

HUROCUP: Obstacle Run

Laws of the Game 2007

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Abstract

The following rules and regulations govern the Obstacle Run event in HUROCUP, a robotic game and robotics benchmark problem for humanoid robots.

Latest Version of the Rules for HuroCup

The latest official version of the rules of the game for HUROCUP is always available from the FIRA HUROCUP website (<http://www.fira.net>).

1 Obstacle Run

In the obstacle run challenge, the robot must move from one end of the playing field to the other as quickly as possible.

There are three types of obstacles in the environment: (a) step obstacles that a sufficiently mobile robot can overcome by stepping over them, (b) wall obstacles which can not be overcome, and (c) gate obstacles that a sufficiently mobile robot can overcome by crawling under them.

2 Changes in the Laws of HuroCup Obstacle Run for 2007

Because of the restructuring of the humanoid competitions under FIRA, the robot dash has now been promoted to an event in its own rights.

A major change in the obstacle run is the introduction of new obstacle types: (a) small step obstacles that can be overcome by stepping over them, and (b) gate obstacles that can be overcome by crawling under them.

3 Laws of the Game: Obstacle Run

The following laws describe the specifics of the obstacle run event. For general specifications relevant to all HUROCUP events (e.g., robot dimensions, playing field and lighting, responsibility of the referees) please refer to the general HUROCUP laws.

OR-1

The Field of Play

- OR-1.1. The dimensions of the playing field are at least 220cm by 180cm.
- OR-1.2. There is a finish line marked on one side of the playing field. This side of the playing field is called the finish side. The opposite side of the playing field is called the start side. The two other sides are called side lines. The field of play is shown in Fig. 1.
- OR-1.3. There is a 30cm zone behind the finish line, which is called the end zone.
- OR-1.4. There are two start points marked on the playing field. The start points are approximately in the center of the playing field. The distance between the start point and the finish line depends on the category of the robot.
 - (a) The start point for small robots is 120 cm in front of the finish line.
 - (b) The start point for large robots is 200 cm in front of the finish line.
- OR-1.5. Teams may place small coloured or infra red markers in the area behind the end zone to guide the robot as long as they do not interfere with other teams.

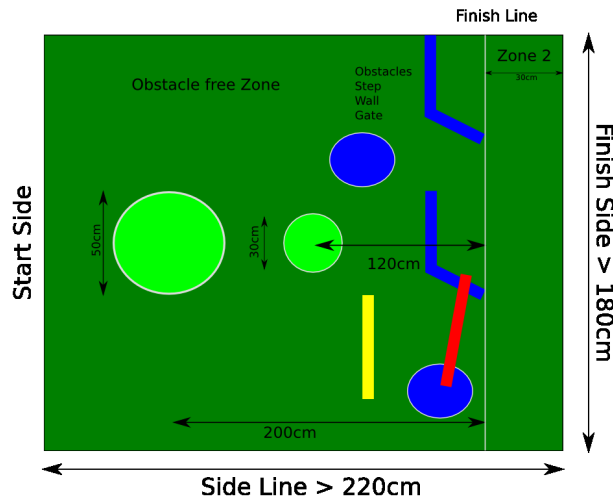


Figure 1: The field of play for the obstacle run challenge

OR-2

Obstacles

- OR-2.1. A step obstacle is a low obstacle. This type of obstacle is at most 2.5cm high and less than 5mm wide and a minimum length of 40cm. The colour of a step obstacle is yellow.
- OR-2.2. A wall obstacle is an obstacle that is placed on the floor and has a height of approximately 30cm. It has a minimum length of 40cm. The colour of a wall obstacle is blue.
- OR-2.3. A gate obstacle is an obstacle that is placed at a height of approximately 30cm. It has a minimum length of 40cm. The colour of a gate obstacle is red.
- OR-2.4. The shape of an obstacle is either flat or circular.
- OR-2.5. The following figure shows pictures of suitable obstacles.
- OR-2.6. The referee or a person designated by the referee shall place at least five obstacles (see OR-2) at random in the playing field.
- OR-2.7. The obstacles may be placed anywhere on the playing field from the start point to the finish line given the following constraints:
- a circular region with a radius of at least 30cm and 50cm for small and large robots respectively around the starting point is free of obstacles,
 - at least one of the obstacles shall be in the direct path of the robot to the finish line,

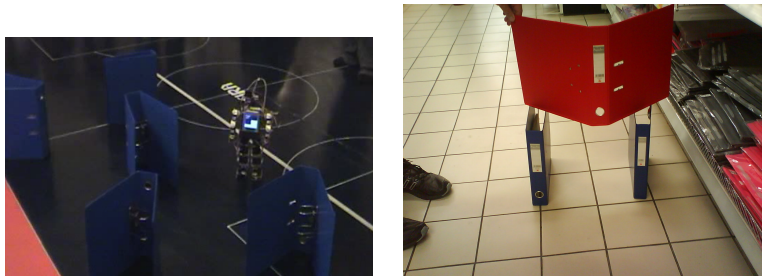


Figure 2: Wall and gate obstacles used in the obstacle run

- there is at least one free walkable path from the start point to the finish line. That is, a circle with a diameter of 40cm can be moved from the start point to the finish line without touching any obstacle or passing underneath or over any of the obstacles. Note that this does not imply that the minimum distance between two obstacles is at least 40cm. Some obstacles may be closer together than 40cm as can be seen in Fig. 1.

OR-3

Number of Robots

OR-3.1. A single robot competes in a match.

OR-4

The Players

Please refer to the general HUROCUP laws for a description of the players.

OR-5

The Referee

Please refer to the general HUROCUP laws for a description of the referee.

OR-6

The Assistant Referee

Please refer to the general HUROCUP laws for a description of the assistant referee.

OR-7

Game Play

OR-7.1. A single robot is designated the runner. All other robots must be outside of the playing field.

OR-7.2. The only robot allowed to move during a run is the designated runner.

OR-7.3. Each robot may have at most one human handler associated with it.

- OR-7.4. The human handlers are not allowed to interfere in any way with other robots, the referee, or other human handlers.
- OR-7.5. A human handler may only enter the playing field or touch his/her robot with the permission of the referee.
- OR-7.6. At the beginning of the competition, the designated runner must be at the start point for its respective category. The runner must face forward. (See OR-1.4).
- OR-7.7. After the robot has been placed, the obstacles will be distributed by the referee according to OR-2.7.
- OR-7.8. The referee will signal the start of the competition by blowing the whistle.
- OR-7.9. A robot is not allowed to leave the playing field as defined in OR-1.
- OR-7.10. A robot has crossed the finish line when either foot of the robot crosses the finish plane and touches the ground in the end zone. The finish plane is the plane which intersects the playing field at a 90 degree angle at the back of the finish line.
- OR-7.11. The handler shall remove his/her assigned robot as soon as possible from the end zone after it has crossed the finish line.
- OR-7.12. The end of the competition is signaled by the referee by blowing the whistle a second time. The referee terminates the competition if
- the robot has crossed the finish line,
 - the maximum duration of the competition (three minutes) has elapsed.
 - the robot is immobilized by a technical defect,
 - the robot leaves the playing field,
 - the robot touches one of the wall or gate obstacles (In case the obstacle was moved by the robot, the obstacle will be repositioned by the referee),
 - at least two minutes have elapsed since the start of the competition and it is unlikely in the opinion of the referee that the robot will cross the finish line within the minute,

OR-8

Method of Scoring

- OR-8.1. At the end of the run, another robot will be designated the runner.
- OR-8.2. There are five rounds in the competition. Each round consists of all robots being designated the runner exactly once. Each robot receives one point for each run in which it manages to cross the finish line.
- OR-8.3. Any robot that has not reached the finish line at least once is automatically awarded 0 rank.

Place	Points scored
1 (Winner)	10
2	8
3	6
4	4
5	3
6	2
7	1
8, 9, ...	0

Table 1: Point allocation for placings in the HUROCUP events.

OR-8.4. Among the robots that have reached the finish line at least once, the robots are ranked (i.e., 1st place, 2nd place) based on the greater number of successful runs.

OR-8.5. The point allocation for robots is as follows:

- The first ranked robot is awarded 10 points.
- The second ranked robot is awarded 8 points.
- The third ranked robot is awarded 6 points.
- The fourth, fifth, sixth, and seventh place robots are awarded 4,3,2, and 1 point respectively. A summary of the point allocation for placings is shown in table 1.

OR-8.6. In case of a tie between n robots with rank k , all robots will be awarded rank k and receive the average of the scores for ranks k to $k + n$. For example, if the robots A, B, C, D scored 10, 8, 8, 4 goals respectively, then robot A will be declared the winner (1st place) and receive 10 points, both robots B and C will be declared 2nd place finishers and receive $(8 + 6)/2 = 7$, and robot D will be declared the fourth place finisher and receive 4 points.