position and push the 12 x 12 studs of LEGO® bricks in 2 layers into the Finish area.

Rules and Regulations of the Game

1. The track line will be black, symbolizing the city roads. The width of each line is between 18-25mm, and the distance between the lines in either direction is approximately 200mm in length and 100mm in width.
2. Adjacent to intersections, there will be numerous 50mm ×50mm rectangular patches or "Traffic Lights". The colour of the patches may vary; robots must **recognise these patches and perform the actions listed in** the table below.
3. The robot must follow the track line, and at the intersection, the robot must act according to the commands of the "traffic light". Note that the robot should act according to the “traffic light” before an intersection, and ignore the “traffic light” after the intersection. When arriving at the colour patches before the intersections, the robot must do the following:

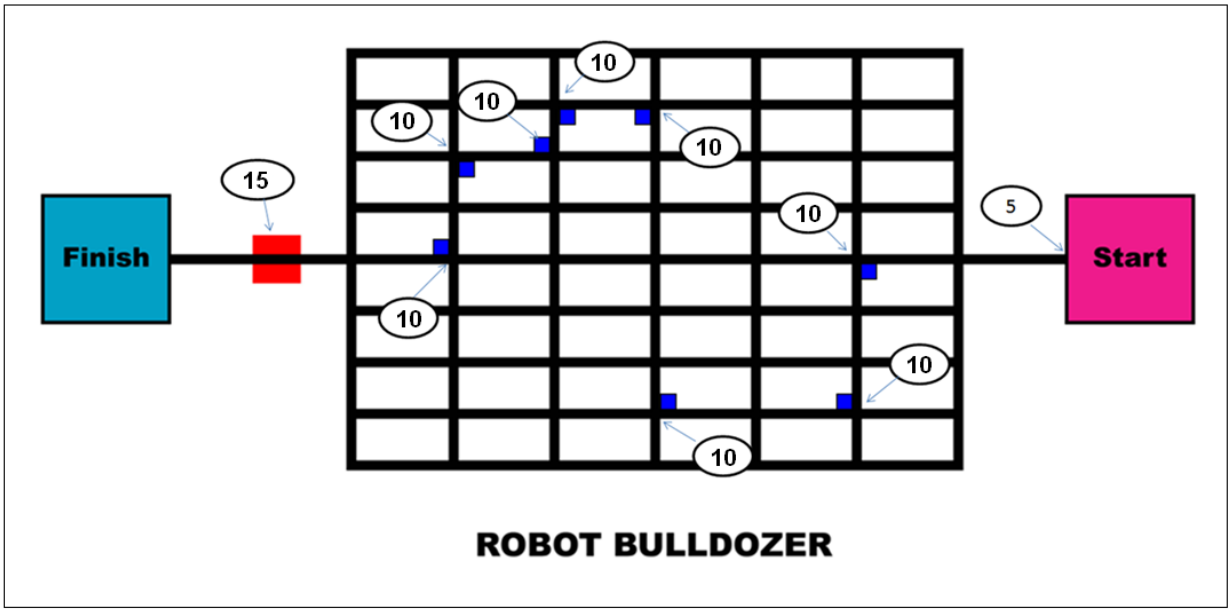
Before

Left Colour Patch	Right Colour Patch	Action
NO	NO	Go Forward
YES	NO	Turn Left
NO	YES	Turn Right
YES	YES	Go Forward



4. Within the start position, any part of the robot must **not** cross the Start Box limits.
5. The exact placement of the colour patches will be announced on the day of the competition before the quarantine and will be used throughout the tournament.
6. The robot **does not need to stop automatically** at the Finish Box.
7. Once the judge signals "incomplete game", the team operator should stop the robot immediately.

Scoring System



1. If the mission is completed within the time limit of 90 seconds, the team that is the fastest (with the shortest time taken) is the winner.
2. In the event of failure to complete the mission, the scoring of the round will be decided by the last intersection with a colour patch that the robot passes through just before the robot misses the track.
3. On passing each intersection with a colour patch the robot will earn 10 points.
4. On pushing the 12 x 12 studs of LEGO® bricks in 2 Layers into the Finish Box, the robot will earn 15 points.
5. The basic rule for scoring points is to obtain points sequentially. This means that a robot can only obtain points by passing through the intersections on the correct path and in the correct order.
6. If the mission is completed, but exceeds 90 seconds, then the extra time taken will be subtracted from the final total score, with precision kept at 2 decimal places. (For example, if the time is 100 seconds, then 10 points will be subtracted from the total score)
7. The maximum number of points that can be subtracted is 10 points.
8. The best time from the two trials during the competition will be the final score.
9. In the event of a tie, the robot with the lightest mass (excluding batteries) wins.

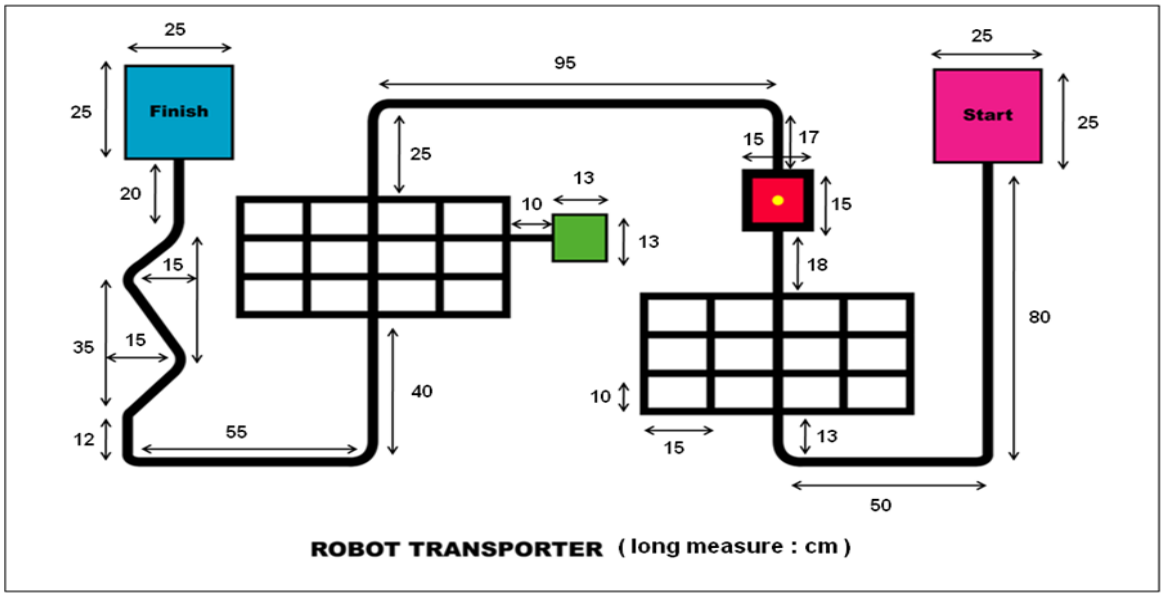
National Robotics Competition 2007

RCX CATEGORY EVENT 3

ZONE COMPETITION: UPPER SECONDARY CATEGORY

Event: Robot Transporter

Competition Field



Competition Field Specification

1. The size of the competition field is 1220mm x 2440mm. The base of the field is white and the black lines on the field have a width of 18-25mm. (For details, see photo).
2. The size of the Start Box and the Finish Box is 250mm by 250mm.
3. The size of the colour patch must not exceed 50mm by 50mm.
4. The size of the red loading and green unloading areas in the competition field does not exceed 200mm by 200mm.

Objective of the Game

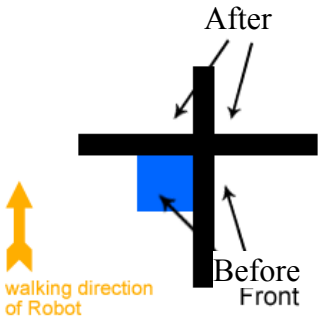
To design an autonomous robot that can follow the track line from the Start Box, turn or cross at the intersection according to the traffic lights represented by the colour patches, pick-up a can in the loading area, and then unload it in the unloading area before arriving at the Finish Box.

Rules and Regulations of the Game

1. The track line will be black, symbolizing the city roads. The width of each line is 18-25mm, and the distance between the lines in either direction is approximately 200mm in length and 100mm in width.
2. Adjacent to intersections, there will be numerous 50mm ×50mm rectangular patches or "Traffic Lights". The colour of the patches may vary; robots must recognize these patches and perform the actions listed in below.

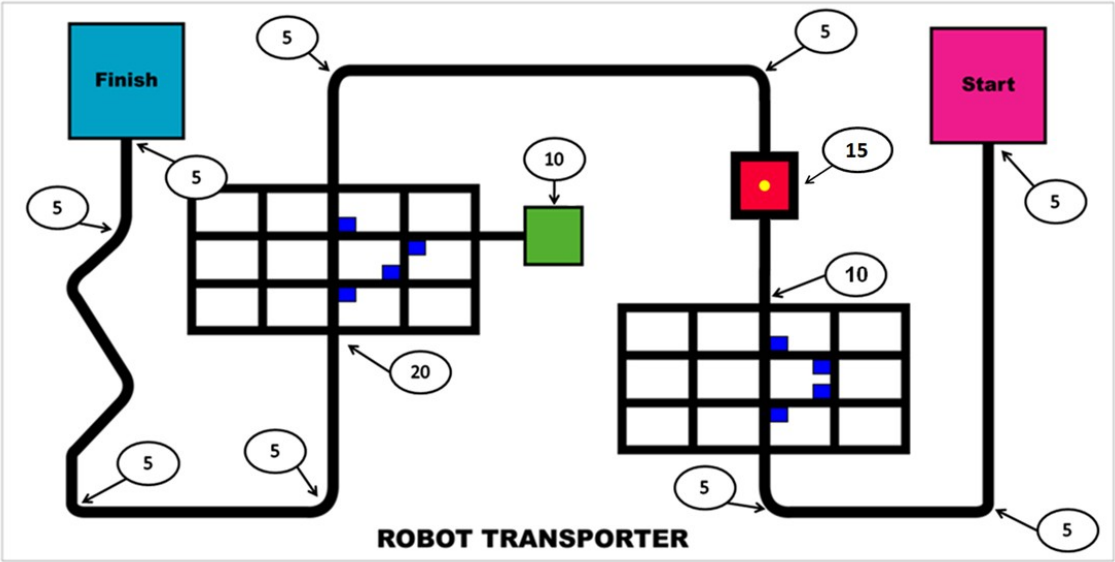
3. The robot must follow the track line, and at the intersection the robot must act according to the commands of the "traffic light". Note that the robot should act according to the “traffic light” before an intersection, and ignore the “traffic light” after the intersection. When arriving at the colour patched before the intersections, the robot must do the following:

Left Colour Patch	Right Colour Patch	Action
NO	NO	Go Forward
YES	NO	Turn Left
NO	YES	Turn Right
YES	YES	Go Forward



4. Within the start position, any part of the robot cannot cross the Start Box limits.
5. The exact placement of the colour patches will be announced on the day of the competition before the quarantine and will be used throughout the tournament.
6. The robot must load and unload the empty **“COKE”** can which is wrapped in white paper.
7. The robot does not need to stop automatically at the Finish Box.
8. Once the judge signals “incomplete game”, the team operator should stop the robot immediately.

Scoring System



1. If the mission is completed within the time limit of 90 seconds, the team that is the fastest (with the shortest time taken) is the winner.
2. In the event of failure to complete the mission, the scoring of the round will be decided by the last intersection with a colour patch or the last checkpoint that the robot passes through just before the robot misses the track.
3. On passing through each checkpoint, the robot will earn 5 points. (There are 9 checkpoints altogether).
4. On passing through “traffic 1” with a colour patch, the robot will earn 10 points.
5. On passing through “traffic 2” with a colour patch, the robot will earn 20 points.
6. On successfully loading the can, the robot will earn 15 points.
7. On successfully unloading the can, the robot will earn 10 points.

8. The basic rule for scoring points is to obtain points sequentially. This means that a robot can only obtain points by passing through the intersections on the correct path and in the correct order.
9. If the mission is completed, but exceeds 90 seconds, then the extra time taken will be subtracted from the total score, with precision kept at 2 decimal places. (For example, if the time taken is 100 seconds, then 10 points will be subtracted from the total score).
10. The maximum number of points that can be subtracted is10 points.
11. The best time from the two trials during the competition will be the final score.
12. In the event of a tie, the robot with the lightest mass (excluding batteries) wins.

NXT CATEGORY EVENT

General Rules

1. Teams participating in the NRC 2007 NXT Category event in the competition must use the LEGO MindStorms Education Base sets 9797 (any colour is acceptable as long as it is from the LEGO MindStorms Education Base sets 9797).
2. Teams are to observe the following:

   a) 1 NXT brick, 3 intelligent servo motors, **2 light sensors**, 2 touch sensors, 1 sound sensor and 1 ultrasonic sensor are allowed.
   b) The teams must use the LEGO MindStorms Education Software or the ROBOLAB 2.9 as the official programming language for the NXT Event.
   c) The dimensions of the robot must not exceed 300mm × 300mm × 300mm in size (including any extended part after any automatic transformation), including installed batteries.
   d) All teams should bring their own competition kits, computers, batteries, adaptors and any other items that they need for the competition. Teams should not use any flammable materials as part of their design.
   e) Teams are **allowed to pre-program the robot or store the program inside the laptop** before the competition.
   f) All teams must use AA batteries with a total output voltage not exceeding 9V.

1. The team is not allowed to modify any part of the competition kit and the NXT software such as the motor, RCX, sensor and Firmware. If the judges detect any changes in the competition kit, the team will be disqualified automatically.
2. Competition Field: The Competition Field Maps illustrated in the rules are for demonstration only. Before the competition, the NRC Organisation Committee will provide SEVERAL competition fields with different variations that are allowed by the rules for teams to practise and test their robots.
3. Only the operator of the competing team is allowed into the match area during the match.
4. Miss-tracking: A robot is declared “miss-track” when one of its wheels crosses the boundary or the centre line. Miss-tracking will result in immediate disqualification from the match for the robot concerned (but not necessarily for its opponent).
5. Team members and the mentor / teacher must not intervene or interfere with the operation of the robot of their own team or that of the opponents, physically or remotely. Interference will result in an immediate disqualification.
6. Robots: The Robots designed for the NRC 2007 NXT Category event must be autonomous robots. Teams are given **1 hour and 30 minutes before the competition in Round 1** to build and test their robots. During Round 1, robots must be **built from scratch** (all the parts must be apart). Thus, pre-built robots are not allowed in the competition area. In subsequent rounds, teams may modify the robots they built in Round 1. Once the competition starts, team members are not allowed to touch their robot again.
7. Inspection: After the **1 hour and 30 minutes** preparation, robots will be quarantined at a specific area for detailed inspection of materials used. Once the robots are placed in the quarantine area, teams are not allowed to touch their robots until it is their turn to compete.

8. Objections: Teams are expected to obey the competition rules to maintain an orderly and friendly competition. In the event of **a valid objection**, teams **must fill in and submit the objection form** to the Head Judge to settle the dispute within **the shortest possible time**. The Head Judge and referees have the ultimate authority during the National Robotics Competition. **Their decisions are final**. Referees will not review recorded replays after the match is over.
9. The competition kit and/or construction materials, particularly of the winning teams, will be randomly checked at the end of the competition.
10. Competition Venue: In the quarantine area of the NXT Event category competition, only the students and organizers are allowed. No teachers and/or parents can enter the restricted area.
11. In the event of a conflict in the translation of the rules, the English version is considered the correct and final version.

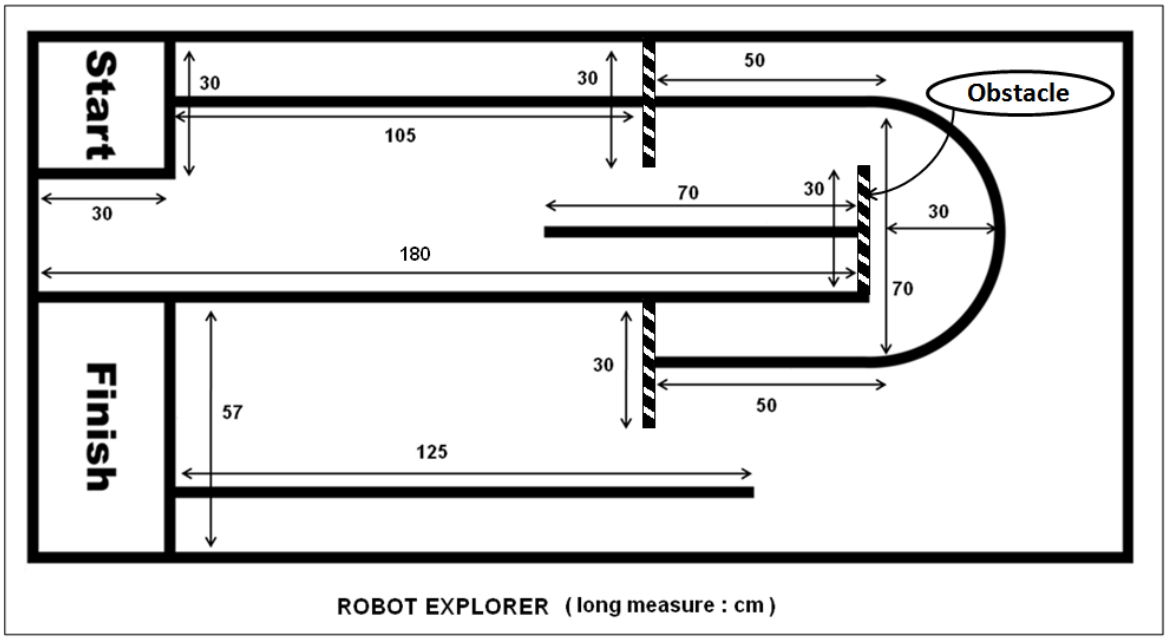
National Robotics Competition 2007

NXT CATOGORY EVENT 1

ZONE COMPETITION: PRIMARY SCHOOL CATEGORY

Event: Robot Explorer

Competition Field



ROBOT EXPLORER (long measure : cm)

Competition Field Specifications

1. The size of the competition field is 1220mm x 2440mm. The base of the field is white and the black lines on the field have a width of 18-25mm. (For details, see photo).
2. The size of the Start Box is 300mm by 300mm.

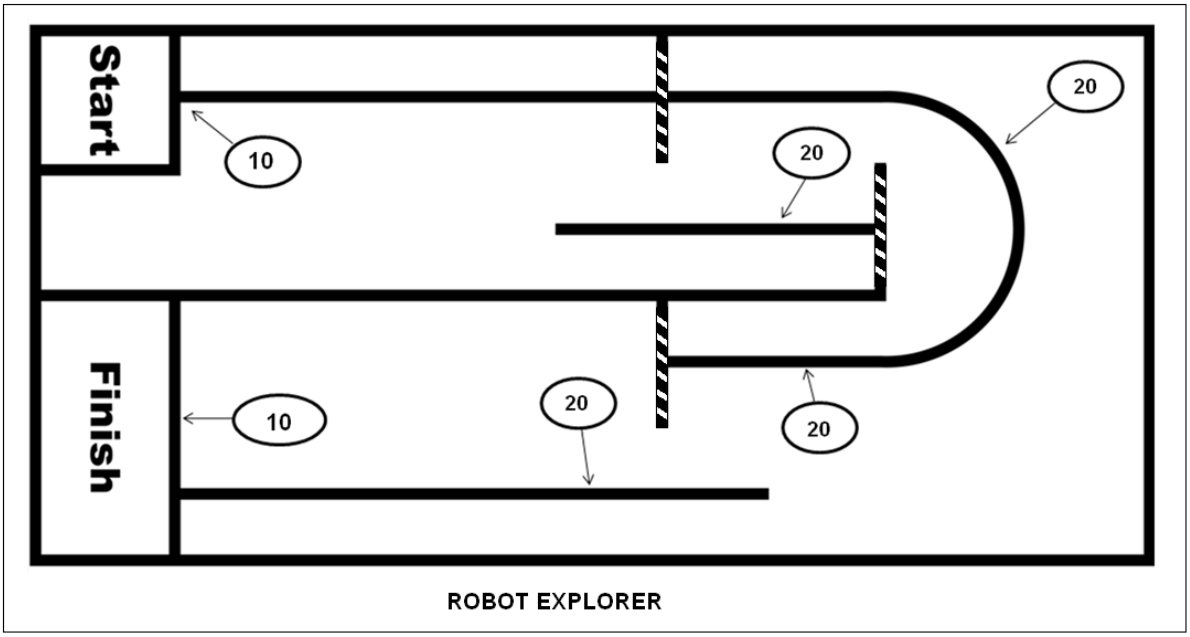
Objective of the Game

To design an autonomous robot that is able to avoid all obstacles from the start to the end and finish the race within 90 seconds.

Rules and Regulations of the Game

1. In the starting position, no part of the robot can cross the limits of the Start Box.
2. The robot is not allowed to touch the boundary and the centre line of the competition field.
3. The robot must avoid the obstacles throughout the competition and GAME OVER will be announced in the following situations:
    a. One wheel of the robot crosses the boundary or the centre line of the competition field
    b. The robot hits an obstacle and the obstacle falls down.
4. Once the judge signals “Incomplete Game” or "Game Over", the team operator must immediately stop the robot.

Scoring System



ROBOT EXPLORER

1. This game has 6 checkpoints with a total of 100 points.

   a) 20 points for 4 checkpoints
   b) 10 points for 2 checkpoints
   c) 10 points will be deducted each time the robot touches the obstacle, the boundary or centre line of the competition field.

2. If the mission is completed within the time limit, the team that is the fastest (with the shortest time taken) is the winner.
3. The basic rule for scoring points is that the points must be obtained sequentially. This means that a robot can only obtain points when passing through the checkpoints on the correct path and in the correct order.
4. If the mission is completed, but exceeds 90 seconds, then the extra time will be subtracted from the final total score, with precision kept at 2 decimal places. For example, if the time is 95 seconds, then 5 points will be subtracted from the total score up to a maximum of 5 points.
5. The game is considered incomplete in the following situations:

   a) The robot that does not pass any checkpoint will not be given any points.
   b) One wheel of the robot crosses the boundary or the centre line of the competition field during the game and the game is terminated. However, points will be awarded for the checkpoints that the robot has previously passed.

6. The best time from the two trials during the competition will be the final score.
7. In the event of a tie, the robot with the lightest mass (excluding the batteries) wins.

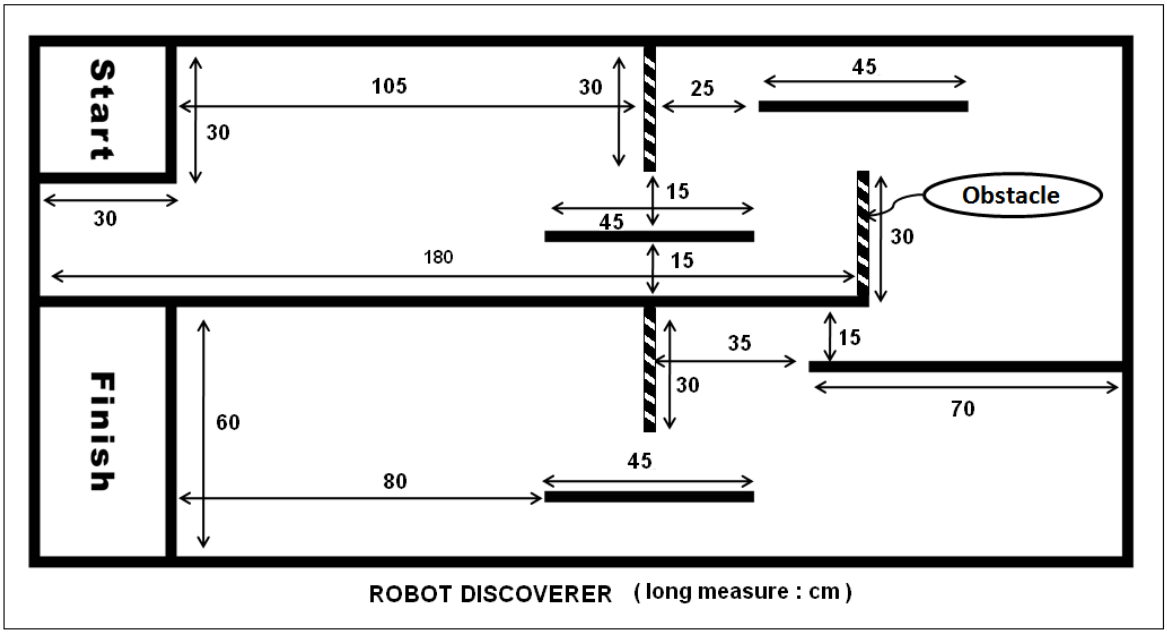
National Robotics Competition 2007

NXT CATOGORY EVENT 2

ZONE COMPETITION: SECONDARY SCHOOL CATEGORY

Event: Robot Discoverer

Competition Field



Competition Field Specifications

1. The size of the competition field size is 1220mm x 2440mm. The base of the field is white and the black lines on the field have a width of 18-25mm. (For details, see photo).
2. The size of the Start Box is 300mm by 300mm.

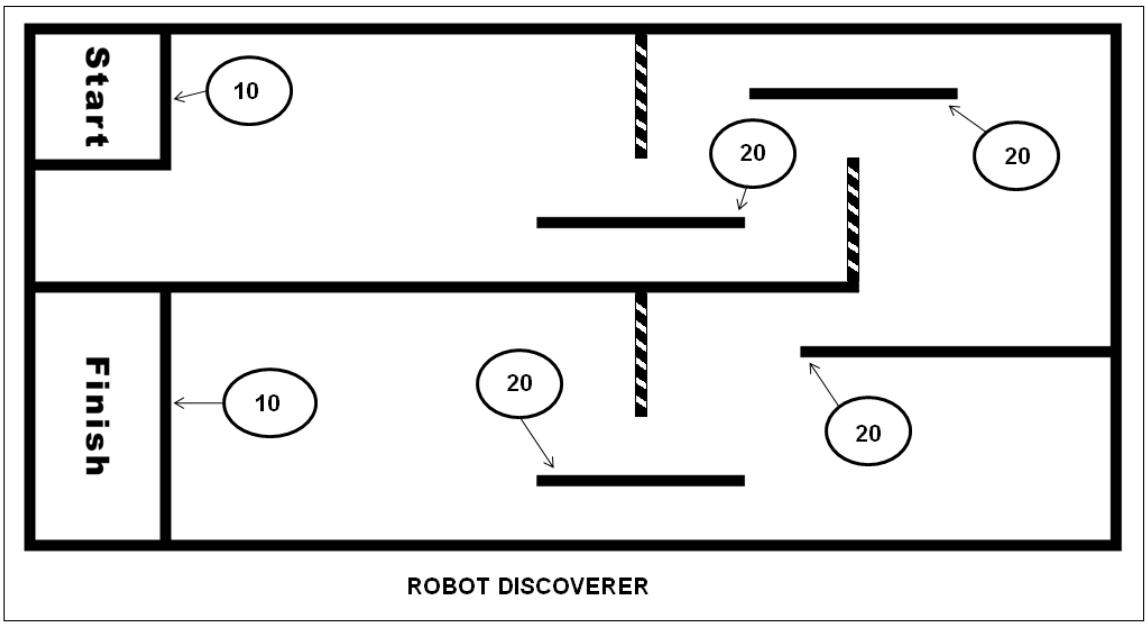
Objective of the Game

To design an autonomous robot that is able to avoid all obstacles from the start to the end and finish the race within 90 seconds.

Rules and Regulations of the Game

1. In the starting position, no part of the robot can cross the limits of the Start Box.
2. The robot is not allowed to touch the boundary and the centre line of the competition field.
3. The robot must avoid the obstacles throughout the competition and GAME OVER will be announced in the following situations:
    a. One wheel of the robot crosses the boundary or the centre line of the competition field
    b. The robot hits an obstacle and the obstacle falls down.
4. Once the judge signals “Incomplete Game” or "Game Over", the team operator must immediately stop the robot.

Scoring System



1. This game has 6 checkpoints with a total of 100 points.

    a) 20 points for 4 checkpoints
    b) 10 points for 2 checkpoints
    c) 10 points will be deducted each time the robot touches an obstacle, the boundary or centre line of the competition field.

1. If the mission is completed within the time limit, the team that is the fastest (with the shortest time taken) is the winner.
2. The basic rule for scoring points is that the points must be obtained sequentially. This means that a robot can only obtain points when passing through the checkpoints on the correct path and in the correct order.
3. If the mission is completed, but exceeds 90 seconds, then the extra time will be subtracted from the final total score, with precision kept at 2 decimal places. For example, if the time taken is 95 seconds, then 5 points will be subtracted from the total score up to a maximum of 5 points.
4. The game is considered incomplete in the following situations:

    a) The robot that does not pass any checkpoint will not be given any points.
    b) One wheel of the robot crosses the boundary or the centre line of the competition field during the game and the game is terminated. However, points will be awarded for the checkpoints that the robot has previously passed.

5. The best time from the two trials during the competition will be the final score.
6. In the event of a tie, the robot with the lightest mass (excluding the batteries) wins.

National Robotics Competition 2007

OPEN CATEGORY

THEME: Science Fiction

1. Competition Requirements
    a) Teams participating in the Open Category will work to create robots that can perform a science fiction story.
    b) Each team should comprise 3 students and one teacher.
    c) Teams can use ANY material including Non- LEGO® products. However, the final design should include at least 50% LEGO® material, and the controller must be either RCX or NXT.
    d) Only the LEGO® programming language is allowed.
    e) The size of the robots cannot exceed 1.5 metre × 1.5 metre.
    f) The process that the Open Category teams must go though is as follows:
        i. Test and make the final assembly of the robot at a designated location and decorate the booth with posters
        ii. Demonstrate to the judges
        iii. Q&A session with the judges.

2. When an Open Category team registers, the team must submit a report including pictures from different angles of the robot created, a programme and summary of the design process. The report submitted could be in an electronic or hardcopy form.

3. Teams should display a poster board of height 120cm and width 90cm to introduce their robot.

4. In the 10 minutes session with the judges, 7 minutes will be used by the team to explain and demonstrate the robot, and the remaining 3 minutes for a Q&A session with the judges.

5. Judging Criteria for the Open Category:
    a) Creativity and Originality in the following areas:
        i. Problem-solving methods
        ii. Use of data and analysis
        iii. Use of equipment and originality in design.

6. Robot Design and Assembly; Good Documentation.
    a) The robot should be of good engineering design, stable in structure and have an appearance befitting the theme. An artistic or creative robot will have a positive impact on judging.

7. Functionality and Successful Demonstration to the Judges
    a) The demonstration should be complete, successful and repeatable.
    b) The poster and oral presentation should clearly indicate all the unique features of the robot.
    c) The team should not just memorise the oral presentation. Members must clearly demonstrate that they designed the robot themselves and know all aspects of the robot design.

8. Team Work
    a) All members of the team must contribute to the design and creation of the robot.
    b) Team members should help each other throughout the demonstration to the judges, and take an active part in the robot project.