



ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE

## SmartRob 2009 robot contest

November 19th, 2008

Version 1.4

Preliminary notes :

- These rules will be modified as little as possible, but can be modified if necessary. In case of modification of the rules, the participants will be informed by email. The latest version of the rules is available on the web ([www.smartrob.org](http://www.smartrob.org)), under [rules](#).
- In case of discussions about the rules and/or their applications, the organizers will decide what to do, based on their opinion of what is closest to the spirit of the contest. The decision of the organizers cannot be discussed.

### Subject of the contest

Like last year, the robots have to perform a task while minimizing the energy consumption. The energy is stored in the form of H<sub>2</sub> gaz.

The task is to move balls through holes in the middle arena walls to get points. The holes are initially blocked by balloons that the robots have to pop to free the hole.

### H2bots contest

The contest will take place in the contest areas as shown in Figure 1. There are two areas: A and B. They are separated by a wall of grey bricks measuring 140 x 100 x 250mm each. The contest will consist of a sequence of matches. Two robotic teams will play at the same time during one match. One team will play in area A, the other in area B.

Before each match, the organizers place 5 red balls and 15 blue balls in each area (total 20 balls, Ø 59mm).

Each team will place its robot(s) in the middle of the area (see Figure 1, red position) before the beginning of the match. At the beginning of each match, the robot(s) can occupy a ground surface of maximum 300mm per 300mm. Each robot cannot change its volume (size and shape) during the match and it must not cross through or over the bricks and bars. The placement of the robot cannot take more than 2 minutes. The robot cannot release objects on the ground.

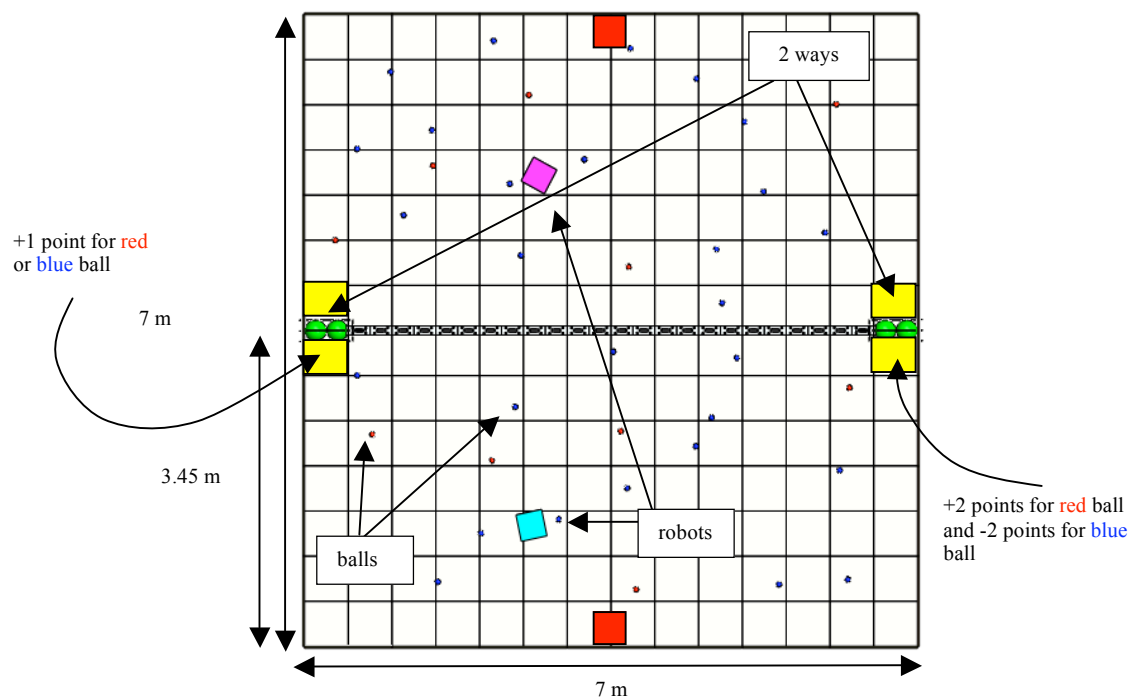


Figure 1 - Size of the playing area. The borders are made of a wooden wall of 30cm. The middle wall is made of bricks.

The match duration is 3 minutes. The energy used by the robot is monitored during these 3'.

Each robot starts with 0 points and has to pop balloons to open the passage (each popped balloon = +2 point). There are two possibilities to pass balls into the adverse camp: on the left or on the right of the middle wall as seen by the robot. They have to be passed only under ~100mm iron bars height.

Red or blue balls can be passed on the left side (it brings +1 point a ball) but only the red balls can be passed on the right side (it brings +2 points for the red ball and -2 points for the blue). Robots are not allowed to rest more than 10 seconds on the yellow zone (~500mm per ~390mm).

At the end of the 3 minutes, the number of resulting points is divided by log of the quantity of used energy (Wh). The precise formula is  $score = pt / \log_{10}(5+100 \cdot cons)$  where **pt** represents the number of points made and **cons** represents the power consumption in Wh. **Score** gives the final evaluation of the robot performance.

To pop the balloons, the robots can use needles or others systems, but all parts have to stay connected to the robot (no flying part). The needles can be mobile with respect to the robot main body.

The robots have to be fully autonomous: no communication with humans is allowed after the placement of the robot in the starting zone, excepted the single use of a starting signal without any additional information. If several robots are used, they are allowed to communicate between themselves by radio or other means. Any direct or indirect human manipulation will result in penalty: At the end of the match, we will subtract 10 points for each human access to the robot, direct or indirect.

The robots will have a unique source of energy: H<sub>2</sub>. The robots cannot use other forms of energy and cannot store, before the beginning of the match, energy in any other form.

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