

# HUROCUP: Robot Dash Laws of the Game 2007

Jacky Baltes  
Autonomous Agents Laboratory  
University of Manitoba  
Winnipeg, Manitoba  
Canada, R3T 2N2  
Email: [jacky@cs.umanitoba.ca](mailto:jacky@cs.umanitoba.ca)  
WWW: <http://www.cs.umanitoba.ca/~jacky>

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## **Abstract**

The following rules and regulations govern the game of the Robot Dash 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 Robot Dash

The robot dash challenge is a sprint event for humanoid robots. The goal is for the robots to move as quickly as possible from a start line to the end line for a series of segments.

## 2 Changes in the Laws of HuroCup Robot Dash for 2007

The year 2007 marks a big change in the history of HUROCUP as it will be the inaugural competition for the HUROCUP, which greatly increases the status and scope of humanoid robotics competitions within the FIRA framework.

## 3 Laws of the Game: Forward - Backward Dash

The following laws describe the specifics of the robot dash 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.

### RD-1 The Field of Play

- RD-1.1. The dimensions of the playing field are at least 220cm by 180cm.
- RD-1.2. The playing field consists of a race track that runs the whole width of the playing field.
- RD-1.3. There are two zones on the ends of the race track. The zones are marked by lines parallel to the goal lines. Please refer to Fig. 1.
- RD-1.4. The width of the zones is the width of the playing field and the length of the zones is at least 30cm.
- RD-1.5. The length of the race tracks depends on the height of the robots. The race tracks are parallel to the side lines.
  - (a) The length of the race track for small robots is 120cm.
  - (b) The length of the race track for large robots is 200cm.
- RD-1.6. All lines are marked with white and have a width between 5mm and 15mm.
- RD-1.7. Teams may place small coloured or infra red markers in the end zones to guide the robot as long as they do not interfere with other teams.

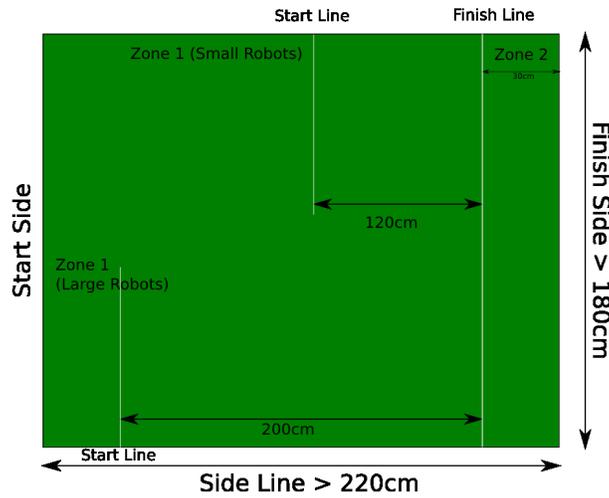


Figure 1: The field of play for robot dash

**RD-2**

**Number of Robots**

RD-2.1. A single robot competes in a match.

**RD-3**

**The Players**

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

**RD-4**

**The Referee**

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

**RD-5**

**The Assistant Referee**

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

**RD-6**

**Game Play**

RD-6.1. At the beginning of the competition, all robots must be behind the start line (i.e., in Zone 1) of their respective categories.

RD-6.2. The referee will signal the start of the competition by blowing the whistle. After the referee blows the whistle, the robots walk forwards towards the end of segment 1 (i.e., zone 2).

RD-6.3. A robot is not allowed to leave the playing field as defined in RD-1. If a robot leaves the playing field, it must be moved back to the start zone.

- RD-6.4. A robot has crossed the end line of one segment when either foot of the robot crosses the finish plane and touches the ground in the respective zone. The finish plane is the plane which intersects the playing field at a 90 degree angle at the back of the finish line.
- RD-6.5. After the robot has crossed the finish line of the first segment (i.e., the robot has reached Zone 2), the robot must walk backwards towards the end line for segment 2 (i.e., Zone 1).
- RD-6.6. A robot is walking backwards if the difference of the robot's current orientation to its orientation when positioned at the start line is at most 90 degrees in either direction.
- RD-6.7. The robot must move forward towards in segment 1, and backwards in segment 2.
- RD-6.8. Each robot may have at most one human handler associated with it.
- RD-6.9. The human handlers are not allowed to interfere in any way with other robots, the referee, or other human handlers.
- RD-6.10. A human handler may only enter the playing field or touch his/her robot with the permission of the referee.
- RD-6.11. The handler shall remove his/her assigned robot as soon as possible from the respective end zone after it has crossed the finish line.
- RD-6.12. Any robot that either leaves the playing field or breaks down may be moved by a human helper and placed again behind the start line. This is subject to laws RD-6.9 and RD-6.10.
- RD-6.13. The end of the competition is signaled by the referee by blowing the whistle a second time. The referee terminates the competition if
  - the maximum duration of the competition (10 minutes) has elapsed.
  - all robots have crossed the finish line of the backward segment,
  - no more active robots remain in the competition.

## **RD-7**

## **Fouls and Misconduct**

- RD-7.1. A robot is not allowed to interfere with another robot in any way.
- RD-7.2. Light contact: Should the contact between two robots be light and infrequent, then the referee uses the following rules:
  - (a) should a contact occur between two robots where one robot is deemed responsible by the referee for the offense (for example, the other robot is stationary), then the offending robot must be moved back behind the start line and continue with segment 1. The robot may then continue in the competition.

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.

- (b) if both robots are moving, then the referee will have both robots moved behind the start line by the human handlers. Once both robots have been moved behind the start line, they may then continue in the competition by restarting segment 1.

RD-7.3. The referee may use the penalties described in the general laws of HUROCUP accordingly.

## RD-8

## Method of Scoring

RD-8.1. Robots are awarded points based on the last segment that the robot completed successfully as well as the order in which they crossed the end line of the last segment.

RD-8.2. All robots that have not crossed the finish line of at least the first segment are automatically awarded no rank and 0 points.

RD-8.3. Among the robots that have crossed the finish line of the at least the first segment, the robots are ranked (i.e., 1st place, 2nd place) based on the maximum segment number that the robot completed successfully. All robots with the same maximum segment number are ranked based on the faster time to complete that segment.

RD-8.4. 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.

RD-8.5. 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.