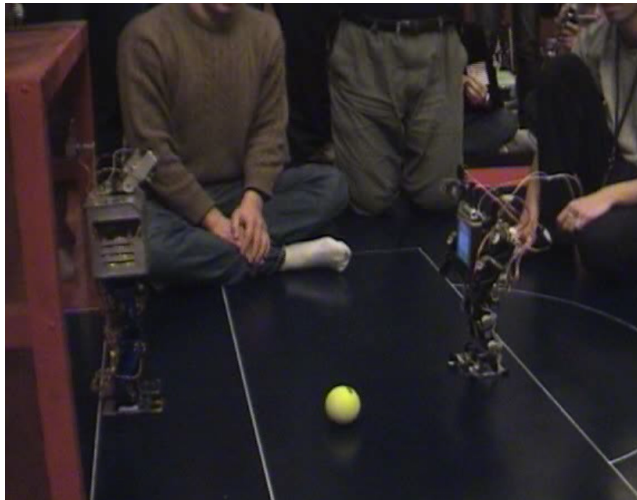


HUROCUP: Penalty Kick Laws of the Game 2007

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Abstract

The following rules and regulations govern the penalty kick 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 Penalty Kick

In this challenge, the robot must approach and kick a ball positioned somewhere in the ball area. A robot from a different team will act as goal keeper during this event.

2 Laws of the Game: Penalty Kick

The following laws describe the specifics of the penalty kick 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.

PK-1 The Field of Play

- PK-1.1. The dimensions of the playing field are at least 220cm by 180 cm.
- PK-1.2. One side of the playing field contains a goal. This side of the playing field shall be called the goal side. The opposite side of the playing field is called the empty side. The two other sides are called side lines.
- PK-1.3. The goal is 100cm wide and is placed on the goal side of the playing area with its center along the center line of the playing field.
- PK-1.4. The penalty mark is 75cm away from the goal line.
- PK-1.5. The penalty area is specified by the triangle that extends from the penalty mark to the top left and top right corner points of the goal area.

PK-2 The Ball

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

PK-3 Number of Robots

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

PK-4 The Players

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

PK-5 The Referee

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

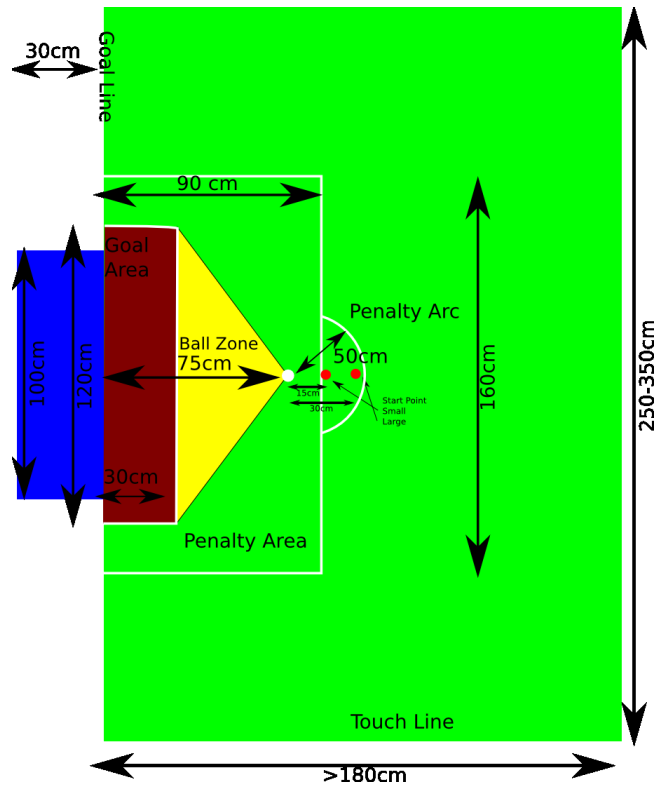


Figure 1: The field of play for penalty kicks

PK-6

The Assistant Referee

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

PK-7

Game Play

- PK-7.1. One robot is designated the kicker, another robot is designated the goal keeper. All other robots must be positioned behind the centre line and must not interfere with the designated kicker or goal keeper in any way.
- PK-7.2. The only robots allowed to move during a penalty kick are the designated kicker and goal keeper.
- PK-7.3. Each robot may have at most one human handler associated with it.
- PK-7.4. The human handlers must not interfere in any way with other robots, the referee, or other human handlers.
- PK-7.5. A human handler may only enter the playing field or touch his/her robot with the permission of the referee. The kick will be declared invalid if the handler touches the robot.
- PK-7.6. The kicker robot must be at the start point at the beginning of the competition. The start point for
- small robots is 15cm behind the penalty mark for small robots in the center of the playing field.
 - large robots is 30cm behind the penalty mark for large robots in the center of the playing field.
- PK-7.7. The designated goal keeper must be positioned so that a part of the robot touches the goal line at the start of the game.
- PK-7.8. The referee will place a ball at a random position inside of the penalty area.
- PK-7.9. The designated kicker is not allowed to leave the playing field or enter the goal area.
- PK-7.10. The designated goal keeper is not allowed to leave the goal area.
- PK-7.11. The designated goal keeper must remain in a standard walking posture until the ball has been kicked.
- PK-7.12. Any infringements of the rules shall be dealt with according to the general HUROCUP rules.
- PK-7.13. The penalty kick begins by the referee blowing a whistle.

PK-7.14. The end of the penalty kick is signaled by the referee by blowing the whistle a second time. The referee terminates the penalty kick if

- a goal has been scored by the kicker,
- the ball moved outside of the playing field,
- a robot is immobilized by a technical defect,
- a robot leaves the playing field,
- the maximum duration of the competition (2 minutes) has elapsed.
- at least 1 minute has elapsed since the start of the competition and it is unlikely in the opinion of the referee that the kicker will score in the next minute,

PK-7.15. After the end of the penalty kick, the next robot is designated the kicker.

PK-7.16. After all other players have played against a robot as goal keeper, a new robot will be designated the goal keeper.

PK-8

Method of Scoring

PK-8.1. The number of rounds in the competition is dependent on the number of robots in the event. Each robot will take a penalty kick against all other robots and will play goal keeper against all other robots at least once. So, if there are five robots in the competition, each robot will take four penalty kicks and there will be 20 kicks in total. Each robot receives one point for each goal that was scored.

PK-8.2. Any robot that has not scored a single goal is automatically awarded 0 rank.

PK-8.3. Among the robots that have scored at least one goal, the robots are ranked (i.e., 1st place, 2nd place) based on the greater number of goals that the robot scored.

PK-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.

PK-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,

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.

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.

Decisions

- Dec-8.1. A robot may follow up on the ball, that is, should the first shot miss, but still be inside of the playing field, then the kicker can repeatedly approach the ball and kick toward the goal.
- Dec-8.2. A robot may also re-approach the ball if it missed hitting the ball in the first attempt.
- Dec-8.3. The goal keeper is not allowed to squat or try to block a large part of the goal until the ball has been kicked for the first time.
- Dec-8.4. During the time between the start of the penalty kick and the time that the ball has been kicked, the robot may move freely in the goal area as long as it remains in a standard walking posture.