2013 International Robotic Olympiad (V4)

Land-based Robot Competition Rules

(Secondary School Division)

General Rules

Game Rules

1. Single motor category robots may use only one set of motor-gear box.
2. Multi-motor category robots may use over two sets of motor-gear boxes, but only two sets of them for the walking actions.
3. All contestants should wear uniform during the competition.
4. Name list of the student contestants should not be altered without the Organizer's permission.
5. Contestants not accompanied by their instructors or teachers are not allowed to take part in the competition.
6. Instructors or teachers cannot enter the restriction area to command students to play the game.
7. Judges have the right to give warning or disqualify the contestants, instructors or teachers who do not obey the rules or the decision of the judges.

Robot Rules

8. All participating robots may only move in walking mode except the worm robot.
9. Except for the servo motor robot group, all participating robots must use Tamiya70093 gear box (203.7:1, 58.2:1, 16.6:1) and its matching motor for competition. The gear ratio may only be adjusted in accordance to the manufacturer's instructions. Contestants are not allowed to modify the motor or the gear box in any way. Gearbox should be exposed and cannot be sealed. Transparent materials must be used if gear box is needed to be sealed. Before and after the game, sealed gear box must be disassembled for checking.
10. All motors must pass the power consumption check. The motor cannot consume more than 280mA when 3V supplied by the power regulator.
11. The weight of the robot means the total weight including all accessories and parts. (Including batteries)
12. Participating robots must comply with the dimensions, weights and specific requirements set by the Organizer.
13. All robots cannot add on control devices not approved by the Organizer. All wireless installations must be able to alter frequency channels. Transmitters found interfering must be immediately changed channel; otherwise it would be disqualified for the competition. 2.4 G wireless remote control device are recommended. All approved models of electronic controller accessories, wireless installations and their suppliers would be announced on the website.
14. The mechanical parts must be constructed by the student contestants from raw materials except for screws, nuts, rings and gear boxes. Ready-made models or toys cannot be used for mechanical parts. No more than 30% decorative accessories should be ready-made subassemblies.
15. In the "Hand Generator Category Competitions", more than one student contestants are allowed to operate the hand generator. They can change at any time.
16. Pneumatic device cannot be used.

Other Points to Note

17. Hand generators (attachment 1) and batteries provided by the Organizer should only be used in the national competition. (Batteries will be prepared by contestants in regional competition.)
18. Registration number of the robot must be engraved or printed with permanent ink on its chassis.
19. The Organizer may check robots on their design any time after registration. Units found not meeting specifications would be disqualified for the competition.
20. The Organizer reserves the right to use all participating items for marketing and publicity purposes.
21. Violation of the above rules would lead to immediate disqualification of the competition and its result.
22. The Organizer reserves the right to modify the game rules and announce them on its website.

Hand Generator (12V 350rpm)

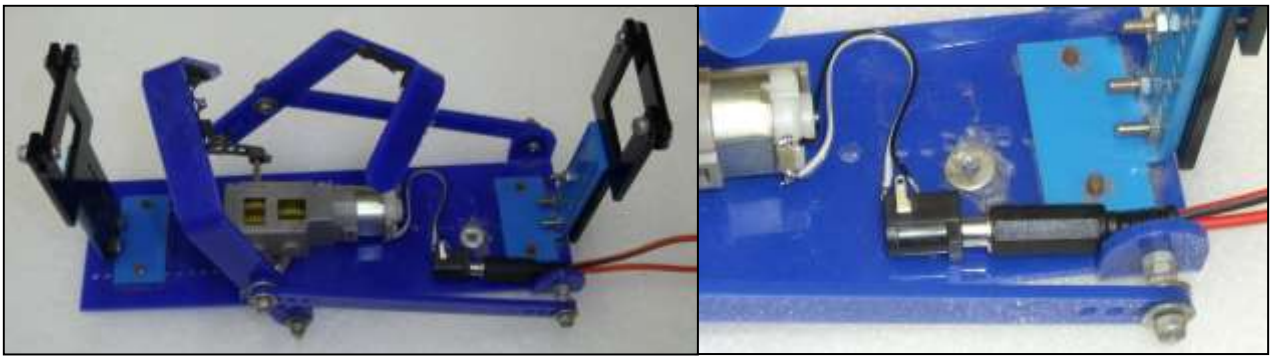
Attachment 1

12V 350rpm Hand Generator

12V 350rpm Hand Generator [with ⊕ ⊖ electrode selector]

2.1mm plug and socket

Different types of *2.1mm* socket



Each Single Motor Robot should be equipped with a 2.1mm socket for the plug of hand generator.

How to equip the 12V 350rpm Hand Generator with a [⊕ ⊖ electrode selector]

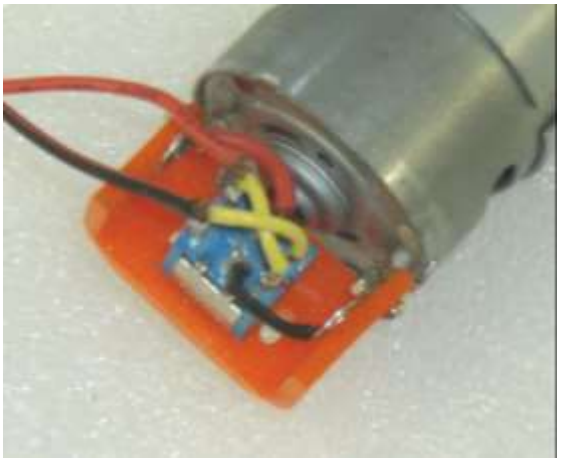
Step 1: Install the 2 wiring blades and acrylic accessory on the electrodes of the Hand Generator.

Step 2: Install a double-pole triple-throw (DPTT) switch.

Step 3: Connect the middle poles of DPTT switch to the electrodes with wires.

Step 4: Cross the opposite poles of DPTT switch with two yellow wires as shown.

Step 5: Connect each end of the yellow wires with the red and black wires of the 2.1mm plug.



The 12V 350rpm Hand Generator
with a ⊕ ⊖electrode selector

Individual competition rules

Category A: Single Motor Robot Category (for students at Junior Secondary 2 or below)

1. Hand Generator 2 legs Robot Short Distance Run Competition
2. Robot Horse Relay Competition
3. Hand Generator Robot Tug-of-War Competition
4. Hand Generator Triathlon Robot Relay Competition
5. Hand Generator Single Motor Robot Appearance Design Competition
6. Hand Generator Worm Robot Short Distance Run Competition
7. Hand Generator Worm Robot Appearance Design Competition

Category B: Multi-motor Robot Category (for students at Senior Secondary 3 or below)

8. Robot Combat Competition
9. Planet Exploration Competition
10. Multi-motor Robot Appearance Design Competition

Category C: Wireless Controlled Robot Category (for students at Senior Secondary 3 or below)

11. Robot Soccer Competition
12. Robot Basketball Competition

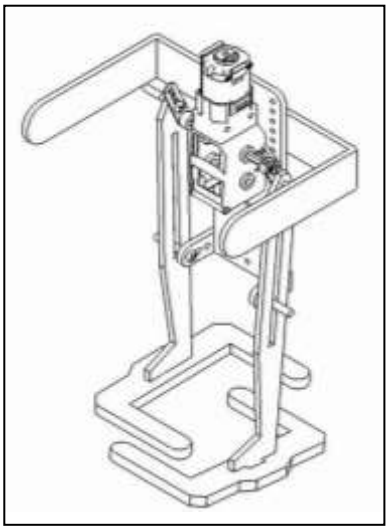
Category D: Servo Motor Robot Category (for students at Senior Secondary 3 or below)

13. Multi-legs Servo Motor Robot Short Distance Run Competition
14. C- shape Foot Two legs Servo motor Robot Short Distance Run Competition
15. Interchange centre of gravity Two legs Servo motor Robot Short Distance Run Competition
16. Lightweight Humanoid Free Fighting Competition
17. Heavyweight Humanoid Free Fighting Competition
18. Humanoid Free Gymnastics Competition
19. Servo motor Robot Obstacle Avoidance Competition
20. Servo motor Robot Performance (Dance) Competition
21. Servo motor Robot Appearance Design Competition

1. Hand Generator 2 legs Robot Short Distance Run Competition

Robots compete for speed in this game. A hand generator will be used to provide power for the 2 legs robot. The robot that finishes 2M run with the shortest time is the winner.

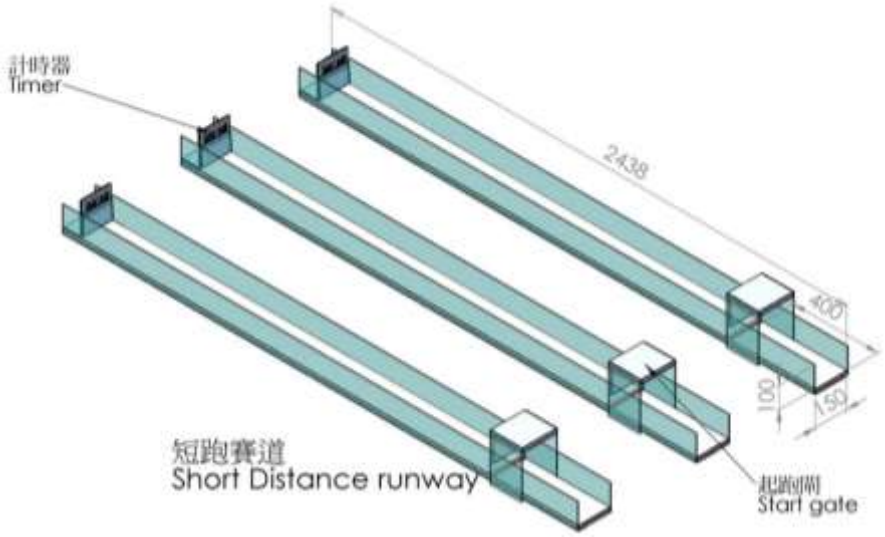
Robot Specification



1. The robot operates only with one motor and the power should only be supplied by the Hand Generator provided by the Organizer (*attachment 1*). The robot must be equipped with a 2.1mm socket for connection of the Hand Generator.
2. The robot cannot be longer than 300mm, wider than 150mm, taller than 180mm (the length, width and height dimensions are not inter-changeable), nor overall weighs more than 500g.
3. The robot must complete the game in walking with 2 legs. No auxiliary parts can touch the ground.
4. The robot cannot have any installation that would change its original dimension during competition.

Game Field Specification

1. Level runway is used for preliminary rounds. The track is 2000mm long. The starting block is 400mm long.
2. The runway has 3 tracks. Each track is 150mm wide.
3. A timer is placed at the finishing end of each runway.



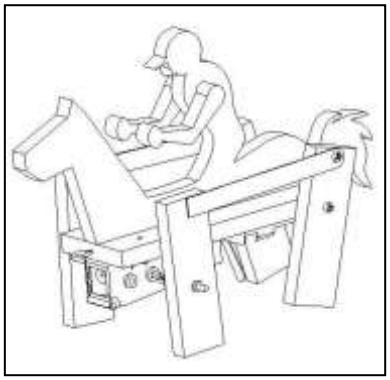
Game Rules

1. Each team can play twice and the best time will be recorded. The shortest recorded time to complete will be the winner.
2. The power of robot should only be supplied by the Hand Generator (attachment 1) provided by the Organizer. Pulling the wire of hand generator is prohibited.
3. The wire of Hand generator is long enough for the contestants. They must remain behind at the starting district. Moving along the runway with the robot is prohibited.
4. Once the game begins, the contestants cannot touch the walking robots until the game finishes. The maximum game time is 30 seconds. Robots that cannot complete the game would be recorded 30 seconds game time.

2. Robot Horse Relay Competition

4 legs robot horse relay competition is a team competition. The computer timer would record the game time of four robots in the team. The team scoring the least accumulated time is the winner.

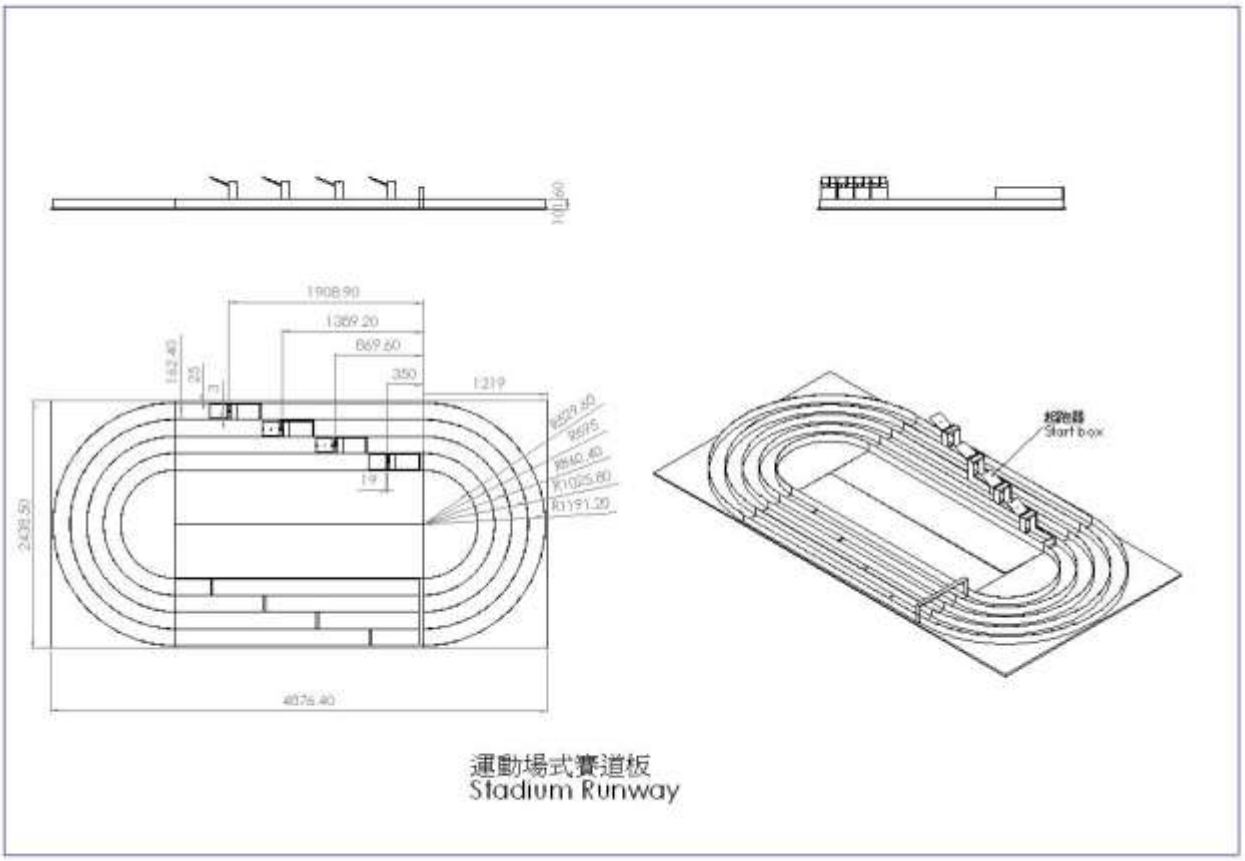
Robot Specification



1. The robot operates only with one motor and two AA size batteries.
2. The robot ***cannot*** be longer than 300mm, wider than 150mm, taller than 180mm (length, width and height dimensions are not inter-changeable), nor overall weighs more than 500g (including batteries).
3. The robot horse must have a horse appearance with a jockey and complete the game in walking mode.
4. The robot cannot have any installation that would change its original dimension during competition.

Game Field Specification

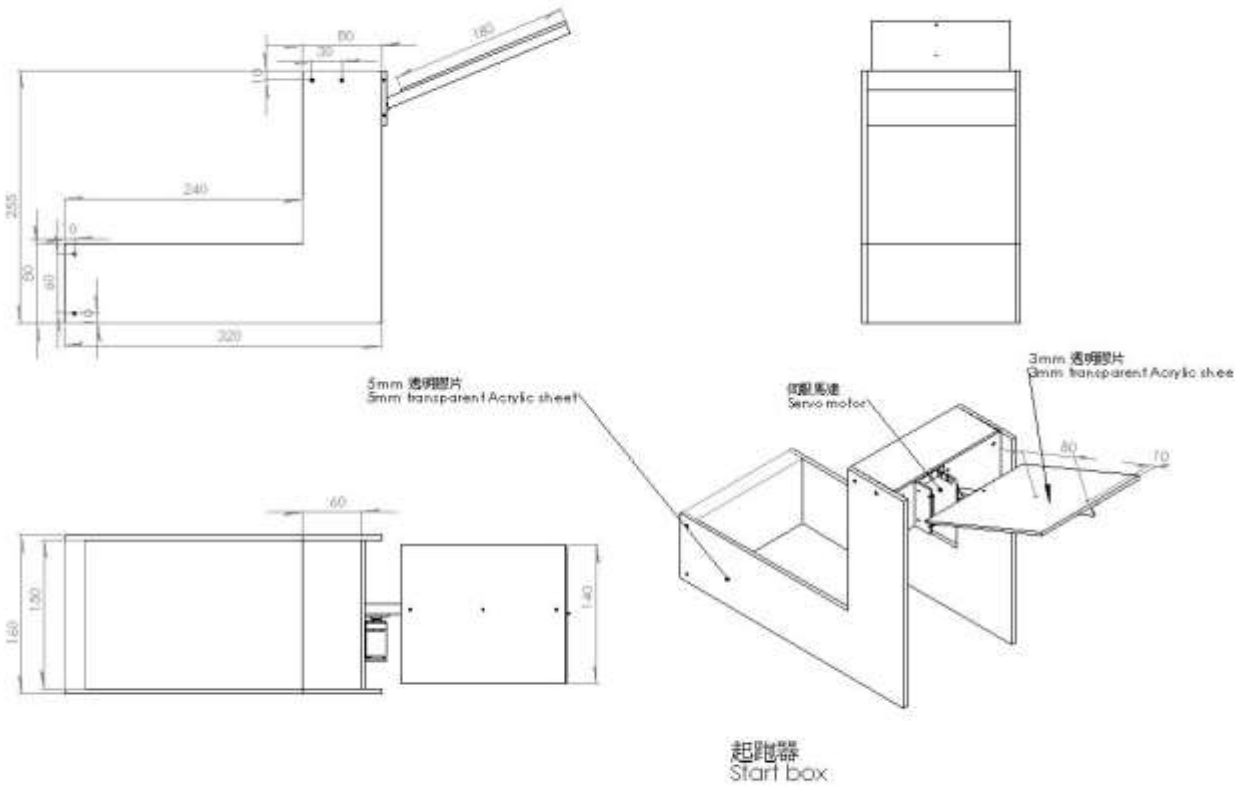
1. The runway has four tracks. Each track is 160mm wide.
2. A 4876mm (16ft) x 2438mm (8ft) stadium runway is used for competition.



運動場式賽道板
Stadium Runway

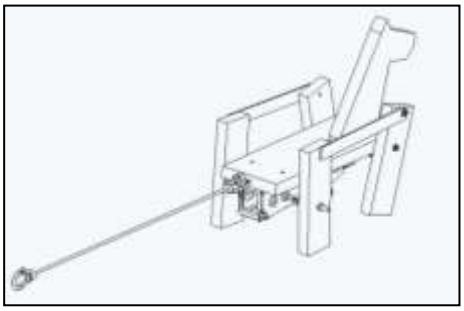
Game Rules

1. Contestants can switch on the robot before or after the gate is opened.
2. The first robot in the team is switched on and placed inside the ”starting block”. The computer then opens the gate of the starting block and the timer begins to count. The robot should leave the starting block in 3 seconds and the gate would then be closed automatically. When the first robot arrives at the finishing point, the computer records the time and opens the gate to release the second robot. When all four robots have completed the run, the computer adds up the total time. The team with the least run time is the winner.
3. Contestants cannot touch the robot once it is placed inside the starting block or during the run until the game is over. The team is disqualified if any of their robots cannot move or stops moving. The maximum game time is 2 minutes. Robots that cannot complete the game would be recorded 2 minutes game time.
4. Robots will run in anti-clockwise direction.
5. Each team can play twice and the best time will be recorded. The shortest recorded time to complete is the winner.



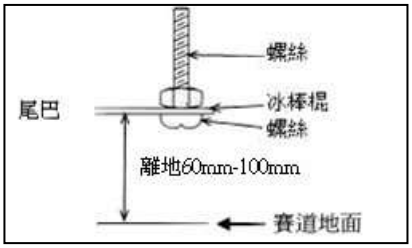
3. Hand Generator Robot Tug-of-War Competition

This game primarily tests the strength of the robots. The robot is to move on a 4 leg walking mode. The one that uses the least time to pull its opponent out of range is the winner.

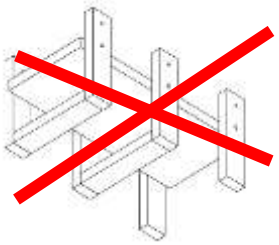


Robot Specification

1. The robot operates only with one motor and the power should only be supplied by the Hand Generator provided by the Organizer. The robot must be equipped with a 2.1mm socket for connection to the Hand Generator.
2. The robot cannot be longer than 300mm, wider than 150mm, taller than 180mm (length, width and height dimensions are not inter-changeable), nor overall weighs more than 500g.
3. A 150mm long wire hook is used to tie the two robots in the tug-of-war.
4. A M3 x 15mm diameter screw is installed at the tail end of robot between 60mm to 100mm above ground with around 20mm outside the body for connecting the wire hook.



5. The robot must move with 4 legs in walking mode. The base area of the foot must not exceed 25mm x 50mm. Each foot should leave the ground as it walks. The robot cannot have any part touching the ground permanently. ***NO*** 6 legs walking robot structure (sample as shown in right figure) should be used.
6. The part which touches the ground should not have high viscosity (cannot stick up a piece of 80g A4 typing paper for more than 3 seconds).

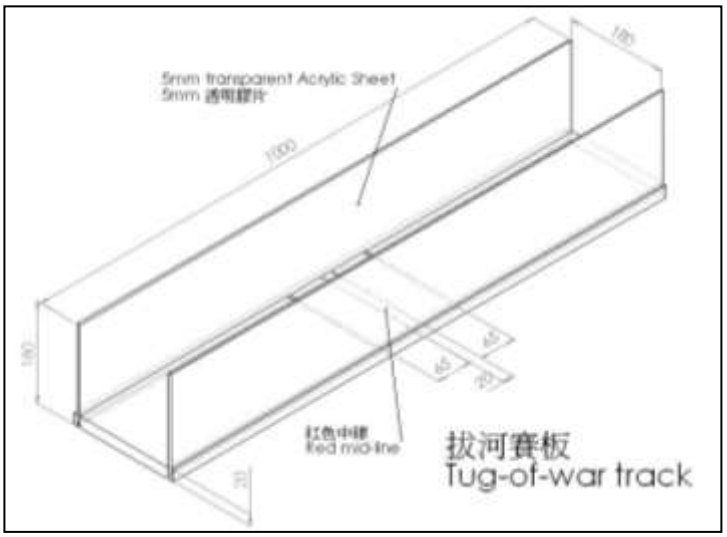


Game Field Specification

1. A tug-of-war track is used. The track is 1000mm long x 180mm wide x 180mm tall. Marks are made 75mm on both sides from the centre line.

Game Rules

1. The winner is decided in one game. The judge signals the start of contest. The robot that pulls its opponent beyond the 65mm competition zone wins.
2. Maximum game time is one minute. In case of draw, the lighter weight robot wins the game.
3. The robot loses the game should it fails to operate at the start or during the contest.



4. Hand Generator Triathlon Robot Relay Competition

This competition involves teams each formed by a set of 3 different robots racing in a triathlon relay. The team that finishes within the shortest time is the winner.

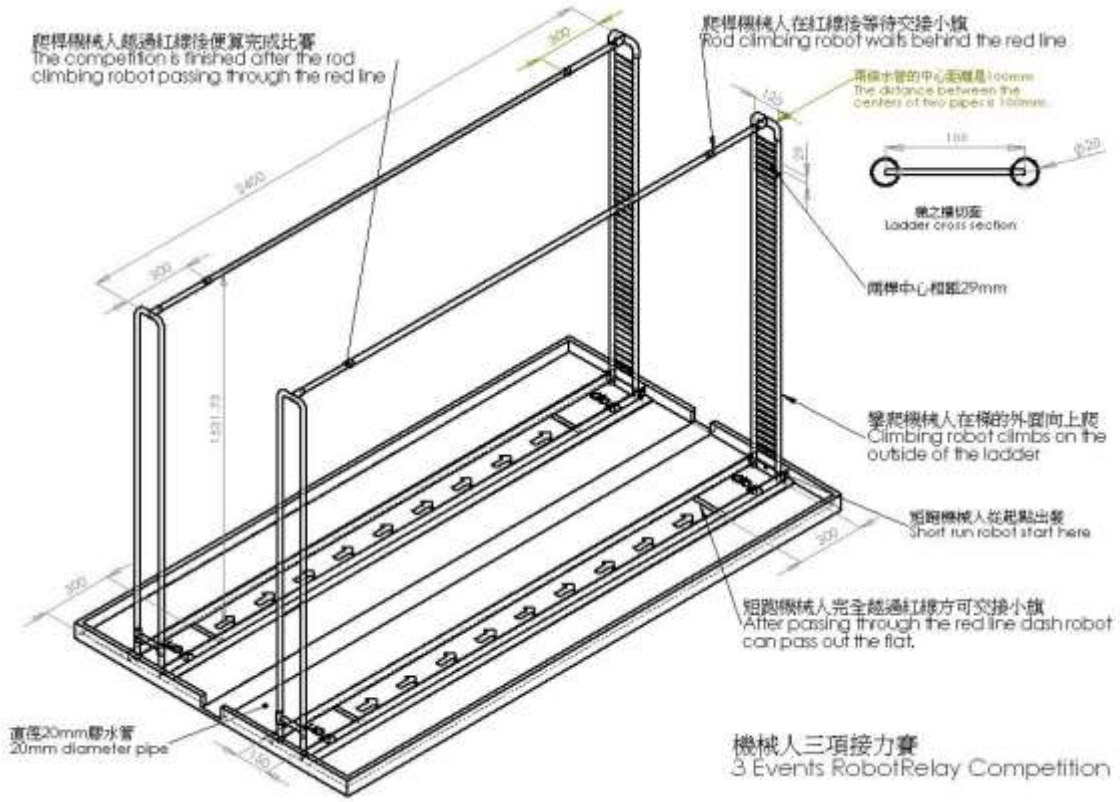
The first part is 2 legs robot short distance run; the second part is ladder climbing; the third part is rod climbing.

Robot Specification

1. Each robot operates only with one motor and the power should only be supplied by the Hand Generator (attachment 1) provided by the Organizer. Only one hand generator is used for all three robots.
2. Each robot cannot be longer than 300mm, wider than 150mm nor taller than 180mm (length, width and height dimensions are not inter-changeable). The gross weight should not be more than 500g.
3. No robot should be powered by wheel actions (or rotate like a wheel) nor auxiliary wheel.
4. Robot short distance run must be completed by 2 legs robot (specification same as Hand Generator 2 legs Robot Short Distance Run Competition). No auxiliary parts can touch the ground.
5. Each robot must be equipped with a 2.1mm socket for connection of the Hand Generator. The plug of the hand generator can then be unplugged and transferred to another robot for hand over in the relay.

Game Field Specification

1. A Triathlon Relay court is used. The maximum outer width of the ladder is 120mm and inner width is 80mm.
2. An easy hanging device should be designed for the rod climbing robot. Contestants cannot pull out the top bar to hang in the rod climbing robot.



Game Rules

1. Each team may have a maximum of 6 members.
2. Time limit for this event is 3 minutes. The first robot (2 legs short distance running robot) begins from the starting point. Once the front end of the robot touches the red line at the end of the track, the plug of the hand generator can be unplugged and transferred to the ladder climbing robot. The ladder climbing robot should only climb on the front of the ladder. The plug of the hand generator can be unplugged and transferred to the rod climbing robot when the top of the ladder climbing robot reaches the red line. When the front end of the rob climbing robot reaches the red line, the game is finished.
3. If a robot could not move, it can retry from the starting point of that particular race. The number of times for re-trial is unlimited.
4. Each team can play twice and the best time will be recorded. The shortest recorded time to complete is the winner.

5. / 10. Hand Generator Single Motor / Multi-motor Robot Appearance Design Competition

The robot appearance design competition encourages students' expression of creativity. The loose game rules allow more esthetic and creative approach to the design of robot appearance.

Competition Category

1. Single Motor Robot Category permits the use of single motor in the mechanism design. This category is only for Junior Secondary 2 students or below.
2. Multi-motor Robot Category permits the use of two or more motors in the mechanism design. This category is suitable for Senior Secondary 3 students or below only.
3. Each school may nominate up to two walking robots for each category in this competition

Game Rules

1. The participating robots may not take part in any other competitions.
2. Robots that took part in last year's competition cannot re-enter the same game this year.
3. The robot including its peripheral decorations cannot exceed 425mm X 300mm X 230mm (the length, width and height dimensions may be interchanged).
4. The robot of single Motor Robot Category operates only with one motor and the power can only be provided by the Hand Generator.
5. The robot must be able to complete its basic maneuver.
6. The contesting student may submit an A4 size introduction on the design concept and features (annex 1) in the specified format. However, the contents must not reflect or imply in any way the name of contestant or school. No presentation is required on the day. Failure to comply may lead to disqualification of the item.

Evaluation Criteria

Appearance / Dynamics	Creativity	Production skills	Application of material	Total
25%	30%	25%	20%	100%

Hand Generator Robot Appearance Design Competition

Product Introduction

Category: *Single Motor* / *Multi-motor* Contest Registration No. : _____

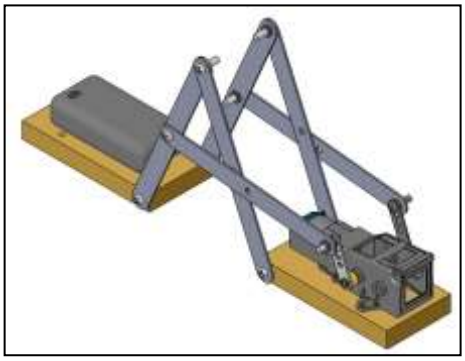
Product Introduction :

Note: the contents must not reflect or imply in any way the name of contestant or school. Failure to comply may lead to disqualification of the item.

6. Hand Generator Worm Robot Short Distance Run Competition

The robot moves like a worm, it is one of the simplest moving actions in the nature. The robot that finishes 2M run with the shortest time is the winner.

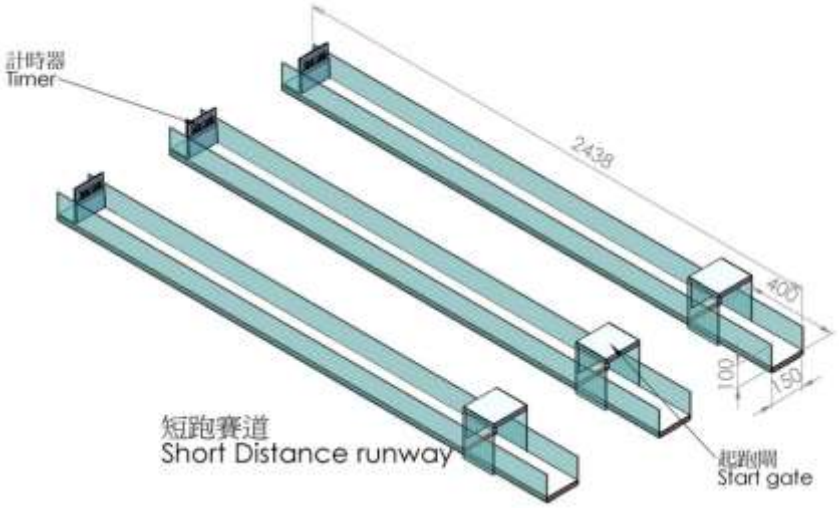
Robot Specification



1. The robot operates only with one motor and the power should only be supplied by the Hand Generator provided by the Organizer. The robot must be equipped with a 2.1mm socket for connection of the Hand Generator.
2. The robot cannot be longer than 300mm, wider than 150mm, taller than 180mm (length, width and height dimensions are not inter-changeable), nor overall weighs more than 500g.
3. The robot is moving by shrink and stretch method. It should not use ratchet to assist the motion.
4. Only the sole of the feet can touch the ground. Any other parts of the robot touching the ground are prohibited.
5. The robot cannot have any installation that would change its original dimension during competition.

Game Field Specification

1. Level runway is used for preliminary rounds. The track is 2000mm long. The starting block is 400mm long.
2. The runway has 3 tracks. Each track is 150mm wide.
3. A timer is placed at the finishing end of each runway.



Game Rules

1. Each team can play twice and the best time will be recorded. The shortest recorded time to complete is the winner.
2. The power of robot should only be supplied by the Hand Generator (attachment 1) provided by the Organizer. Pulling the wire of the hand generator is prohibited.
3. The wire of provided the Hand generator is long enough for the contestants. They must remain behind at the starting district. Moving along the runway with the robot is prohibited.
4. Once the game begins, the contestants cannot touch the walking robots until the game finishes. The maximum game time is 60 seconds. Robots that cannot complete the game would be recorded 60 seconds game time.

7. Hand Generator Worm Robot Appearance Design Competition

The worm robot appearance design competition encourages students' expression of creativity. The loose game rules allow more esthetic and creative approach to the design of robot appearance.

Competition Category

1. It is the Single Motor Robot Category and permits the use of single motor in the mechanism design. This competition is suitable for Junior Secondary 2 students or below only.

Game Rules

1. The participating robots may not take part in any other competitions.
2. Robots that took part in last year's competition cannot re-enter the same game this year.
3. The robot including its peripheral decorations cannot exceed 425mm X 300mm X 230mm (the length, width and height dimensions may be interchanged).
4. The robot must be able to complete its basic maneuver. The robot operates only with one motor and the power can only be provided by the Hand Generator. It is moving by shrink and stretch method. It should not use ratchet to assist the motion.
5. The contesting student may submit an A4 size introduction on the design concept and features (annex 2) in the specified format. However, the contents must not reflect or imply in any way the name of contestant or school. No presentation is required on the day. Failure to comply may lead to disqualification of the item.

Evaluation Criteria

Appearance / Dynamics	Creativity	Production skills	Application of material	Total
25%	30%	25%	20%	100%

Hand Generator Worm Robot Appearance Design Competition

Product Introduction

Category: *Single Motor* Contest Registration No. : _____

Product Introduction :

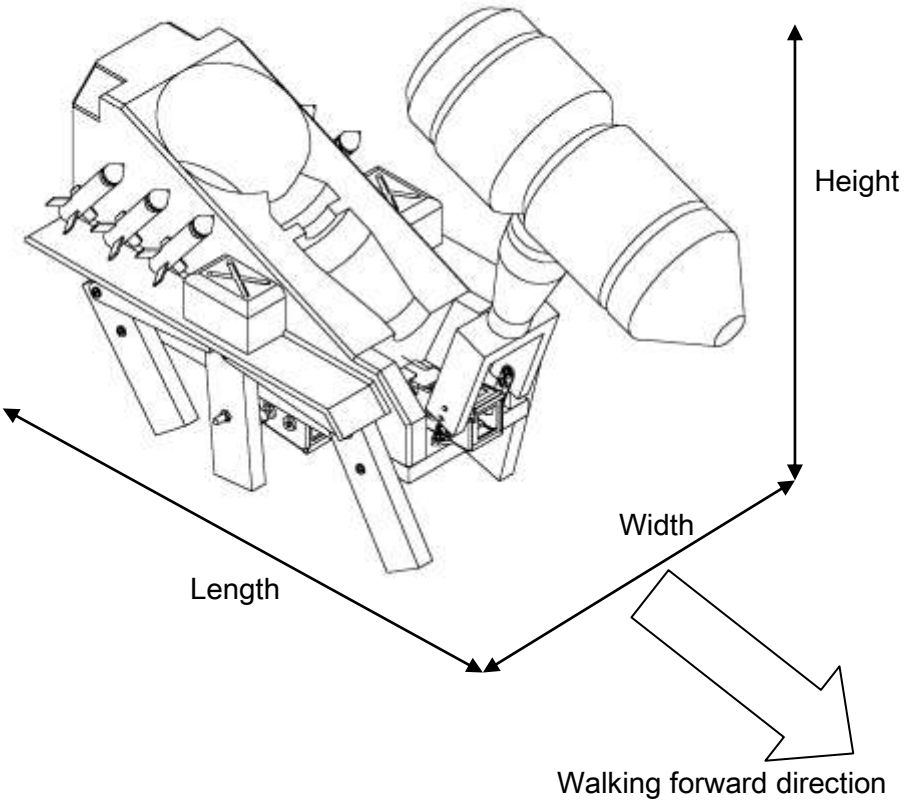
Note: the contents must not reflect or imply in any way the name of contestant or school. Failure to comply may lead to disqualification of the item.

8. Robot Combat Competition

This game tests the robots' power as well as players' control skill and team work. The team that can damage, overthrow or push the opponent's two robots out of the range wins the game.

Robot Specification

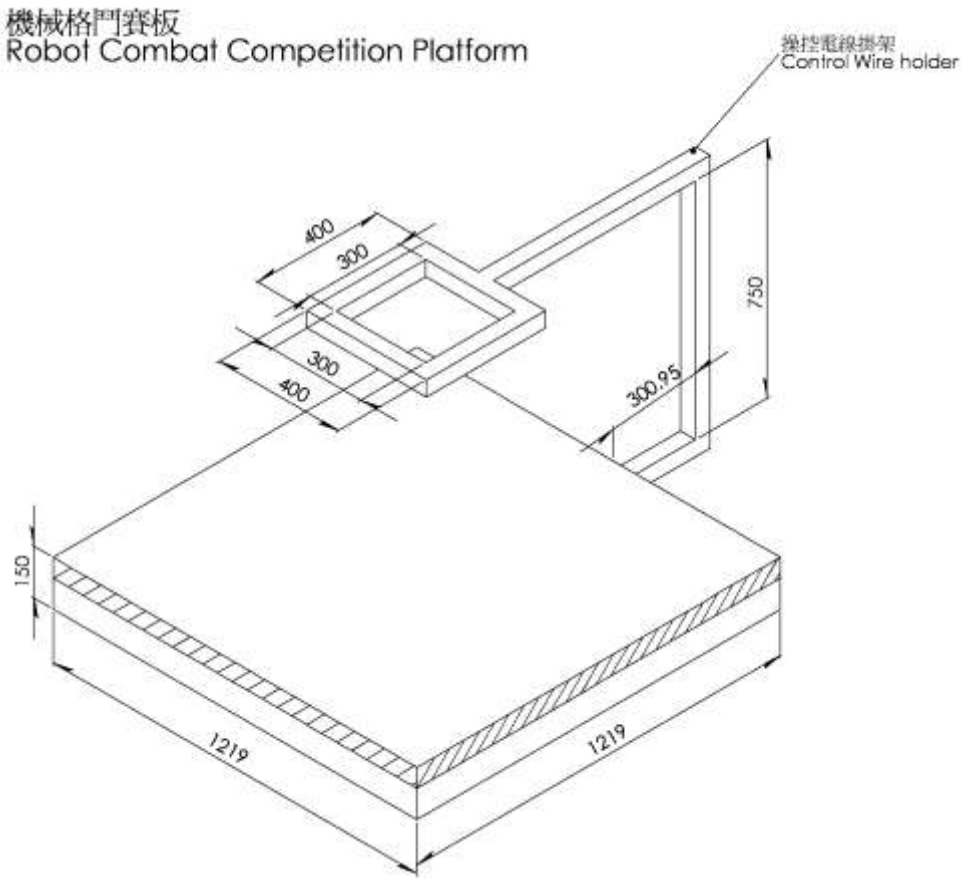
1. The robot may employ up to five sets of gear boxes, in which only two sets are for the walking mechanisms. Contestants are free to design their weapon mechanisms but cannot cause any danger such as the use of launcher, gun powder or spring.
2. The robot is controlled by wired manual controller which must only be supplied by not more than six pcs. 1.5V AA size batteries. The batteries will be provided by the Organizer (batteries will be prepared by contestants in regional competitions).
3. The control wires should be routed away from the robot via a tall hanger (e.g., an erected pole) 240mm above the track to avoid interfering the game.
4. After extension of all installations, the robot should not exceed the specified dimension of 300mm long, 200mm wide, 240mm tall, nor heavier than 1.5kg. From the view of walking forward direction, the dimension measured from the left to the right is the width, the dimension measured from the front to the end is the length, the dimension measured from bottom to the top is the height(length, width and height dimensions are not inter-changeable). Hence, it is not permitted to place the robot in the 'Detection box 'vertically or side way for dimension checking.
5. It is important that the sharp end of weapon cannot cause damage to the playing field.



Robot Specification

Game Field Specification

1. The platform is 1219mm long, 1219mm wide and 100mm tall.
2. The robots are placed at the opposite corners of the platform at the start of game.
3. The control wire should be placed through the wire holder, so the wire should be long enough.



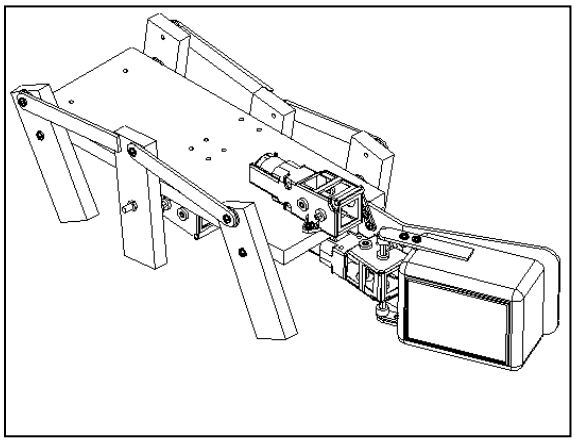
Game Rules

1. Each team assigns two robots for the competition. Each robot is controlled by one member.
2. The judge checks the robots to ensure that there is no movable dangerous mechanism in the design before game start. The platform is placed on a table or the ground. A robot is considered "lost" should any part of it touch the table/ground or it completely loses the combat ability.
3. The judge signals start of the game. The winner is determined in one match.
4. The maximum game time is two minutes. The team with more robots remained on platform wins.
5. Should both sides have equal number of remaining robots, the lighter robot team (2 robots together) wins the game.
6. The judge will warn the team that continually dodges the opponent and refuses to attack. The team will be disqualified after receiving the second warning.
7. The judge has the right to remove the robot which cannot fight anymore to ensure the competition is not interrupted.
8. The Panel of judges' decision is final.

9. Planet Exploration Competition

Students are encouraged to design flexible gripper to explore the planet but not a mining tool. Robots have to pick up stones (ping pong) and deliver them to a designated storing area. They should pick the 'useful' stones (white ping pong) and avoid the 'harmful' stones (orange ping pong).

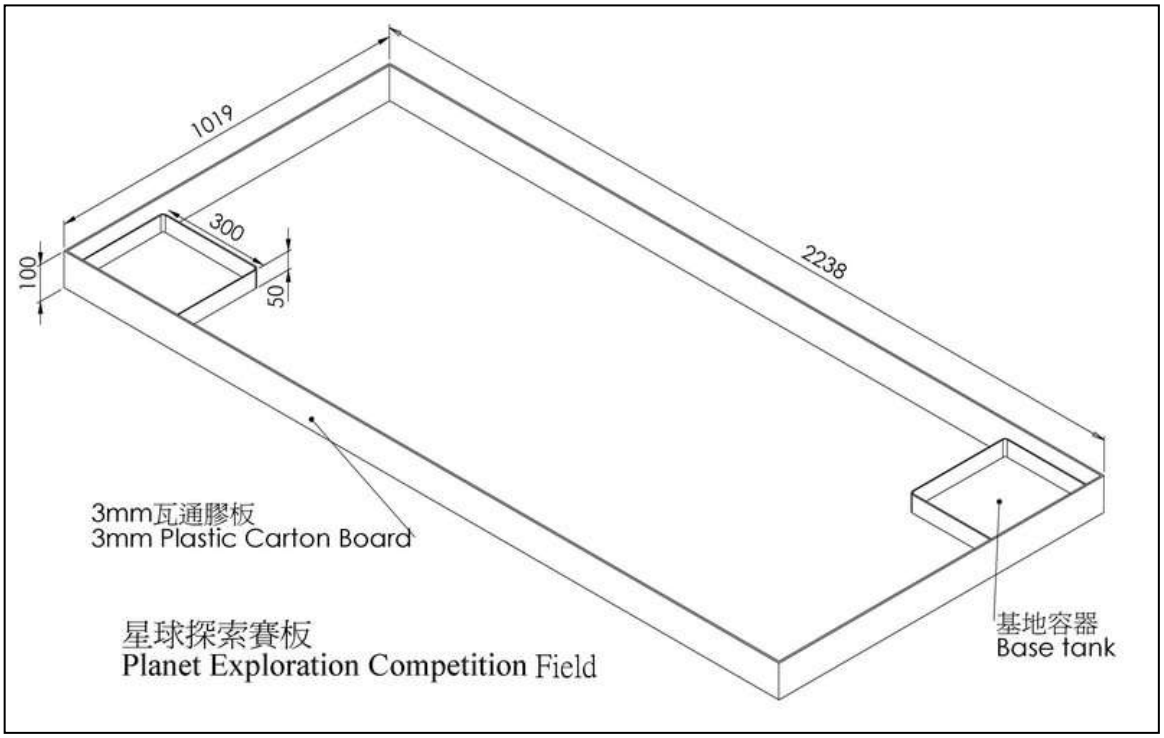
Robot Specification



1. The robot, with its arm contracted, must not exceed a length of 300mm, a width of 200mm, and a height of 240mm (length, width and height dimensions are not inter-changeable) nor overall weighs more than 1.5kg.
2. The robot may employ up to five sets of gear boxes. It must move in walking mode. There is no limit to the number of stones for each pick as long as gripper or hand-folding action is used. Spade or sweep actions are not allowed.
3. The robot is controlled by wired manual controller which must only be supplied by not more than six pcs. 1.5V AA size batteries. The batteries will be provided by the Organizer (batteries will be prepared by contestants in in Hong Kong region competition).

Game Field Specification

1. This game uses a universal playing field.
2. The area of playing field is 2238mm × 1019mm with 100mm tall fencing surrounding the four sides.
3. A base tank for storing stones with length of 300mm, a width of 300mm, a height of 50mm is located at both ends of the universal playing field.



Game Rules

1. Each robot is controlled by one member.
2. The robot attempts to pick as many stones (ping pong) as possible within the 2 minutes game time. Different color stones score different points. The team has the stones in the base tank with the highest accumulated point is the winner. If the points are same, the team with more orange colored stones wins.
3. Points represented by respective colored stones are as follows:

Color	Points
White	-50
Orange	+10

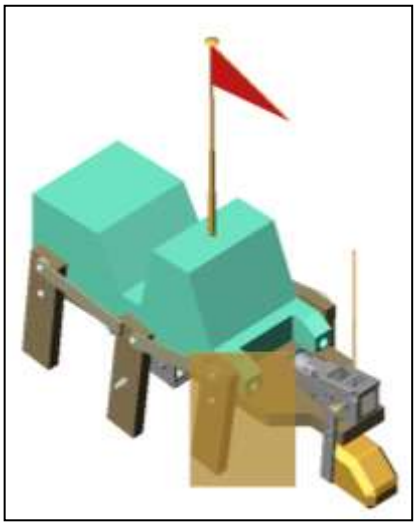
4. A robot may not damage or obstruct other competing robots. The judge would serve warning to the offending player. The player would be disqualified after two warnings and asked to leave the playing field immediately.
5. During the competition, a robot may receive repair off the field. The judge then places it back to where it left and continues the game. No extra time would be given to the robot.

11. Robot Soccer Competition

This is a team competition. Each team should have four robots with one of them as reserve. Students are encouraged to work as a team to build robots with efficient walking actions for the competition. During the game, the two competing team players would use their "legs" to kick the ball into their opponent's goal. The team with higher score is the winner.

Robot Specification

1. The robot cannot be longer than 300mm, wider than 200mm, taller than 240mm(length, width and height dimensions are not inter-changeable) nor heavier than 1.5kg (including batteries and receiver).



2. Each team consists of three robots.
   a) The Forward robot identifies itself with a yellow semi-circular flag on its 200mm pole. It may move around in the front half of its own playing field and into the penalty area of the opponent's field.
   b) The Midfield robot identifies itself with a red triangular flag on its 200mm pole. It may move around in the entire playing field except the two penalty areas.
   c) The Defense robot identifies itself with a blue rectangular flag on its 200mm pole. It may move around in the rear half of its own playing field including it's own penalty area.

3. A flap is installed on each side of the robot front end, slanting backward at 30-45 degree from the gear box to prevent the robot front legs from kicking the football. The opening between the two flaps should not be wider than 30mm. Therefore, the foot for kicking the ball may not be larger than 30mm (diagram referred).

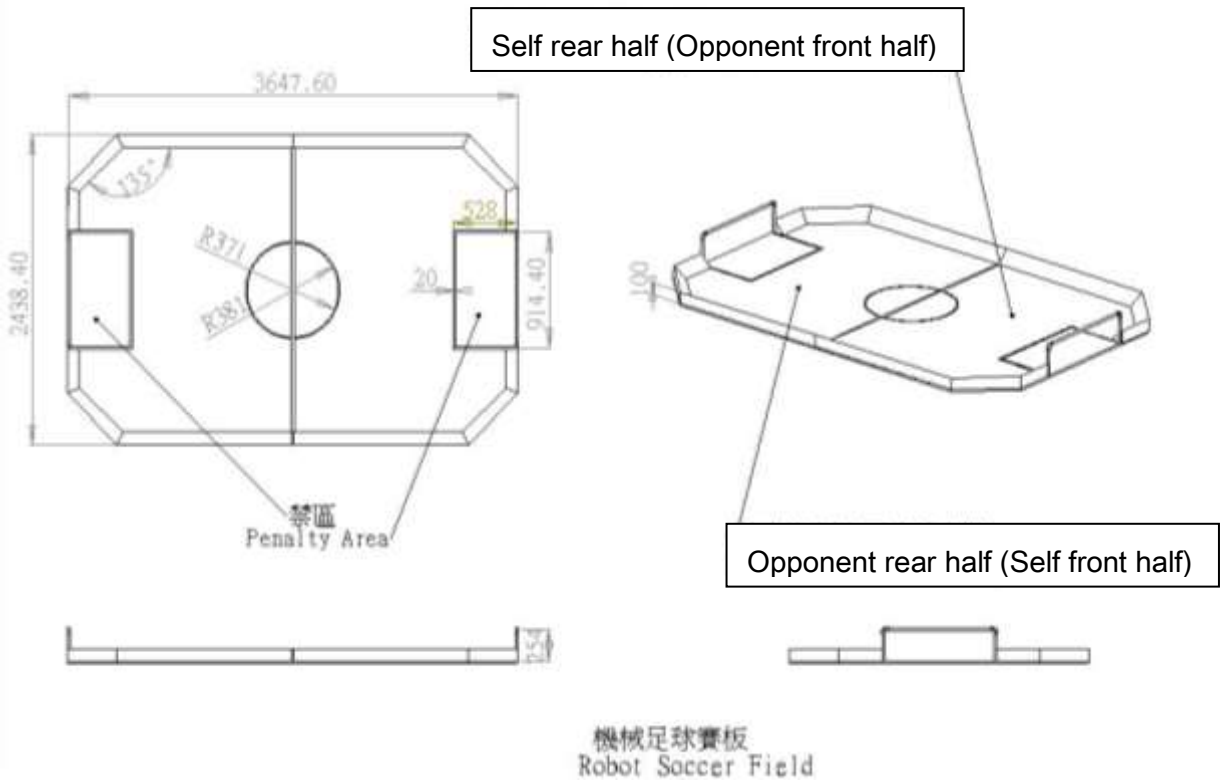
4. All robots are controlled by wireless controller approved by the Organizer. All wireless installations must be able to alter frequency channels. Transmitters found interfering must be immediately changed channel, otherwise it would be disqualified for the competition. 2.4 G wireless remote control device are recommended.

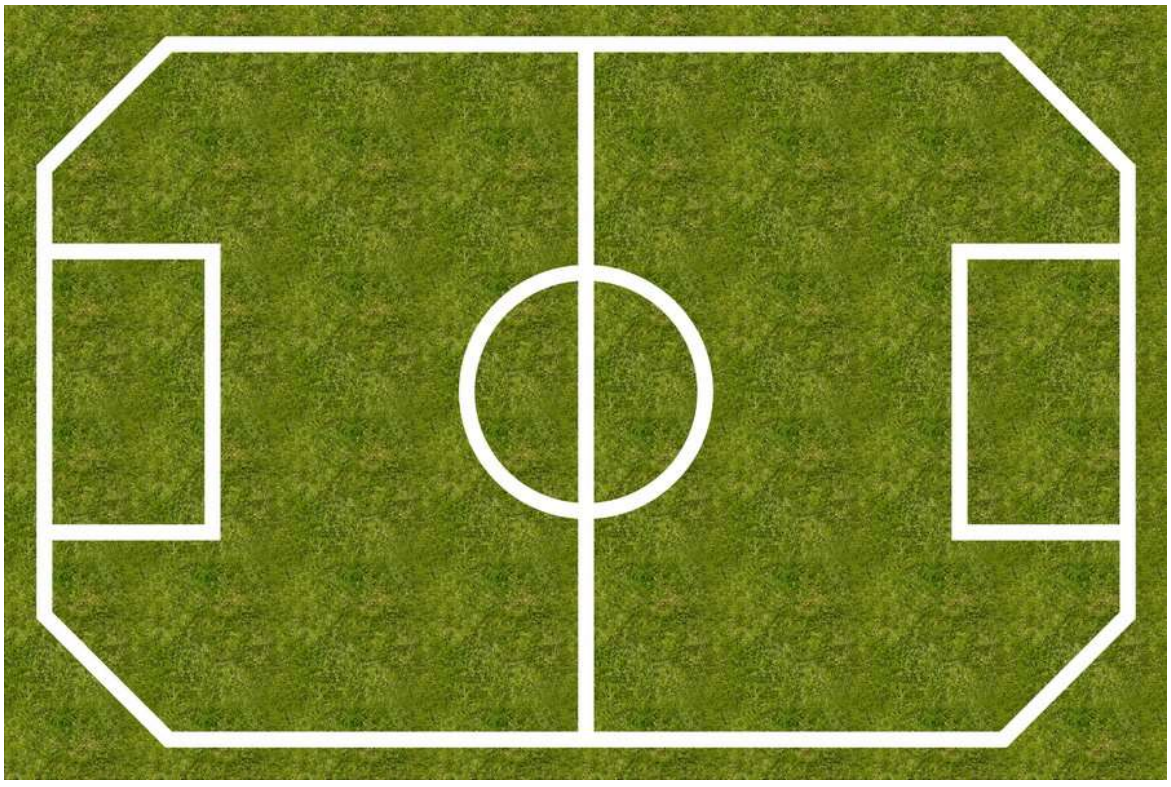
5. Motors of robot cannot use more than 6 pieces of 1.5V size AA battery or 7.4V Lithium-polymer battery. The batteries for transmitter and receiver have no limitation

6. The robot must kick the ball with a swing (not rotation) action.

Game Field Specification

1. Football court is used for the competition.
2. The area of playing field is 3658mm (12ft) × 2438mm (8ft), surrounded by 100mm tall 45 degree triangular fence. The goal is 915mm (width) x 200mm (height) x 200mm (depth). A 60mm diameter rubber ball is used for the competition.





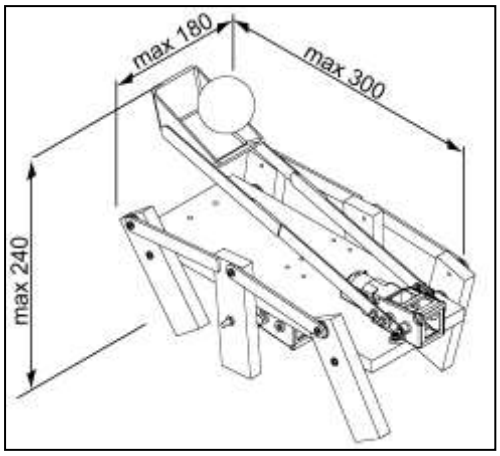
Game Rules

1. The Robot may only kick but not hold or push the ball.
2. The reserve robot and its controller must be placed in a position specified by the referee; otherwise contestants would not be allowed to replace the robot.
3. The game has first and second halves, each lasts for 2 minutes. The first stage of the competition will be conducted on a round-robin basis. The winning side will get 3 points, losing side 0 point and each side 1 point in case of a draw. The second stage will be conducted on a knockout basis.
4. Choice of side and first-kick is determined by toss of coin. Each team has a first-kick opportunity in the first or second half of game. Each side places its Forward robot in position first and then the Defense robot in their own penalty area. The first-kick team would then place the Midfield robot inside the mid-court and finally the opposing team places its Midfield robot outside of the mid-court.
5. The timer begins to count when the referee calls the game to action. The first-kick team should kick the ball within five seconds or the right goes to the opposing team. All other robots must stay still before the first-kick.
6. If the ball is tangled by the robots for over ten seconds, the judge may pause the match and move the robots 300mm away from the ball and re-start the match.
7. Players of each team should stay at the designated areas to control their robots. Once the game starts, players may not touch the robots or the ball until either the ball goes into the goal or the match ends.
8. The goal would not be counted as score by first-kick or pushing opponent and the ball together in the goal.
9. During the match, request should be made to the referee for repair or replacement of robot. Upon approval, the robot should only be removed and returned to the field by the referee. The timer would not pause and the match continues. The robot on returning to the field should wait for the referee's permission to move and continue the play.
10. Each goal scores one point. The losing team would re-start the game from the middle field. The timer would not pause. The side with higher score at the end of the game is the winner.
11. Should there be a draw at the end of time during the knockout stage, extra time of 2 minutes will be given to determine the winner via 'sudden death'. Each team can send one robot only for the extra time game.
12. Should there be no score or same score in the extra time game, each team takes turn to send the 3 robots to do Fix Point Shooting one at each time. Time of each successful shooting will be recorded and sum up. After the 3 robots of each team have finished the fix point shooting, the team that scores higher points will win. In case of draw, the team with shorter sum up time of the three shootings will win. Second round will be conducted if they still draw until a winner is identified.
13. Fix Point Shooting: Each team would be given one minute to move the ball from mid–court to shoot the goal without defensive robot. Repeat the attempt of shooting if unsuccessful. Robot cannot shoot but get the ball inside the penalty area .
14. Penalty kick: The ball is placed at the middle top location of the penalty area. The shooting robot is placed outside the penalty area. The defense robot would then be placed at the goal line perpendicular to it (the shortest side faces the ball). The Defense robot must not move before the ball is kicked or the shoot would be retaken.
15. The Panel of Referee's decision is final.

12. Robot Basketball Competition

Robot basketball match is another team competition. It emulates human basketball match including passing and shooting activities. Each team should have at least two robots which should have good ability to pick up and throw balls. Each match has one game of six minutes duration. Each score counts for two points and the team with higher points at the end of the match is the winner.

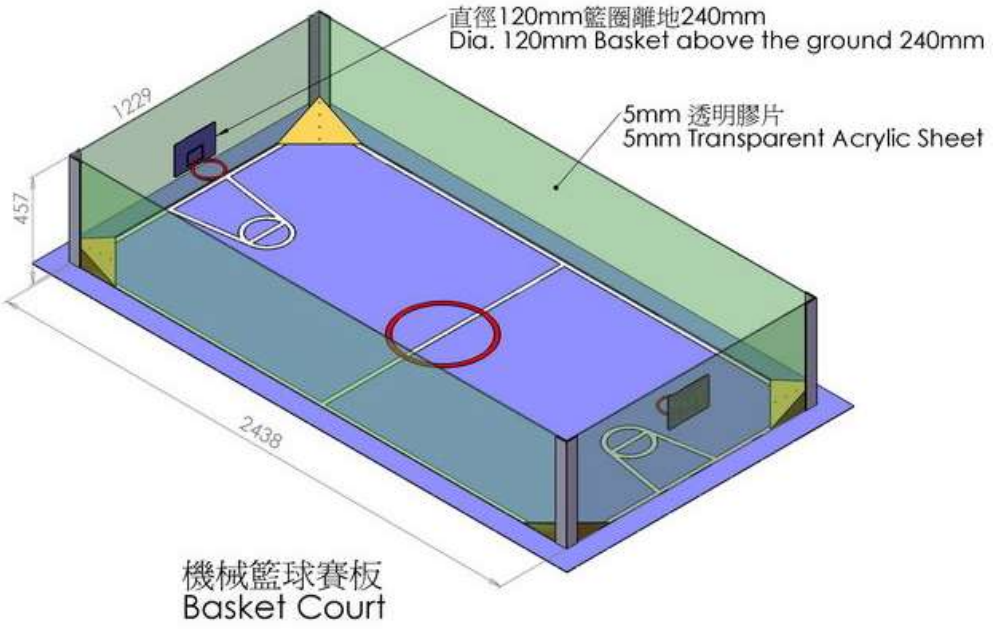
Robot Specification



1. The robots with contracted arms (pick-up arm and shooting mechanism) cannot exceed a length of 300mm, a width of 200mm and a height of 240mm (length, width and height dimensions are not inter-changeable) nor an overall weight of 1.5kg (including batteries and receiver).
2. The robot may use up to five gear boxes. It must move in walking mode.
3. All robots are controlled by wireless controller approved by the Organizer. All wireless installations must be able to alter frequency channels. Transmitters found interfering must be immediately changed channel, otherwise it would be disqualified for the competition. 2.4 G wireless remote control device are recommended.
4. Motors of robot cannot use more than 6 pieces of 1.5V size AA battery or 7.4V Lithium-polymer battery. The batteries for transmitter and receiver have no limitation.

Game Field Specification

1. Basketball court is used for the match. The four sides are fenced with 457mm tall transparent wall. The 180mm diameter shooting net is 240mm above ground.
2. An orange ping-pong will be used as a basketball.



Game Rules

1. Each team may have three robots. Two for the game and the third robot serves as a reserve and kept by the referee. The team without reserve robot can only repair the damaged robot during the game time.
2. Robots from the two teams should be placed in their own respective section outside the mid-court The referee would put a basketball at the centre of the mid-court 300mm above the ground for robots from the two teams to scramble for.
3. The robot should not hold the ball longer than five seconds, otherwise a warning would be given (holding). Referee will then give the right to the opposite party to start the game in the original position. The team which threw the basketball into the basket of the opponent will score two points.
4. During the match, request should be made to the 2nd referee for repair or replacement of robot. Upon approval, the robot should only be removed and returned to the field by the referee. The timer would not pause and the match continues. The robot on returning to the field should wait for the referee's permission to move and continue play.
5. After the goal, losing side will start the game at the base line of its own section..
6. Robots of both sides enter the penalty area exceeding 5 seconds will get warning from referee. Referee will give the right to the opponent to start the game in the original position.
7. A penalty will be given to the robot on receiving two warnings. The opponent will get a chance to shoot outside of penalty area. If the basketball is thrown into the basket, 2 points will be awarded; otherwise the game will continues to play.
8. The duration of the game is 6 minutes. The team with higher points is the winner. The first stage of the competition will be conducted on a round-robin basis. The winning team will get 3 points, losing team 0 point and each team 1 point in case of a draw. The second stage will be conducted on a knockout basis.
9. Should there be a draw at the end of time during the knockout stage, extra time of 3 minutes will be given to determine the winner via 'sudden death'. No switch of goal nor replacement of robot is allowed. Only one robot from each team would be placed in their own section outside the mid-court and facing its opponent. The referee would put a basketball at the centre of the mid-court 300mm above the ground for robots from the two teams to scramble for. The team that first scores points is the winner.
10. Should there be no score or same score in the extra time game, each team takes turn to send the 2 robots to do ***Fix Point Shooting*** one at each time within one minute. Time of each successful shooting will be recorded and sum up. After the 2 robots of each team have finished the fix point shooting, the team that scores higher points will win. In case of draw, the team with shorter sum up time of the 2 shootings will win. Second round will be conducted if they still draw until a winner is identified.
11. **Fix Point Shooting**: The robot is placed in the mid-court and the ball is placed on the top of the penalty area. Each team would be given 1 minute to pick and shoot the goal without defensive robot. Repeat attempts of shooting if unsuccessful. Robot cannot shoot but get the ball inside the penalty area.

13. Multi-Leg Servo Motor Robot Short Distance Run Competition

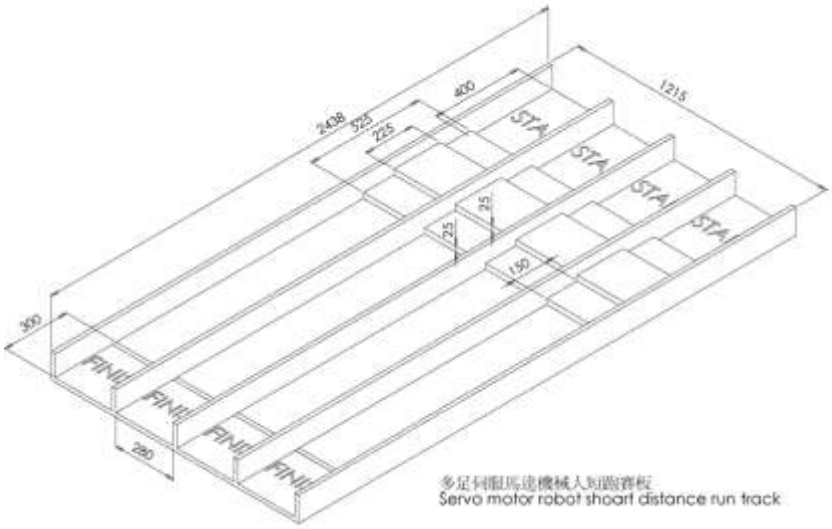
We can use servo motor to make different kinds of joint type robot, multi-leg servo motor robot is one of the simplest forms of joint type robot. Contestant has to make a servo motor robot which walks with many legs, and program the motion with computer. The robot that finishes 2M run with the shortest time is the winner.

Robot Specification

1. No market robot can be used. The robot should be made with servo motors with simple animal figure. There is no restriction to the number of servo motors. Each leg should have at least 2 servo motor joints.
2. The robot must not be larger than 400mm x 280mm x 300mm (length, width and height dimensions are inter-changeable). There is no limit in weight.
3. The participating robots must move with walking actions automatically without connecting to a computer or external power supply.
4. The robot cannot have installation that would change its original dimension during competition, such as moving the head from upright position at the beginning and level the head when it approaches the finish.

Game Field Specification

1. Multi-Legs Servo motor Robot Short Distance Run Competition Board is used for the match. The track is 2400mm long. The starting area is 400mm long.
2. The runway has four tracks. Each track is 280mm wide. A stepping block is placed at the starting point as shown in figure



多足伺服馬達機械人短跑賽板
Servo motor robot shoart distance run track

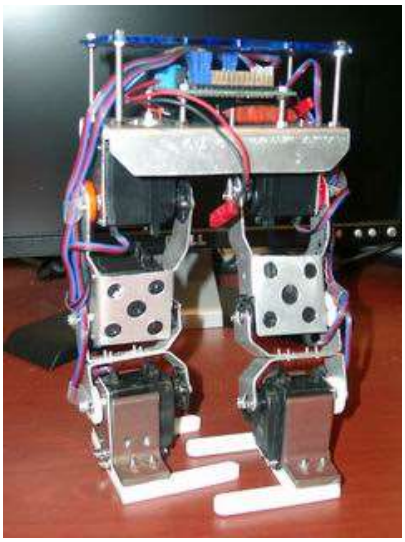
Game Rules

1. The robot that takes the shortest time to complete the specified distance is the winner.
2. The robot can be switched on and placed at the “START” position first. Contestants can release the robot after the judge ordering start of the game and the timer begins to count.
3. If the robot stops moving or falls down during the run, contestant can pick up the robot and place it at the starting point and restart again. The timer would continue without reset.
4. The maximum game time is 2 minutes. Robots that cannot complete the game would be recorded 2 minutes game time.

14. C-Shape Foot Two Legs Servo motor Robot Short Distance Run Competition

We can use servo motor to make different kind of joint type robot. 2 legs servo motor robot is considered one of the complicated form of joint type walking robot. Contestant has to make a servo motor robot which walks with 2 legs in C-Shape feet and program the motion with computer. The robot that finishes 2M run with the shortest time is the winner. The C-Shape feet overlap and have larger touching ground area, so it walks more steadily and easy for programming.

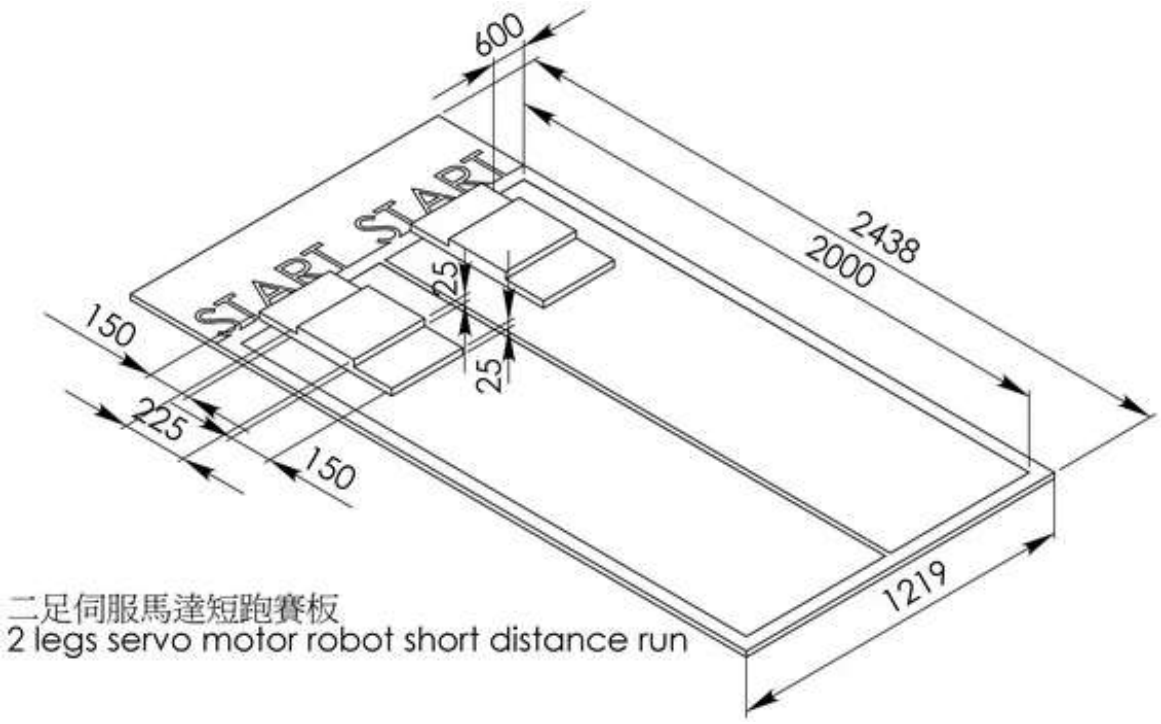
Robot Specification



1. No market robot can be used. The robot should be made using not more than 8 servo motors and move with walking mode. Robot cannot use "interchange centre of gravity" method to move nor walk sideways.
2. The robot must not exceed a length of 200mm, a width of 200mm, and a height of 300mm. There is no limit in weight and size of the foot.
3. The participating robots must move with walking actions automatically without connecting to a computer or external power supply.

Game Field Specification

1. 2-Leg Servo motor Robot Short Distance Run Competition Board is used for the match. The track is 2438mm wide and 1219mm long.
2. The runway has two tracks. Each track is 600mm wide and 2000mm long. A stepping block is placed at the starting point as shown in figure.



二足伺服馬達短跑賽板
2 legs servo motor robot short distance run

Game Rules

1 The maximum game time is 3 minutes. The robot must finish the following specified motion:

a) First, step up and then step down the 'stepping block'

b) Walk 3 steps forward

(e.g. Firstly step out the right leg. Secondly step out the left leg. Thirdly step out the right leg.)

c) Stand at attention

d) Make a forward somersault 2 times

e) Stand at attention

f) Walk 2 steps forward

g) Stand at attention

h) Make a backward somersault 2 times

i) Stand at attention

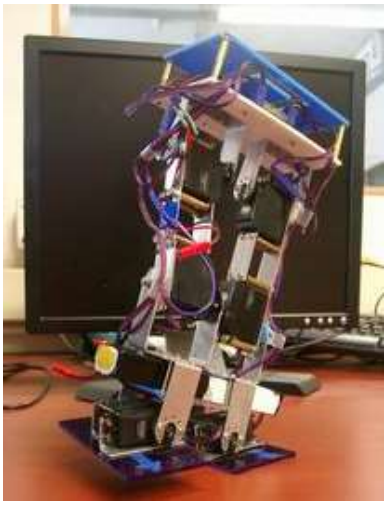
j) Walk to the destination quickly.

2. Marks will be deducted if the robot fails to perform the specified motion in specified sequence.
3. 10 marks will be deducted for each missing motion.
4. 10 marks will be deducted for each vague motion.
5. The foot should clearly leave the ground for each step the robot made (no dragging step). 10 marks will be deducted for each dragging step.
6. If the sole of the foot touches the middle line of the competition board, a corrective action must be made immediately by the contestant. 10 marks will be deducted for each touching. If the sole of the foot touches the outside border line, correction is not necessary.
7. Contestant can correct the walking direction of robot or put the robot up right again after falling, but 10 marks will be deducted for each touching.
8. The robot that cannot complete the game would be recorded the distance between the starting point and the robot. The deducted marks will also be recorded.
9. The robot will be disqualified if it reaches the destination without completing all the specified motions.
10. Each team can play twice and the best result will be recorded.
11. The team who completed the game with the least marks deducted is the winner. If same marks are deducted, the team used the least time to finish the game is the winner.
12. If all the teams cannot complete the game, the team with the least marks deducted is the winner. Otherwise, the team who is the nearest to the destination is the winner.

15. Interchange Centre of Gravity Two Legs Servo motor Robot Short Distance Run Competition

We can use servo motor to make different kind of joint type robot, 2 legs servo motor robot is considered one of the complicated form of joint type walking robot. Contestant has to make a servo motor robot which walks with 2 legs and program the motion with computer. The robot that finishes 2M run with the shortest time is the winner. The robot walks by interchanging the centre of gravity between the two legs. This motion is closed to the walking motion of human. It is easy to fall down and hard to program.

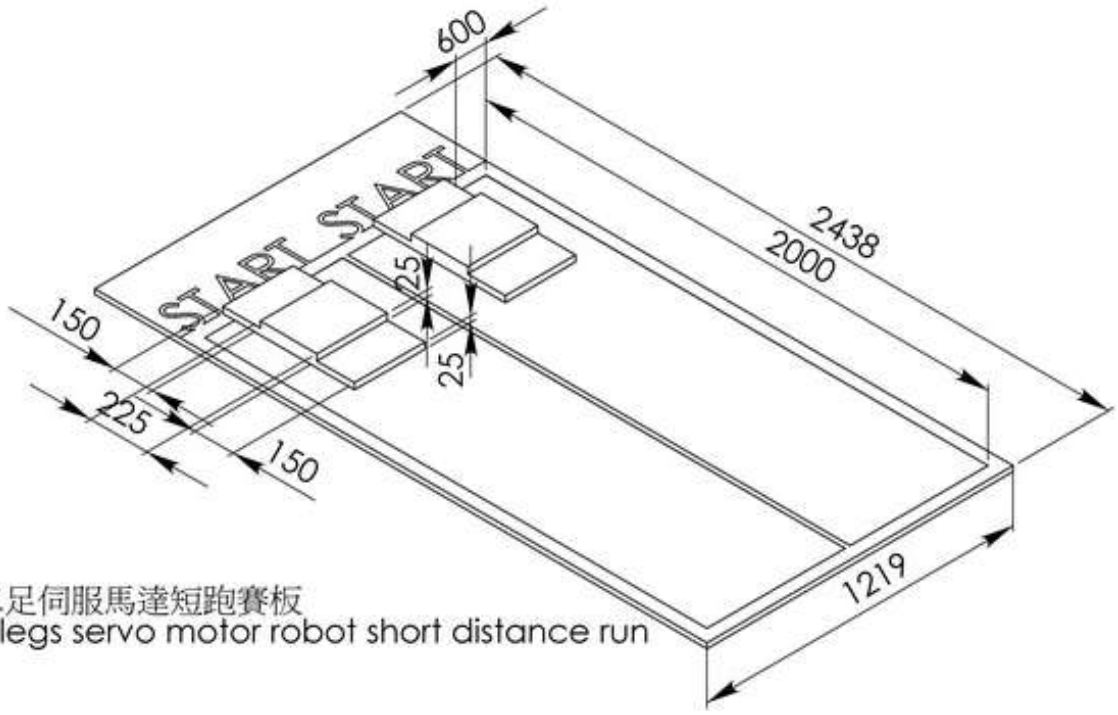
Robot Specification



1. No market robot can be used. The robot should be made using not more than 8 servo motors and move with walking mode. Robot must use "interchange centre of gravity" method to move. Robot cannot walk sideways.
2. The robot must not exceed a length of 200mm, a width of 200mm, a height of 300mm. The size of the foot must not exceed a length of 150mm, a width of 60mm. There is no limit in weight
3. The participating robots must move with walking actions automatically without connecting to a computer or external power supply.

Game Field Specification

1. 2-Leg Servo motor Robot Short Distance Run Competition Board is used for the match. The track is 2438mm wide and 1219mm long.
2. The runway has two tracks. Each track is 600mm wide and 2000mm long. A stepping block is placed at the starting point as shown in figure.



二足伺服馬達短跑賽板
2 legs servo motor robot short distance run

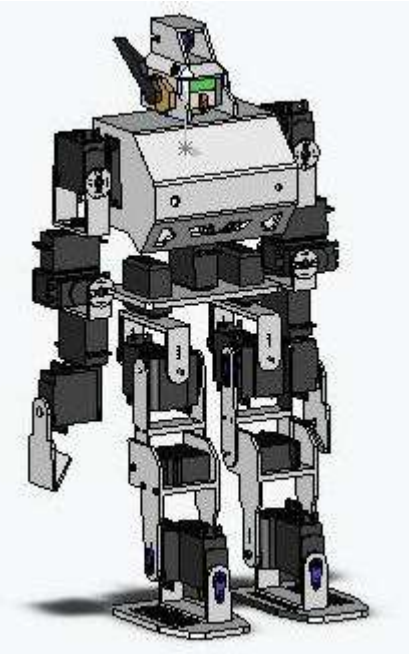
Game Rules

1. The maximum game time is 3 minutes. The robot must finish the following specified motion:
   a) *First, step up and then step down the 'stepping block'*
   b) *Walk 3 steps forward*
      (e.g. Firstly step out the right leg. Secondly step out the left leg. Thirdly step out the right leg.)
   c) *Stand at attention*
   d) *Make a forward somersault 2 times*
   e) *Stand at attention*
   f) *Walk 2 steps forward*
   g) *Stand at attention*
   h) *Make a backward somersault 2 times*
   i) *Stand at attention*
   j) *Walk to the destination quickly.*
2. Marks will be deducted if the robot fails to perform the specified motion in specified sequence.
3. 10 marks will be deducted for each missing motion.
4. 10 marks will be deducted for each vague motion.
5. The foot should clearly leave the ground for each step the robot made (no dragging step). 10 marks will be deducted for each dragging step.
6. If the sole of the foot touches the middle line of the competition board, a corrective action must be made immediately by the contestant. 10 marks will be deducted for each touching. If the sole of the foot touches the outside border line, correction is not necessary.
7. Contestant can correct the walking direction of robot or put the robot up right again after falling, but 10 marks will be deducted for each touching.
8. The robot that cannot complete the game would be recorded the distance between the starting point and the robot. The deducted marks will also be recorded.
9. The robot will be disqualified if it reaches the destination without completing all the specified motions.
10. Each team can play twice and the best result will be recorded.
11. The team who completed the game with the least marks deducted is the winner. If same marks are deducted , the team used the least time to finish the game is the winner.
12. If all the teams cannot complete the game, the team with the least marks deducted is the winner. Otherwise, the team who is the nearest to the destination is the winner.

16. Lightweight Humanoid Free Fighting Competition

2 legs servo motor robot (humanoid) is a complicated form of joint type robot. Contestant has to make a servo motor robot which walks with 2 legs and program the motion with computer. The team that can knock down the opponent's robot wins the game.

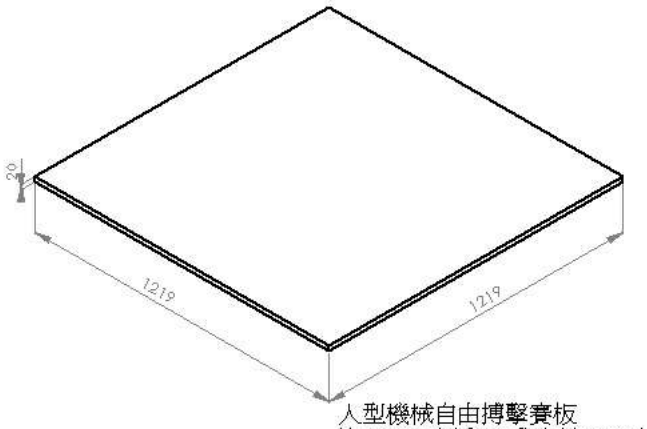
Robot Specification



1. No market robot can be used. The robot should be made with servo motors with simple human figure such as head, hand and leg etc. There is no restriction to the number of servo motors used.
2. Contestants are free to design their weapon mechanisms but cannot cause any danger such as the use of launcher, gun powder or spring.
3. The robot must not be larger than 350mm x 350mm x 350mm.. The size of the foot must not exceed a length of 150mm, a width of 100mm. The overall weight of the robot including batteries must not exceed 1.5kg.
4. The participating robots must move with walking actions. The robots cannot be connected to a computer or external power supply and be controlled manually.

Game Field Specification

1. The platform is 1219mm long, 1219mm wide and 100mm tall.
2. The robots are placed at the opposite corners of the platform at the start of game.



人型機械自由搏擊賽板
Humanoid free fight board

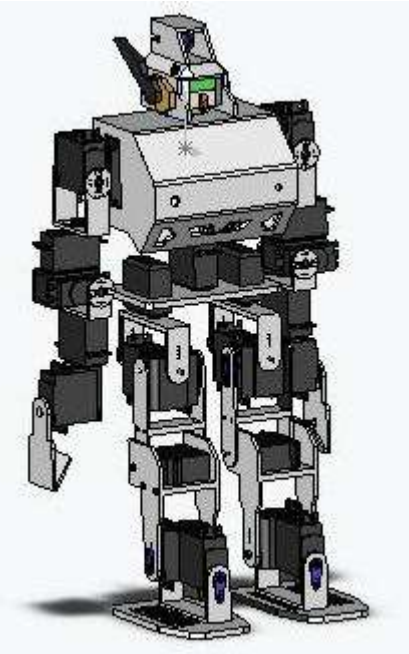
Game rule

1. The judge checks the robots to ensure that there is no movable dangerous mechanism in the design before game starts. The platform is placed on a table or on the ground
2. The duration of the game is 4 minutes. Each time when the robot knocks down the opponent's robot can score one point. The team with higher points is the winner.
3. After being knocked down, the robot has to stand up and continue to fight.
4. If the robot steps outside of the matching field (colored boundary) will be warned and one mark will be deducted on receiving two warnings.
5. The robot that attacks first and falls down together with the opponent will score one point.
6. The judge will warn the team that continually dodges the opponent and refuses to attack. One mark will be deducted on receiving two warnings.
7. At the end of the match, if the score of both sides is the same, the lighter robot team wins the game.
8. The Panel of judges' decision is final.

17. Heavyweight Humanoid Free Fighting Competition

2 legs servo motor robot (humanoid) is a complicated form of joint type robot. Contestant has to make a servo motor robot which walks with 2 legs and program the motion with computer. The team that can knock down the opponent's robot wins the game.

Robot Specification



1. No market robot can be used. The robot should be made with servo motors with simple human figure such as head, hand and leg etc. There is no restriction to the number of servo motors used.
2. Contestants are free to design their weapon mechanisms but cannot cause any danger such as the use of launcher, gun power or spring.
3. The robot must not be larger than 350mm x 350mm x 350mm. The size of the foot must not exceed a length of 150mm, a width of 100mm. The overall weight of the robot including batteries must not exceed 2.5kg.
4. The participating robots must move with walking actions. The robots cannot be connected to a computer or external power supply and be controlled manually.

Game Field Specification

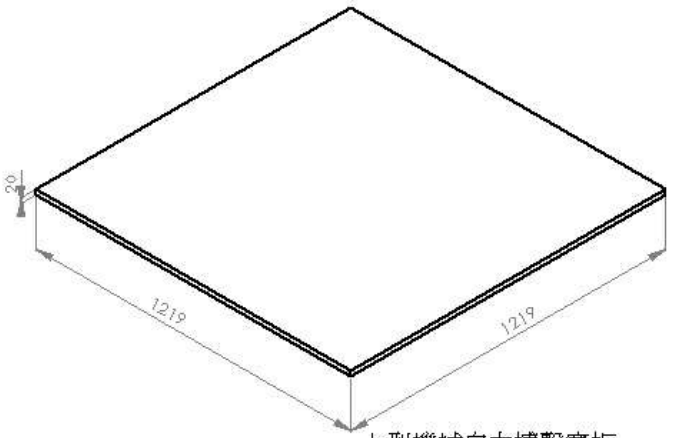
1. The platform is 1219mm long, 1219mm wide and 20mm tall.
2. The robots are placed at the opposite corners of the platform at the start of game.

Game rule

1. The judge checks the robots to ensure that there is no movable dangerous mechanism in the design before game starts. The platform is placed on a table or on the ground.

2. The duration of the game is 4 minutes. Each time when the robot knocks down the opponent's robot can score one point. The team with higher points is the winner.

3. After being knocked down, the robot has to stand up and continue to fight.



人型機械自由搏擊賽板
Humanoid free fight board

4. If the robot steps outside the matching field will be warned and one mark will be deducted on receiving two warnings.

5. The robot that attacks first and falls down together with the opponent will score one point

6. The judge will warn the team that continually dodges the opponent and refuses to attack. One mark will be deducted on receiving two warnings.

7. At the end of the match, if the score of both sides is the same, the lighter robot team wins the game.

8. The Panel of judges' decision is final.

18. Humanoid Free Gymnastics Competition

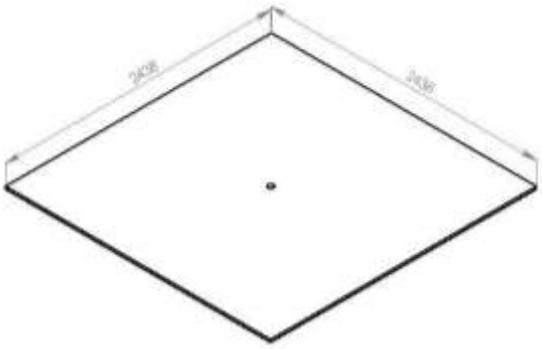
This event requires students to design a dexterous and steady servo motor robot. The participating robot will play alone and perform different gymnastic motions. All motions of the robot are programmed with computer and will perform automatically without manual control.

Robot Specification

1. No market robot can be used.
2. The robot should be made with not more than 10 servo motors
3. The robot must not be larger than 400mm x 300mm x 300mm (length, width and height dimensions are inter-changeable). There is no limit in weight.
4. The participating robot must move automatically in walking mode without connecting to a computer or external power supply.
5. The robot can perform automatically without manual control.

Game Field Specification

1. Two Polly boards (2438mm x 1219mm) are put together to form a 2438mm x 2438mm competition area.



Game rule

1. The robot has to carry out a not more than 4-minute gymnastics performance on a 2438mm x 2438mm size platform The performance includes:

   Opening motion ➔ Standard motions + Self-design motions ➔ Closing motion

   a) Opening motion: stand at attention, bowing and single hand waving
   b) Standard motions:
      - forward somersault 360°
      - backward somersault 360°
      - left hand push up
      - right hand push up
      - two hands push up,
      - left cartwheel 360°
      - right cartwheel 360°
      - a handstand
      - a handstand with two legs open at 180°

      The motions mentioned above are not necessary be in the sequence as stated above and can be repeated once only.
   c) 11 self-design motions.
   d) Closing motion: stand at attention, bowing and single hand waving.

2. Contestant should design 20 motions(9Standard motions +11Self-design motions). Note: After each performed motion, contestants should have a 3-second break time to explain it to the judges. Sequence of the motions must be written down on the mark sheet and handed in to the judges before the competition.

Markings:

1. If the robot walks out of the boundary or falls down, contestants can pick up and place the robot at where it falls; and continues the performance. Time will not be compensated.
2. Each complete motion can get 5 marks; no mark will be given for incomplete motion.
3. 10 marks will be deducted for touching the robot each time.
4. 10 marks will be deducted for missing the break time (3 seconds) for explanation in between each motion.
5. The total marks are equal to the sum of motion marks and judges' marks minus the marks deducted. The team who gets the highest marks will win the game. If the marks are the same, the team who uses the least time to finish the performance will win the game.

Judges' marks

Appearance / Creativity	Dynamics / entertaining	Production Technique	Action Difficulty	Total Score
20%	30%	15%	35%	100%

Humanoid Free Gymnastics Competition Mark Sheet

Contest Registration No. : _____

order	Motion	completed	Not completed	order	Motion	completed	Not completed
	Stand at attention			11			
	Bowing and hand waving			12			
1				13			
2				14			
3				16			
4				16			
5				17			
6				18			
7				19			
8				20			
9					Stand at attention		
10					Bowing and hand waving		
					Motion **marks** ***Total*** :		

*** *Each complete motion gets 5 marks, no marks will be given for incomplete motion.*

Time completed : _____

Judges marks:

Appearance/Creativity 25%	Dynamics / entertaining 30%	Production Technique 15%	Action Difficulty 35%	**Total Score** 100%

Interference	Number of touching (@ -10 marks)	**Marks Deducted**
Put up a fell down robot		
Adjust the position of robot which is out-of-bounds		

Total marks = *Motion marks*_____ + *Judges marks*_____ - *Deduction*_____ = _____

Signature of Judge _____

19. Servo motor Robot Obstacle Avoidance Competition

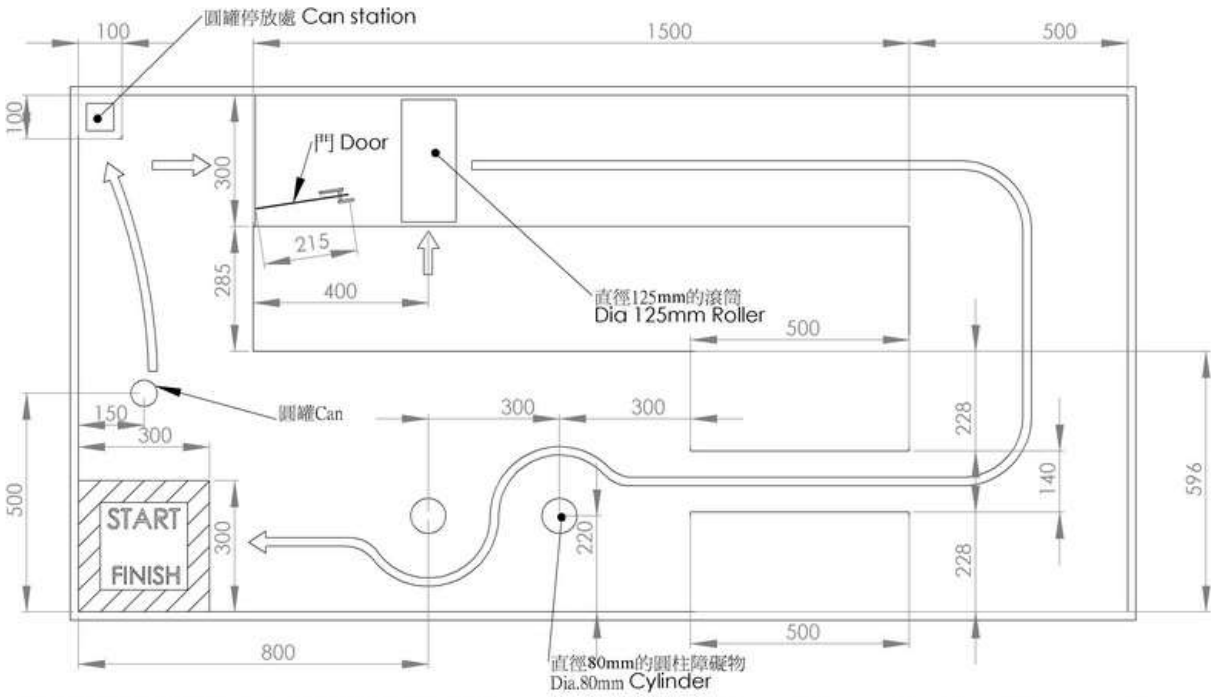
The participating robot is required to navigate through the door, cylindrical obstacle, removing the ball and roller and to reach the destination in the shortest time to win. This game tests the ultimate performance of the robots as well as the navigation ability of the players.

Robot Specification

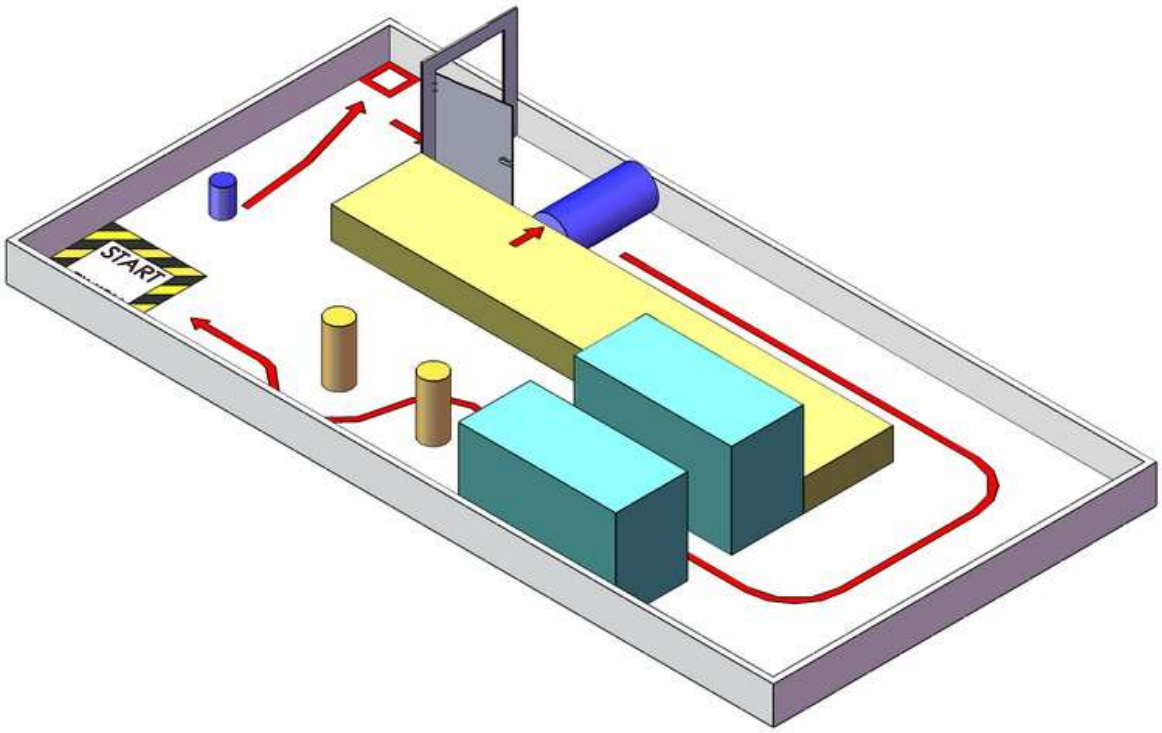
1. No market robot can be used. The robot should be made with servo motors and walk with two legs. There is no restriction to the number of servo motors used.
2. The robot must not be larger than 200mm x 200mm x 300mm (length, width and height dimensions are inter-changeable). There is no limit in weight.
3. The participating robots must move with walking actions without connecting to a computer or external power supply.
4. The motion of robot is programmed by computer and controlled manually through wireless remote control during the competition.

Game Field Specification

1. Servo motor Robot Obstacle Avoidance Competition Court is used for the match.
2. The area of playing field is 2438mm × 1219mm, surrounded by 100mm tall fence.(as shown in diagram)
3. Obstacle includes: I) a can (an empty coffee can) of 60mm in diameter, 90mm high, weight 50g; II) a roller of 125mm in diameter and 280mmin length; III) a cylindrical obstacle of 80mm in diameter and 150mm height; IV) a door with 215mm width and 300mm height.



伺服馬達機械人障礙賽板 Servo Motor Robot Obstacle Avoidance Court



伺服馬達機械人障礙賽板 Servo Motor Robot Obstacle Avoidance Court

Game rule

1. The robot is placed at the "START" position. The judge orders start of the game and the timer begins to count.
2. The robot has to travel along the designated route. First, the robot pushes the can to the square mark at the corner. Then it presses down the door handle and passes through the door. The robot then pushes away the roller and makes right turn into the cylindrical obstacle zone . At last, the robot detours around the cylindrical obstacle zone and run to the destination (Start position).
3. The maximum game time is 5 minutes. Robots that cannot complete the game would be recorded 5 minutes game time.
4. Once the game begins, the contestants cannot touch the robot until the game finishes. 10 seconds will be added for each touching.
5. During the match, request should be made to the referee for repairing the robot. On approval to do so, the robot should only be removed and returned to the field by the referee. The timer would not pause and the match continues. The robot on returning to the field should wait for the referee's permission to move and continue the play.
6. Each team can play twice and the best time will be recorded. If none of the robots ha finished the game, the one with the longest distance completed will be counted as winner. If the completed distance is the same, the team with the shortest travelling time will be the winner.

20. Humanoid Performance (Dance) Competition

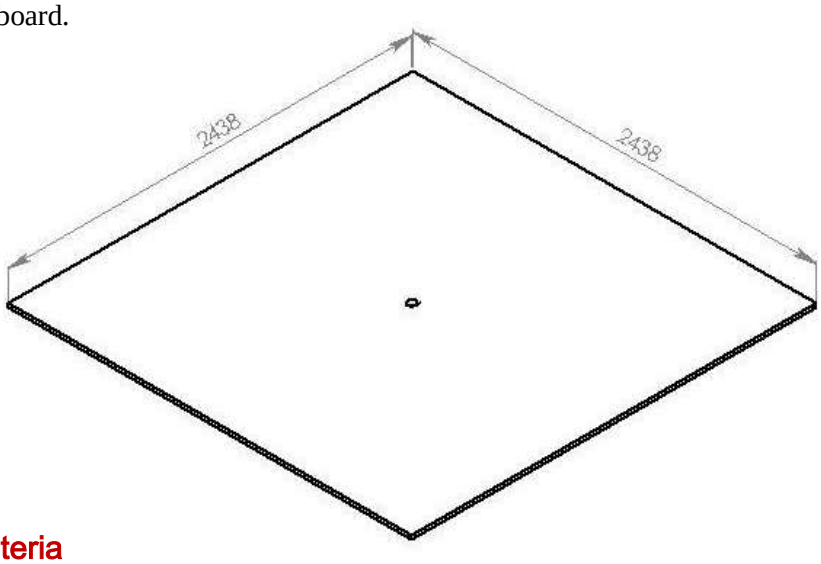
This competition requires students not only to produce a flexible humanoid, but also encourage creativity and expression. The participating robots may perform solo or as a team. During the competition the robot may demonstrate a series of difficult actions with background music or various audio effects. Organization of the entire performance should match the robot characteristics and is controlled with or without wire by a computer program. Manual control is not allowed.

Robot Specification

1. There is no restriction to the number of robots in each team.
2. No market robot can be used.
3. The robots should be made with servo motors mainly and gear boxes can also be used.
4. The robot must not be larger than 500mm x 500mm x 500mm (length, width and height dimensions are inter-changeable). There is no limit in weight.
5. The participating robots must move with walking actions without connecting to a computer or external power supply.
6. The robot can perform automatically without manual control.

Game Field Specification

1. Two Polly boards (2438mm x 1219mm) are put together to form an area of 2438mm x 2438mm competition board.



Assessment Criteria

1. Contestants can create their own background music or use the music with right.
2. Each team has not more than five minutes for setting and performance.

Appearance / Creativity	Dynamics / entertaining	Production Technique	Action Difficulty	Total Score
30%	30%	15%	25%	100%

21. Servo Motor Robot Appearance Design Competition

The Servo Motor Robot appearance design competition encourages students' expression of creativity. The loose game rules allow more esthetic and creative approach to the design of robot appearance.

Competition Category

1. Servo Motor Robot Category permits the use of Servo Motor in the mechanism design. This category is suitable for all Secondary students.

Robot Specification

1. No market robot can be used.
2. The robot should be made with servo motors mainly and gear boxes can also be used.
3. The robot must not be larger than 500mm x 500mm x 500mm (length, width and height dimensions are inter-changeable). There is no limit in weight.
4. The participating robots must move with walking actions without connecting to a computer or external power supply.
5. The robot is programmed by computer and performs automatically without manual control .

Game Rules

1. The participating robots may take part in other competitions.
2. Robots that took part in last year's competition cannot re-enter the same game this year.
3. The robot including its peripheral decorations cannot exceed 1m × 1m × 1m (the length, width and height dimensions may be interchanged).
4. The robot must be able to complete its basic maneuver.
5. The contesting student may use 2 minutes to introduce and demonstrate the robot to the judges.

Evaluation Criteria

Appearance / Dynamics	Creativity	Production skills	Application of material	Total
30%	30%	25%	15%	100%