

ABU

Asia-Pacific Robot Contest 2005

Beijing

THEME & RULES

Sep. 12, 2004

2005 Beijing Contest

Theme and Rules

The aim of this robot contest is to make machines by hand from design to construction, to compete in the contest set out below.

Climb on the Great Wall Light the holy fire

The Great Wall is one of the greatest feats of construction the world has ever seen. This ancient monument is not only a cultural heritage site with great significance for China, but also a major tourist attraction, known all around the world. Foreign tourists know that a visit to China is not complete without a trip to the Great Wall, a symbol of China's ancient civilization and humankind's powerful ability to shape our surroundings. There is an old Chinese saying: "You are not truly a strong man until you have climbed to the top of the Great Wall". Now let's climb up the Beacon Tower of the Great Wall and light the holy fire there!

The aim of this contest is to climb the Great Wall and feed Fuel Balls into five Torches and four Bonfires by collaboration between Manual and Automatic machines. The duration of each match is three minutes.

1 THE GAME FIELD

- (1) Area: 14000mm×14000mm in a square form.
- (2) The floor of the game field shall be made of 2mm thick vinyl sheeting. The surface of the sheets shall be joined by non-shiny vinyl tape.
- (3) The game field is surrounded by a wooden fence 100mm in height and 30mm in thickness.

(4) The game field consists of Manual Zone, Bonfire Zone and Automatic Zone including the Beacon Tower Zone. Refer to the attached floor plan layout for details.

(5) **Automatic Zone**

a. Area: 9000mm×9000mm in a square form.

b. The Automatic Zone is surrounded by a wooden fence 100mm in height and 30mm in thickness.

c. **Automatic Machine Start Zone** for each team, 1000mm×1000mm, is located in the Automatic Zone, and two Start Zones are opposite each other, as shown in the layout.

d. Only Automatic Machine(s) may be operated in the Automatic Zone. The 30mm-wide white guidelines are marked on Automatic Zone.

e. An octagon upland area, called the **Beacon Tower Zone**, of 100mm in height, is located in the center of the Automatic Zone. It has four sides of 2000mm in length and the other four of 1414mm. Along two opposing 2000mm edges, two slopes of a 1:5 gradient link the upland area to the ground.

f. Five Torches are located in the Automatic Zone. The highest **Main Torch** of 1800mm in height is set in the center of the **Beacon Tower Zone**. The other four **Outer Torches** of 1500mm in height are distributed around it.

g. The torch is a transparent bucket with open top mounted on top of a torch pole. The Main Torch is divided into red, blue and green portions, called the red, blue and green Fuel Canisters, equally by colored clapboards. Each Outer Torch is divided into the same red and blue Fuel Canisters by colored clapboard. The Main Torch can rotate around the axis of its own pole in each game, if external force is applied. The Outer Torches can not be rotated.

h. Refer to the attached floor plan layout for details of the arrangements in the Automatic Zone.

(6) **Bonfire Zone**

Four Bonfire Zones of 1200mm in diameter are located in the four corners of the Automatic Zone. A **Fuel Disk** with a diameter of 600mm is located in the center of the Bonfire Zone. The Fuel Disk is 100mm above the ground with an edge 50mm in width. The depth of the disk is 30mm. A slope of 350mm in width links the Disk and the ground. Refer to the attached floor plan layout for details of the Fuel Disk.

(7) Manual Zone

- a. The Manual Zone surrounds the Automatic Zone and Bonfire Zones.
- b. Two Fuel Stocks for both teams are located in the Manual Zone oppositely each other, and 16 Fuel Balls will be located in each Fuel Stock.
- c. **Manual Machine Start Zone** sized 1000mm×1000mm in a square form is located in the middle of the side of Manual Zone. Two Start Zones for both teams are set oppositely.
- d. Refer to the attached floor plan layout for details of the arrangement for the Manual Zone.

2 TEAM MEMBERS

- (1) Each team shall be comprised of four members (three students and one instructor) from the same university, polytechnic or college. However, only the three students are permitted to enter the game field.
- (2) Team members must be enrolled in their University/Polytechnic at the time of the international contest. Exceptions are allowed for those who were enrolled in a University/Polytechnic at the time of the domestic contest.
- (3) Postgraduates are not qualified.

3 MACHINES

Each team must design and construct either or both handmade Manual Machine and Automatic Machine(s) to compete in the contest. There is no restriction on the number of Automatic Machine(s) but **ONLY ONE** Manual Machine is allowed for each team.

(1) Manual Machine

- a. The Manual Machine has to be operated via remote control using a cable connected to it or remote control using infrared rays, visible rays or sound waves. Radio wave remote controls are not allowed. Operators are not allowed to ride on the machine .
- b. When operating via cable, the connecting point of the cable to the machine must have the height of 1000mm from the ground or higher. Also, the length of the cable from the Manual Machine to the control box must not exceed 3000mm.
- c. Team members are not allowed to touch the Manual Machine once the game begins.

(2) Automatic Machine(s)

- a. Automatic Machine(s) have to be autonomous.
- b. Everything separate from an Automatic Machine is considered as another automatic machine, so it must work as an automatic machine too.
- c. Before the game begins, maximum of 16 Fuel Balls for each team can be preloaded into Automatic Machines.
- d. Each Automatic Machine must be started by one operation.
- e. Automatic Machines are allowed to go into any zones except the Bonfire Zones and space over it.
- f. After a game begins, all Automatic Machines may be started one by one, but all start actions must finish in 20 seconds, then team members responsible for starting the machines must leave the game field and stand outside the game field's wooden fence immediately. Automatic Machines that do not start in the prescribed period shall be left on the Start Zone.
- g. Once a machine starts, the team members are not allowed to touch the machine.

h. A team's Automatic Machines are not allowed to communicate with each other in any way.

(3) Method of Control

a. Only one operator for each team is allowed to control a Manual Machine in the game field.

b. For Automatic Machine(s), a "Retry" is permitted once per game for each team. After a team calls for "Retry" and referee grants it, any team members are allowed to reset and restart any Automatic Machine(s) from the Start Zone. All restart actions must be finished in 20 seconds, then, the team members responsible for restarting the machine(s) must leave the game field and stand outside the game field's wooden fence immediately. The Automatic Machine operators are allowed to enter the game field only when they start the machines, including during a "retry".

(4) Power Supply

a. Each team shall prepare its own power supply for all its machines during the games.

b. Voltage of the machines' electrical power supply must be below 24V DC.

c. Power supply that is considered dangerous or unsuitable by the committee shall not be permitted.

(5) Weight

a. The sum of total weights of each team's all machines to be used in the game field must not exceed 50 kg.

b. The total weight includes the weight of all power sources, cables, remote controller and other parts of each machine.

(6) Size

- a. The combined total size of all a team's Automatic Machines must fit in the space of 1000mm×1000mm×1500mm in the Start Zone.
- b. Once the Automatic Machines leave the Start Zone after the game begins, they may separate, and their form may be changed freely, but the height of each machine must be limited to within 2000mm.
- c. The Manual Machine must fit in the space of 1000mm×1000mm×1500mm at the Start Zone.
- d. Once the Manual Machine leaves the Start Zone after the game begins, its size can be changed freely, but its height must not exceed 1500mm. It may not separate.

4 OBJECTS (Fuel Ball)

- (1) The **Fuel Ball** is a miniature rubber basketball 150mm in diameter and 150g in weight.
- (2) The air pressure inside the ball is controlled to make it less elastic. The rebounding height of the ball dropped down from 1m above a hard wooden surface must not exceed 150mm±50mm.
- (3) Red and blue balls are used respectively for the two teams.

5 MATCHES

(1) The Tournament

The contest is played under the knockout system and proceeds in the order below: Preliminary matches, Quarter-finals, Semi-finals and final.

(2) The Duration of Matches

- a. Matches shall last for three minutes. However, if a team feeds at least one Fuel Ball into both its own and green canisters in the Main Torch,

at least one Fuel Ball into its own canisters of two Outer Torches in any diagonal,

and at least one Fuel Ball into all four Fuel Disks,

it denotes that the team has complete “climbed onto the Great Wall”, and the match will end immediately.

b. Setting of the machines shall be completed within one minute after receiving the signal for setting.

(3) Points Awarded

a. Points are calculated when the match ends.

b. Any Fuel Ball left on the canisters of Torches or Fuel Disks without touching the machine, gains point(s). Points for each Ball are as follows.

- A Fuel Ball in the Fuel Canister of Main Torch scores 5 points.
- A Fuel Ball in the Fuel Canister of Outer Torch scores 1 point.
- A Fuel Ball in the Fuel Disk of Bonfire Zone scores 1 point.

c. All Fuel Canisters of the Main Torch must be fed by the Automatic Machine which is on the Beacon Tower Zone.

d. For green canister and Fuel Disks, the balls of both teams score separately.

e. If a team feeds a Fuel Ball into an opponent’s Fuel Canister, attached to any Torch, the opponent scores.

(4) Deciding the Winner

The winner of the match will be decided based on the following conditions.

a. A team accomplishing “Climb on the Great Wall” wins the match.

b. In the case that neither of the teams accomplishes “Climb on the Great Wall”, a team that scores more points by adding up all the points after subtracting points for violations wins the match.

c. In the case of a draw, the winner of the match will be decided by the following rules.

The team that feeds more balls into its own and green canisters of the Main Torch wins the match.

The team that scores more points in all Torches wins the match.

In the case of no winner being selected by the above order, the judges will decide a winner.

6 VIOLATIONS AND DEDUCTION OF POINTS

The following actions will be regarded as violations and 1 point will be deducted for each instance. If 3 points are deducted, the team will be disqualified.

(1) Manual Machine or its operator touches the floor of outside the Manual Zone, Automatic or Bonfire Zone.

(2) Manual Machine extends over into Automatic or Bonfire Zone.

(3) Manual Machine touches its own team's Automatic Machines.

(4) If above (1), (2) or (3) violation continues, 1 point will be deducted for every 5 seconds.

(5) An Automatic Machine extends over into Bonfire Zone when it tries to feed the Fuel Fall into the Fuel Disk.

7 DISQUALIFICATION

The following behavior shall be considered for disqualification by the referee. The team could be possibly disqualified.

(1) Attempting to cause damage to the game field, its equipments, including Fuel Balls arrangement in the opponent's Fuel Stock, or the opponent's machines.

(2) A Manual Machine touching the opponent's Automatic Machine in any zones.

(3) Performing any act against the spirit of fair play.

8 SAFETY

(1) All machines must be built so that they will not harm the operators, the referees or the audience.

(2) To ensure safety, when using a laser beam, it must be less than a class 2 laser, and used in a way that will not harm any operators, the referees or the audience.

9 COST OF PRODUCTION AND CARRIAGE

(1) Cost of production

The committee shall provide US\$1000.00 as a subsidy for machine construction to each committee member organization.

(2) Cost of carriage

a. The transport company, specified by the committee, will ship the machine. Details will be announced later.

b. The machines must be packed in ONE CRATE measuring 1500mm × 1500mm×1500mm.

10 OTHERS

(1) For any other behavior not specified in the rules, referees are given full authority to make the decision and the decision is final in the event of a dispute.

(2) Any amendments to the rules will be announced by the Contest Committee.

(3) All teams are encouraged to decorate their machines with their country's national symbols.

(4) Only handmade machines are allowed in the contest.

11 AWARDS

Prizes shall include awards for the winners, runner-ups, best technology, best idea and best artistic design and ABU Robocon award.

12 NOTICE ON MACHINE DESIGN AND CONSTRUCTION

Followings are the points to be kept in mind when constructing machines. In every case, sufficient attention must be paid to avoid possible danger.

(1) Each team shall avoid machines damaging the game field or its equipments.

(2) For official supplementary information on the contest rules, the Contest Committee will release FAQ (Frequently Asked Questions).

(3) Each participating country will be asked to prepare a five-minute videotape, which explains the structure and the movement of the participating teams' machines. The Contest Committee will verify whether each participating machine complies with the rules through viewing the videotapes, prior to the shipment of the machines.

13 QUESTIONS REGARDING THEME AND RULES

Questions regarding theme and rules should be addressed by e-mail to the Committee in English.

E-mail: robocon-cctv@vip.sina.com

14 FAQ (Frequently Asked Question)

Supplementary information (FAQ) on rules will be provided on Robocon Official Homepage.

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<http://www.abu.org.my/programme/robocon/robocon.htm>

<http://www.robocon2005.net.cn> to be determined

Contest Rules designed by CCTV Technical Advisory Group -

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& ABU Contest Committee

Annex A

Brief on Material

1 Main Torch and Outer Torches

- a. All Torches, including clapboards, are made of non-colored transparent polystyrene sheets 3mm in thickness.
- b. Seams between polystyrene sheets are pasted by appropriate glue.
- c. According to the requirements, the polystyrene sheets are covered by red, blue or green adhesive sheets.

2 Main Torch Pole and Outer Torch Poles

- a. All Poles are made of steel or aluminum.
- b. A set of design drawings of the Poles has been proposed for reference. In the domestic contest, all countries are encouraged to design the poles, providing that the Main Torch can rotate around its own axis passively and freely.