RoboCup Humanoid League 2003 Rules

Last Updated: June 25, 2003.

first draft as of: June 12, 2003.

The main body of this draft is from the www.robocup.org homepage last updated 02/09/2002. This draft is still under discussions. Any suggestions shall be made to humanoid@borneo.ais.fhg.de

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1. Definition of humanoid

1.1 Structure

A humanoid robot that is eligible to participate in RoboCup Humanoid League shall meet the following requirements:

> A) A humanoid robot shall be able to walk using two legs. No wheel/s shall be allowed to assist its walk.
> B) A humanoid robot shall have the approximate body proportions as described in figure.
> C) A humanoid robot shall consist of two legs, two arms, one body, and one head.

1.2 Proportion

Hmax is a maximum permitted height of the humanoid
H is the actual height of the humanoid
L is the length of the leg
AS is the length of the arm measured from the shoulder
AC is the length of the arm measured from the center of the body
HD is the length of the head, including the neck.

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0.4 * H < L < 0.6 * H
2 * AC < H
0.1 * H < HD
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A tolerance of 10% is applied to the relative proportions as well as to Hmax, except for the H-120 league where Hmax is 180 cm.

The foot of the robot shall not overlap while standing, and a rectangle shaped surface (S) of each foot must satisfy: S < (H/3 * H/3)/2.

The humanoid should be able to stay in equilibrium on one leg during one minute (this will force the number of degrees of freedom of the legs of the robot)

Figure 1. Humanoid Size
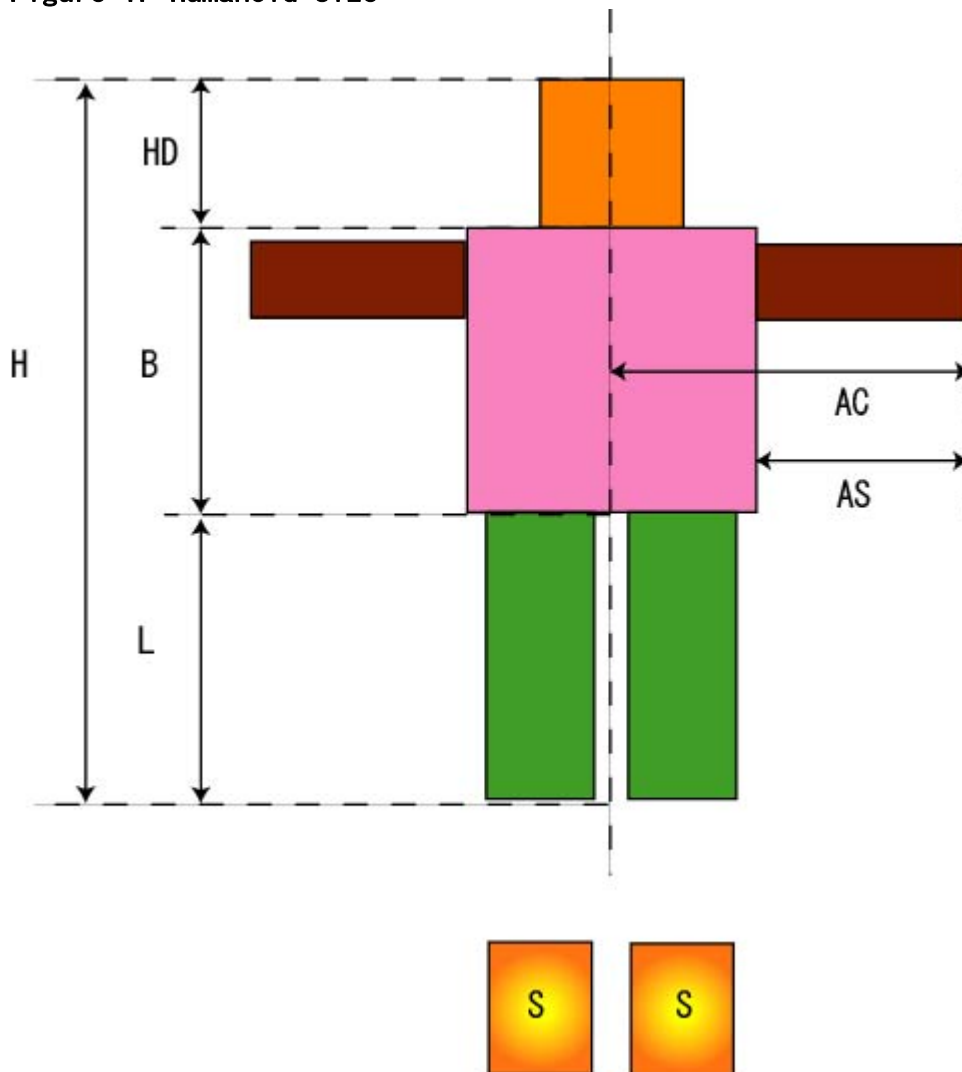
1.3 Specific Dimensions

This section provides concrete examples of the specific proportion of the humanoid robot for each class.

1.3.1 H-40 Class Dimensions

- Hmax = 44 cm (in compliance with 10% tolerance)
- H = 40 cm (Assuming as an example that the humanoid's height is 40 cm)

- 16 cm < L < 24 cm
- 16 cm < AC < 24 cm
- HD > 4 cm
- Humanoid shall fit within cylinder of 24 cm diameter.
- S < 89 cm^2

1.3.1 H-80 Class Dimensions

- Hmax = 88 cm (in compliance with 10% tolerance)
- H = 80 cm (Assuming as an example that the humanoid's height is 80 cm)
- 32 cm < L < 48 cm
- 32 cm < AC < 48 cm
- HD > 8 cm
- Humanoid shall fit within cylinder of 48 cm diameter.
- S < 356 cm^2

1.3.1 H-120 Class Dimensions

- Hmax = 180 cm
- H = 120 cm (Assuming as an example that the humanoid's height is 120 cm)
- 48 cm < L < 72 cm
- 48 cm < AC < 72 cm
- HD > 12 cm
- Humanoid shall fit within cylinder of 72 cm diameter.
- S < 800 cm^2

1.4 Ball specifications

The ball specifications for the humanoid competions are the following:

1.4.1 H-40 Class Ball

- Orange ball 83mm, weight 26 g (same as the 4-legged League).

1.4.2 H-80 Class Ball

- Orange ball 83mm, weight 26 g (same as the 4-legged League).

1.4.3 H-120 Class Ball

- Standard FIFA size 5 football, orange color (same as RoboCup MidSize League)

2. Competitions

2.1 Solo Games

A) Standing Still on One Leg

The robot shall stay on one leg during one minute.

B) Humanoid Walk

Humanoid shall be placed at the designated location in the field. It shall walk along the defined course in the field. It should start from one end of the field, walk to the other end, round the marker placed in the middle of the defense area, and come back to the initial position. Once the game has started, no human assistance shall be allowed to reposition the robot.

$Href$ is the reference height referring to the value in the league name, e.g. 40 cm for H-40.

H is the actual height of the humanoid that is less or equal to $Hmax$

D is the distance from the start line to the marker.
W is the width of the allowed walk area.
MH is the height of the marker.
MR is the radius of the marker.

    D = 5 * H
    W = 3 * Href
    MH = 100 cm
    MR = 10 cm

H-40 Class:

    D = 200 cm (Assuming as an example that the humanoid's height is
    40 cm)
    W = 120 cm
    MH = 100 cm
    MR = 10 cm

H-80 Class:

    D = 400 cm (Assuming as an example that the humanoid's height is
    80 cm)
    W = 240 cm
    MH = 100 cm
    MR = 10 cm

H-120 Class:

    D = 600 cm (Assuming as an example that the humanoid's height is
    120 cm)
    W = 360 cm
    MH = 100 cm
    MR = 10 cm

For the first one or two years, the marker could transmit IR. This allows a robot without vision system to perform this task.

The intention of this challenge is to evaluate the stable walking behavior of the humanoid. The course has two straight routes and one 180 degree turn. The 180 degree turn is included in order to evaluate orientation change capability. A minimum visual perception of the robot is needed, because the marker is red, and there is a yellow panel behind the start/end zone that will help the robot to orient itself.
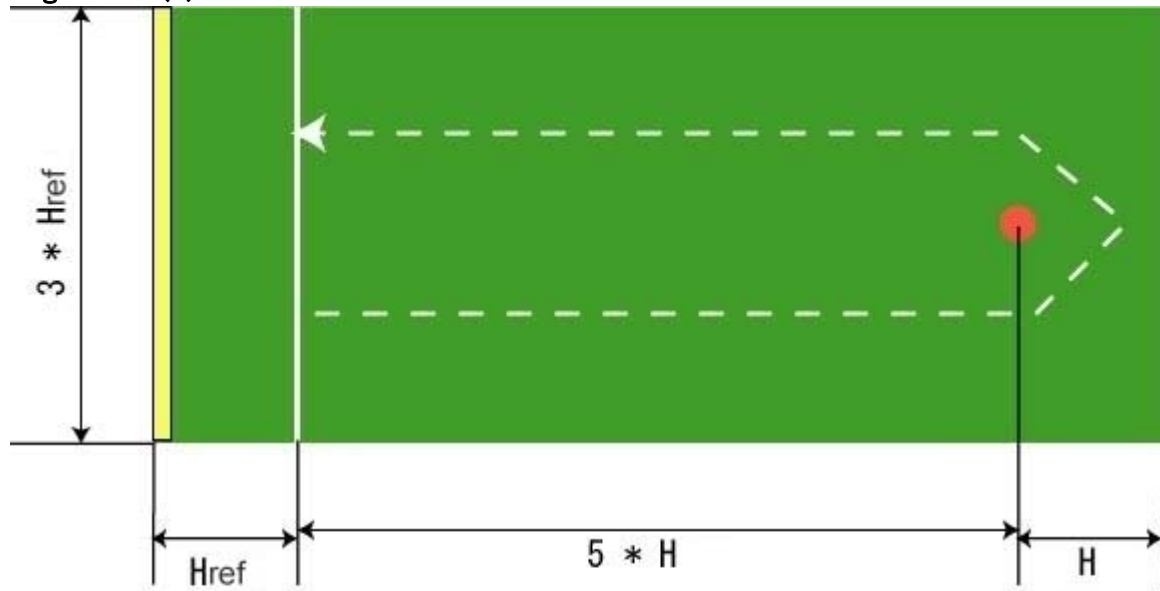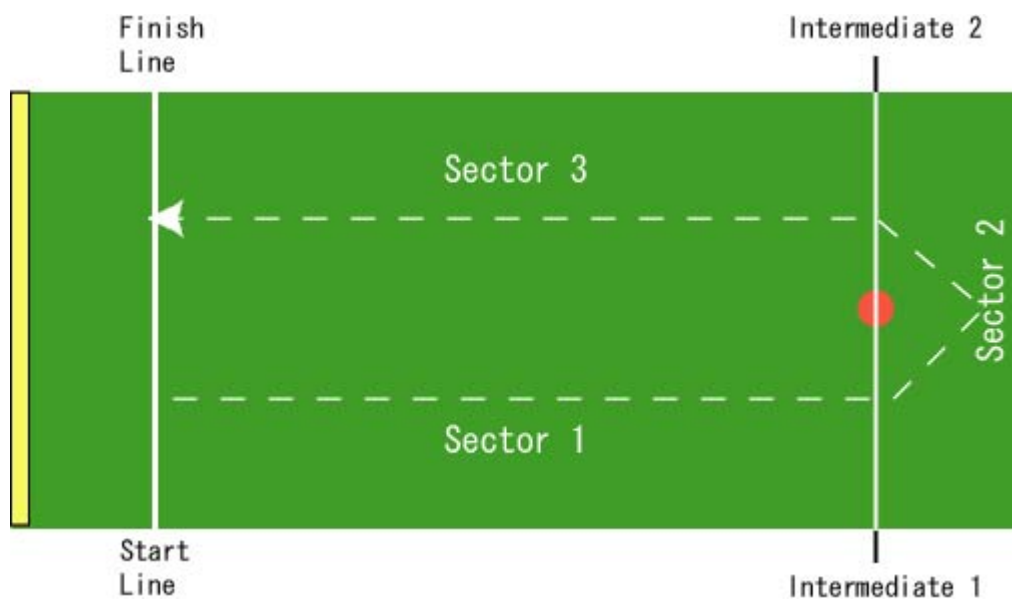
Figure 2 (a). Walk Field

Figure 2 (b) Walk field time measurement points

Total time is measured, as well as timing for each one of the sectors. Sector 1 and 3 measures the speed of the robot between the straight lines,

and sector 2 measures the duration of the circular movement.

C) Shoot

A ball is placed in front of the goal (in front of the goal line). The robot is placed behind the ball. The robot shall walk to the ball and kick it into the goal.

D1 is the distance from the initial position of the humanoid to the ball
D2 is the distance from the ball to the goal line.
GW is the width of the goal and GH is the height of the goal

    D1 = 1.5 * H
    D2 = 3.0 * Href
    GW = 3.0 * Href
    GH = Href

H-40 Class:

    D1 = 60 cm (Assuming as an example that the humanoid's height is
    40 cm)
    D2 = 120 cm
    GW = 120 cm

H-80 Class:

    D1 = 120 cm (Assuming as an example that the humanoid's height is
    80 cm)
    D2 = 240 cm
    GW = 240 cm

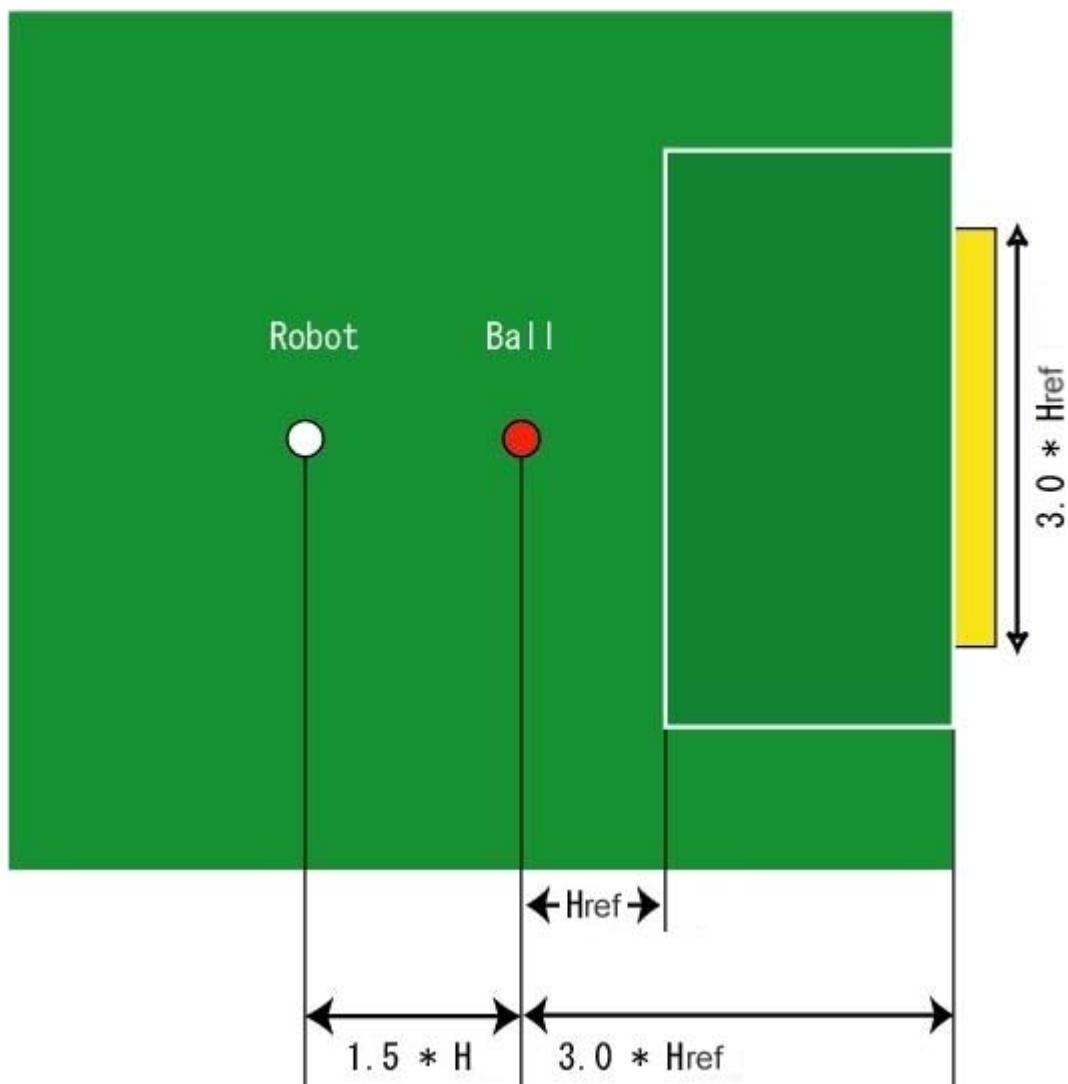### H-120 Class:

    D1 = 180 cm (Assuming as an example that the humanoid's height is
    120 cm)
    D2 = 360 cm
    GW = 360 cm

Figure 3. Shoot Field

2.2 Games

A) Penalty Shoot-out

Team A's robot is placed behind the ball. Team B's robot is placed in front of the goal. Team A's Robot shall walk and kick the ball to the goal.

D1 is a distance from the initial position of the humanoid to the ball
D2 is a distance from the ball to the goal line.
GW is the width and GH is the height of the goal.

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D1 > 0.5 * H
D2 = 3.0 * Href
GW = 3.0 * Href
GH = Href
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Goalie robot can be placed within Href from the goal line.

H-40 Class:

D1 > 20 cm (Assuming as an example that the humanoid's height is 40 cm)
D2 = 120 cm

GW = 120 cm

Goalie robot can be placed within 40 cm from the goal line.

H-80 Class:

D1 > 40 cm (Assuming as an example that the humanoid's height is
80 cm)
D2 = 240 cm
GW = 240 cm

Goalie robot can be placed within 80 cm from the goal line.

H-120 Class:

D1 > 60 cm (Assuming as an example that the humanoid's height is
120 cm)
D2 = 360 cm
GW = 360 cm

Goalie robot can be placed within 120 cm from the goal line.

A session will finish, once the goalie robot (Team B) has touched the ball,
or, as soon as the ball has stopped within the marked goal field. If the
ball is free (not touched by Team B's robot), 60 seconds is allowed for the
striker robot to attempt to score the goal. During this period, the session
will finish whenever the goalie robot touches the ball. The goalie robot is
not alowed to move out of the goalie position area until after 5 seconds
after the ball was initially touched by Team A's robot.

One game consists of 5 sessions for each team. If both teams have the same
number of scores after 5 sessions, the session will continue until one team
scores more goals than the other team. The roles between the teams are
exchanged after each kick (e.g. striker and goalie).

Figure 4, PK Shoot Field
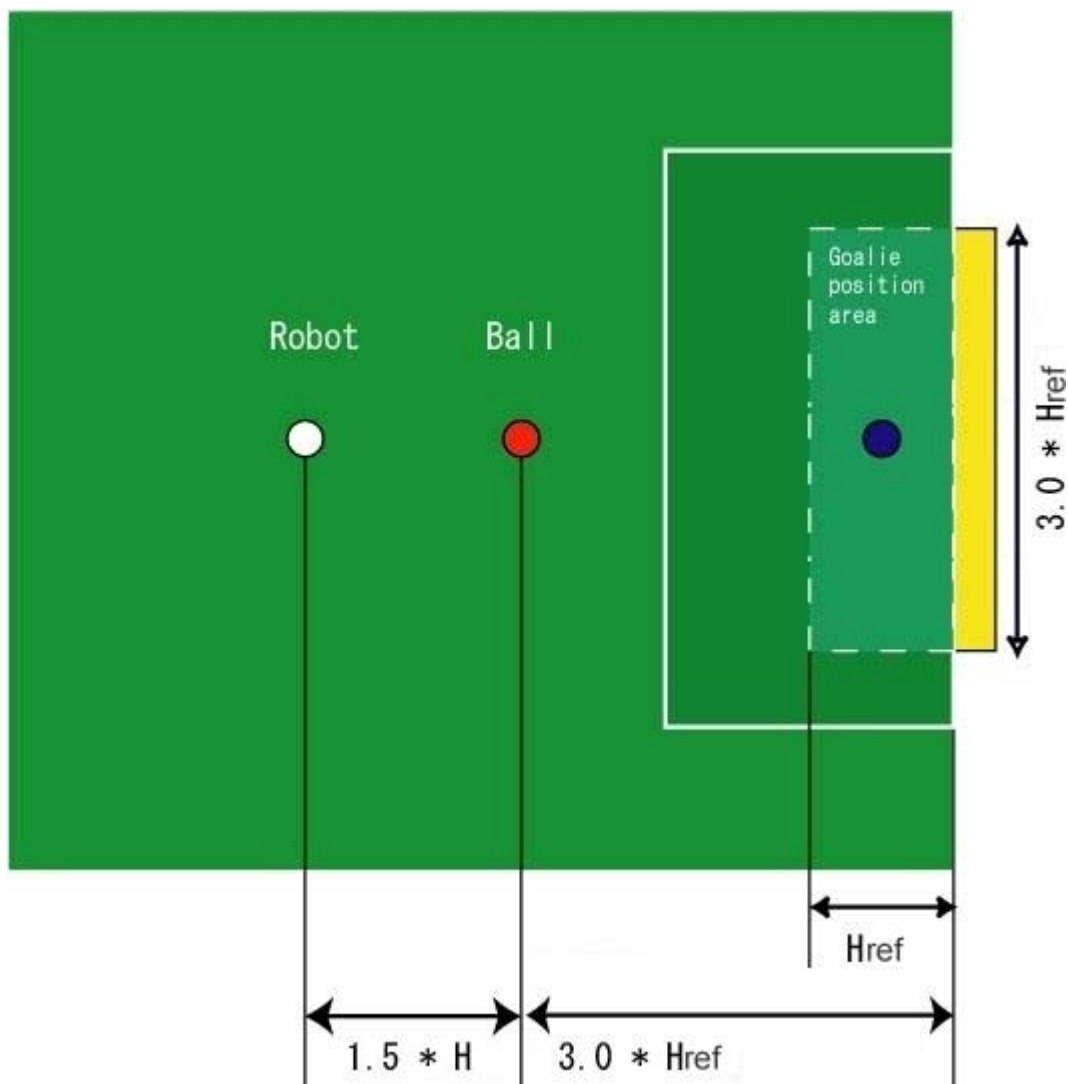
B) Soccer

A game of soccer will be played with at least one robot, or at most three robots that participate for each team.

Game Period

- A game consists of two periods of 10 minutes each with a 10 min break in the middle.
- Loss Time: A referee counts loss time, and continues the games for a time equal to the loss time after the second period of the game has ended, without interuption.
- If both teams have the same score when the total game time has ended, one extended period with the duration of 10 minutes is played with the Golden Goal rule.
- If the winner of the game is still not decided after the extended period, a penalty shoot-out session will be used to decide the winner. Each team shall then have five trials.
- If the winer of the game is still not decided after the five trials of penalty shoots, extra penalty shoot will be carried out. If one team score more than the other team in each pair of trial, the team with higher score will win the game.

Field Definition

Field size:
Width (W) = 6.0 * Href
Length (L) = 9.0 * Href

H-40 Class:	Width = 240 cm	
	Length = 360 cm	
H-80 Class:	Width = 480 cm	
	Length = 720 cm	
H-120 Class:	Width = 720 cm	
	Length = 1080 cm	

Walls: No wall shall exist surrounding the field

Lines: Center circle, center line, side lines, penalty area lines shall be marked with white line.

Markers: Six color markers shall be used for each corner and by the center line. This shall be consistent with Sony Legged Robot League.

Goal Colors: Each goal shall be painted with blue and yellow colors, consistent with the middle size (F-2000) league.

Rules of Play

Free kick: In the event of charging, referee can stop the game, and award a free kick to the team who did not caused the foul.

Throw In: In the event that ball rolled out from the side line, throw in is awarded to the team who did not touch the ball last. If the humanoid cannot hold the ball to perform "throw in", the humanoid is allowed to perform "kick in", instead.

Penalty-shot: In the event, defending players obstructed the offense players in the penalty area, the team affected will be awarded with the penalty-shot.

2.3 Free Style

Five (5) minutes will be given to each team for them to show any demonstration with their humanoid robot/s. Evaluation will be given by a panel that consists of seven independent jury members. Each jury member shall rate each demonstration, within a scale from 1 to 10 points, for (A) technical merits, and (B) artistic impression. One highest score and one lowest score is discarded, and the total points from the remaining jury are assigned as a over-all score for the team.

2.4 Performance factors

Performance factors will be used for robots that are not fully autonomous regarding: power supply, remote brain, human remote control and if they are

built on a commercial platform. The performance factors will be voted by each team, and the average result from the votings will be used to determine the final performance factors. The voting results can be found here.