

RoboCup Humanoid League 2002 Rule

Last Updated 02/09/2002

second draft as 11/21/2001

first draft as of 10/26/2001

This draft is still under discussions.

Any suggestions shall be made to humanoid@symbio.jst.go.jp (to be available)

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1. Definition of humanoid

1.1 Structure

"Humanoid" that eligible to participate in RoboCup Humanoid League shall meet following requirements:

- A) "humanoid" shall be able to walk using two legs. No wheel shall be allowed to assist its walk.
- B) "Humanoid" shall have approximate body proportion as described in the figure.
- C) Humanoid shall be consists of two legs, two arms, one body, and one head.

1.2 Proportion

H_{max} is a maximum permitted height of the humanoid

H is a height of the humanoid

L is a length of the leg

AS is a length of the arm measured from the shoulder

AC is a length of the arm measured from the center of the body

HD is a length of the head, including a neck.

W is a weight of the humanoid

$$0.4 * H < L < 0.6 * H$$

$$2 * AC < H$$

$$0.1 * H < HD$$

Rule Revision suggestion #1 (Gordon Wyeth: 25, Oct, 01)

AC restriction shall be modified as:

$$0.4 * H < AC < 0.6 * H$$

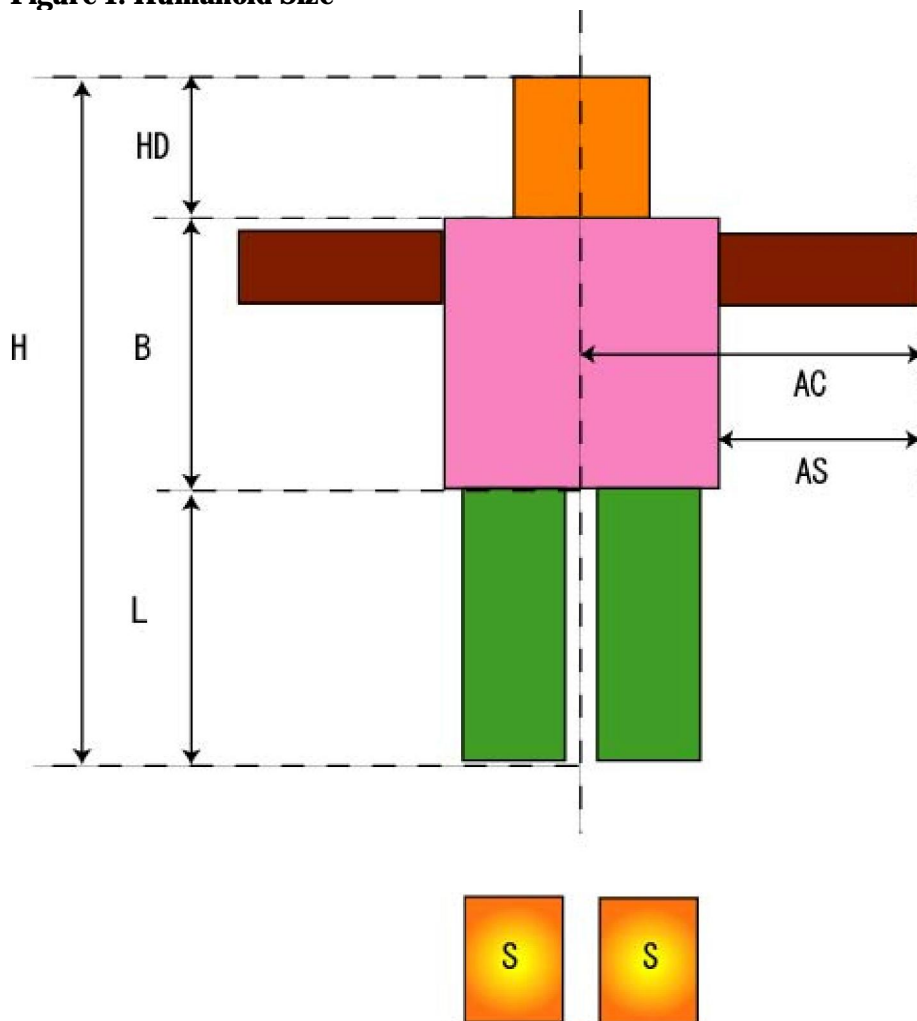
Rule Revision suggestion #2 (Gordon Wyeth: 25, Oct, 01)

Humanoid should fit within a cylinder of $H_{max} * 0.6$ diameter.

Foot of the robot shall not overlap while standing, and the surface (S) of each foot must be $S < (H/3 * H/3)/2$ (?)

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

Figure 1. Humanoid Size



1.3 Specific Dimensions

This section provide concrete example of specific proportion of humanoid for each class.

1.3.1 H-40 Class Dimensions

- | Hmax = 40cm
- | H = 40cm (Assume an example humanoid's height is 40cm)
- | $16\text{cm} < L < 24\text{cm}$
- | $16\text{cm} < AC < 24\text{cm}$ (following Revision #1)
- | $HD > 4\text{cm}$
- | Humanoid shall fit within cylinder of 24cm diameter.
- | $S < ???$

1.3.1 H-80 Class Dimensions

- | Hmax = 80cm
- | H = 80cm (Assume an example humanoid's height is 80cm)
- | $32\text{cm} < L < 48\text{cm}$

- | 32cm < AC < 48cm (following Revision #1)
- | HD > 8cm
- | Humanoid shall fit within cylinder of 48cm diameter.
- | S < ???

1.3.1 H-120 Class Dimensions

- | Hmax = 120cm
- | H = 120cm (Assume an example humanoid's height is 120cm)
- | 48cm < L < 72cm
- | 48cm < AC < 72cm (following Revision #1)
- | HD > 12cm
- | Humanoid shall fit within cylinder of 72cm diameter.
- | S < ???

2. Competitions

2.1 Solo Games

A) Standing Still on One Leg

The robot shall stay in equilibrium 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. For 2002, 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 started, no human assistance shall be allowed to reposition the robot.

D is a distance from the start line to the marker.

W is a width of the allowed walk area.

MH is a height of the marker.

MR is a radius of the marker.

$$D = 5 * H_{max}$$

$$W = 3 * H_{max}$$

$$MH = 100 \text{ cm}$$

$$MR = 10 \text{ cm}$$

H-40 Class:

$$D = 200\text{cm}$$

$$W = 120\text{cm}$$

$$MH = 100 \text{ cm}$$

$$MR = 10 \text{ cm}$$

H-80 Class:

$$D = 400\text{cm}$$

$$W = 240\text{cm}$$

$$MH = 100 \text{ cm}$$

$$MR = 10 \text{ cm}$$

H-120 Class:

$D = 600\text{cm}$
 $W = 360\text{cm}$
 $MH = 100\text{ cm}$
 $MR = 10\text{ cm}$

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

The intention of this challenge is to evaluate stable walking behavior of the humanoid. The course has two straight route and one 180 degree turn. The 180 degree turn is included in order to evaluate orientation change capability.

A minimum visual perception is required, because a marker is red, and there is an yellow panel behind the start/end zone.

Figure 2 (a). Walk Field

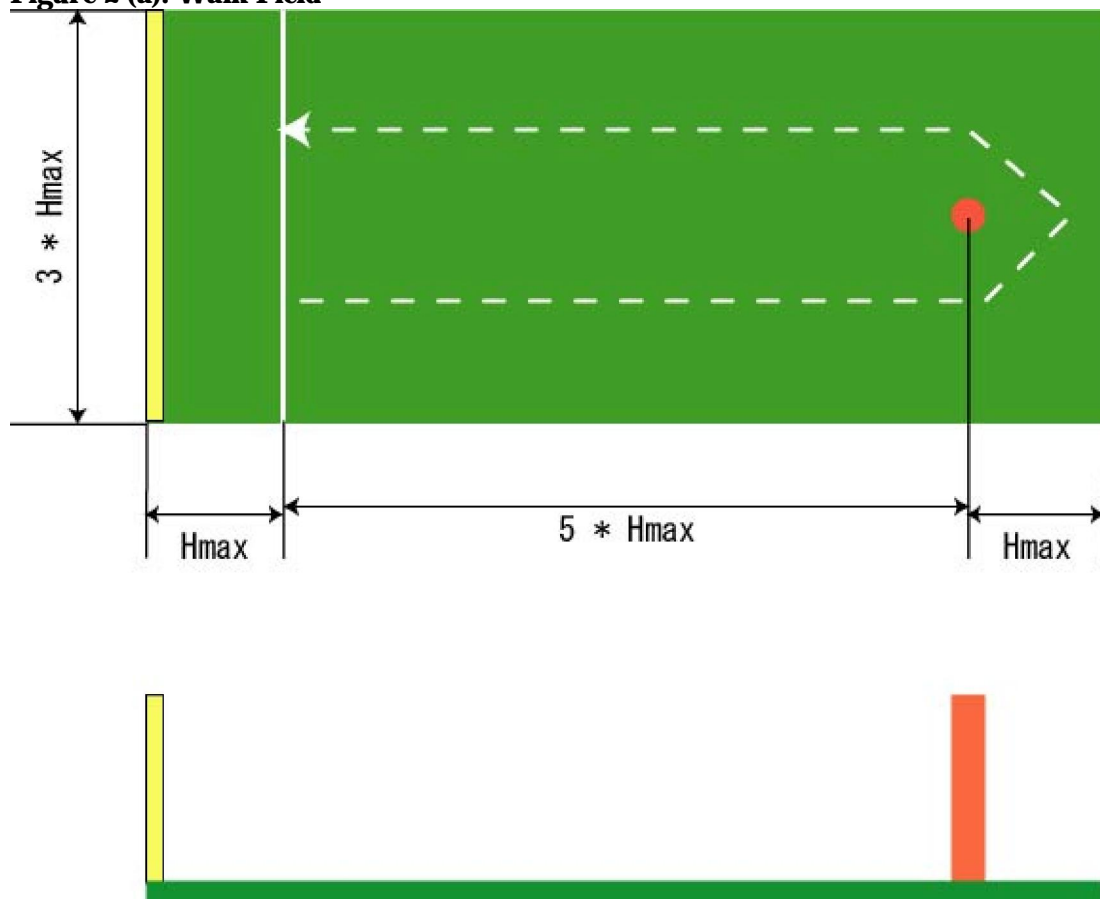
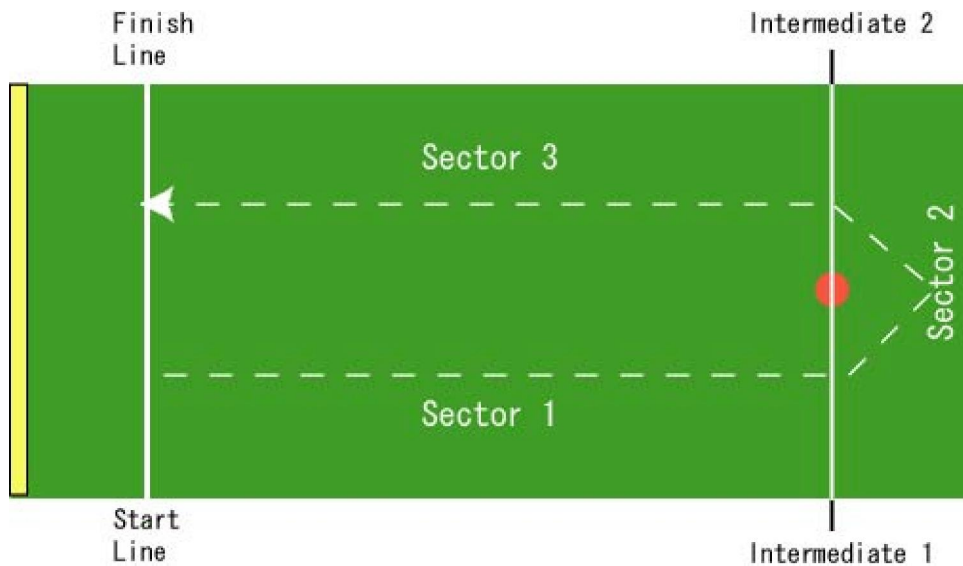


Figure 2 (b) Walk field time measurement points



Total time is measured, as well as timing for each sectors.

Sector 1 and 3 measures speed of straight line, and sector 2 measures speed of circular movement.

C) Shoot

A ball is placed in front of the goal (X m from the goal line). Robot is placed Y m behind the ball. Robot shall walk to the ball and kick it to the goal.

$D1$ is a distance from the initial position of the humanoid to a ball

$D2$ is a distance from the ball to the goal line.

GW is a width of the goal

$$D1 = 1.5 * H_{max}$$

$$D2 = 3.0 * H_{max}$$

$$GW = 2.0 * H_{max}$$

H-40 Class:

$$D1 = 60\text{cm}$$

$$D2 = 120\text{cm}$$

$$GW = 80\text{cm}$$

H-80 Class:

$$D1 = 120\text{cm}$$

$$D2 = 240\text{cm}$$

$$GW = 160\text{cm}$$

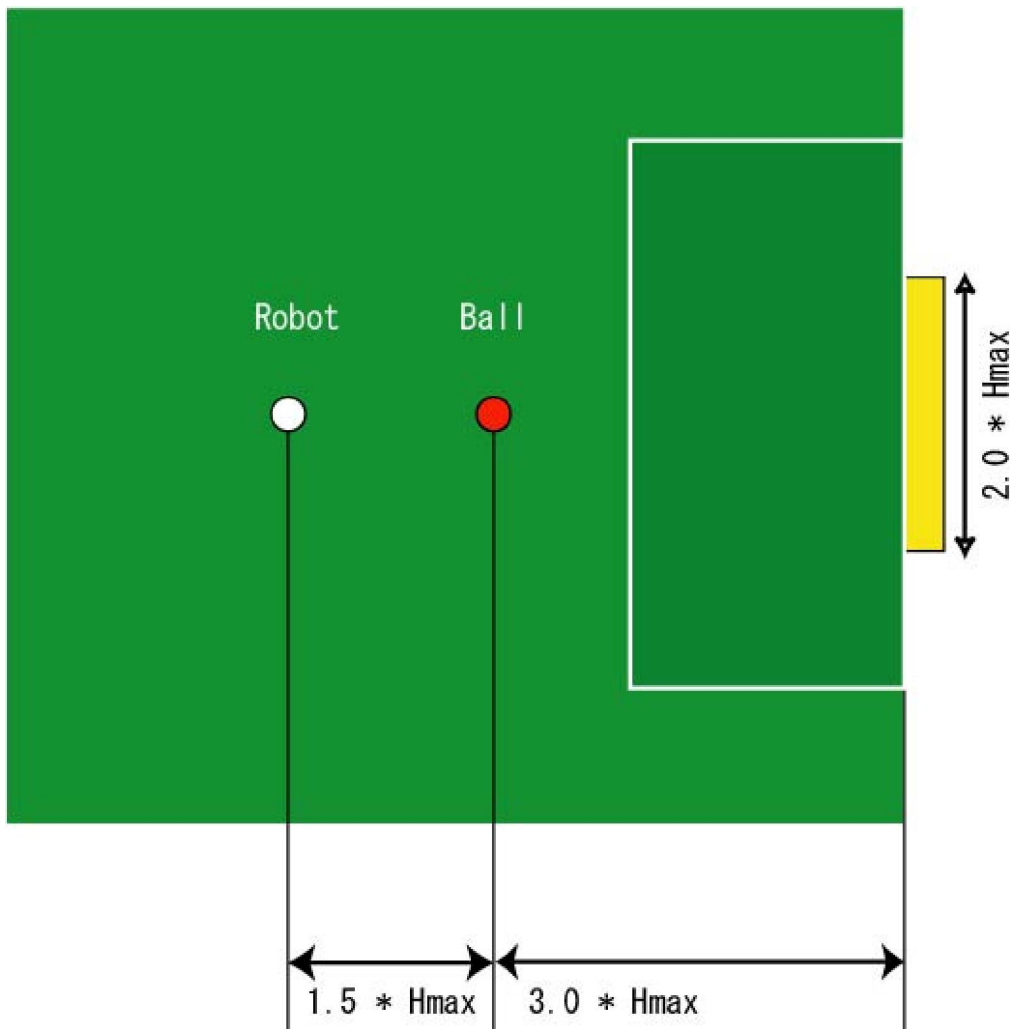
H-120 Class:

$$D1 = 180\text{cm}$$

$$D2 = 360\text{cm}$$

$$GW = 240\text{cm}$$

Figure 3. Shoot Field



2.2 Games

A) Penalty Shootout

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 a ball

D2 is a distance from the ball to the goal line.

GW is a width of the goal

$$D1 > 0.5 * H_{max}$$

$$D2 = 3.0 * H_{max}$$

$$GW = 2.0 * H_{max}$$

Goalie robot can be placed within H_{max} from the goal line.

H-40 Class:

$$D1 > 20\text{cm}$$

$$D2 = 120\text{cm}$$

$$GW = 80\text{cm}$$

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

H-80 Class:

D1 > 40cm
D2 = 240cm
GW = 160cm

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

H-120 Class:

D1 > 60cm
D2 = 360cm
GW = 240cm

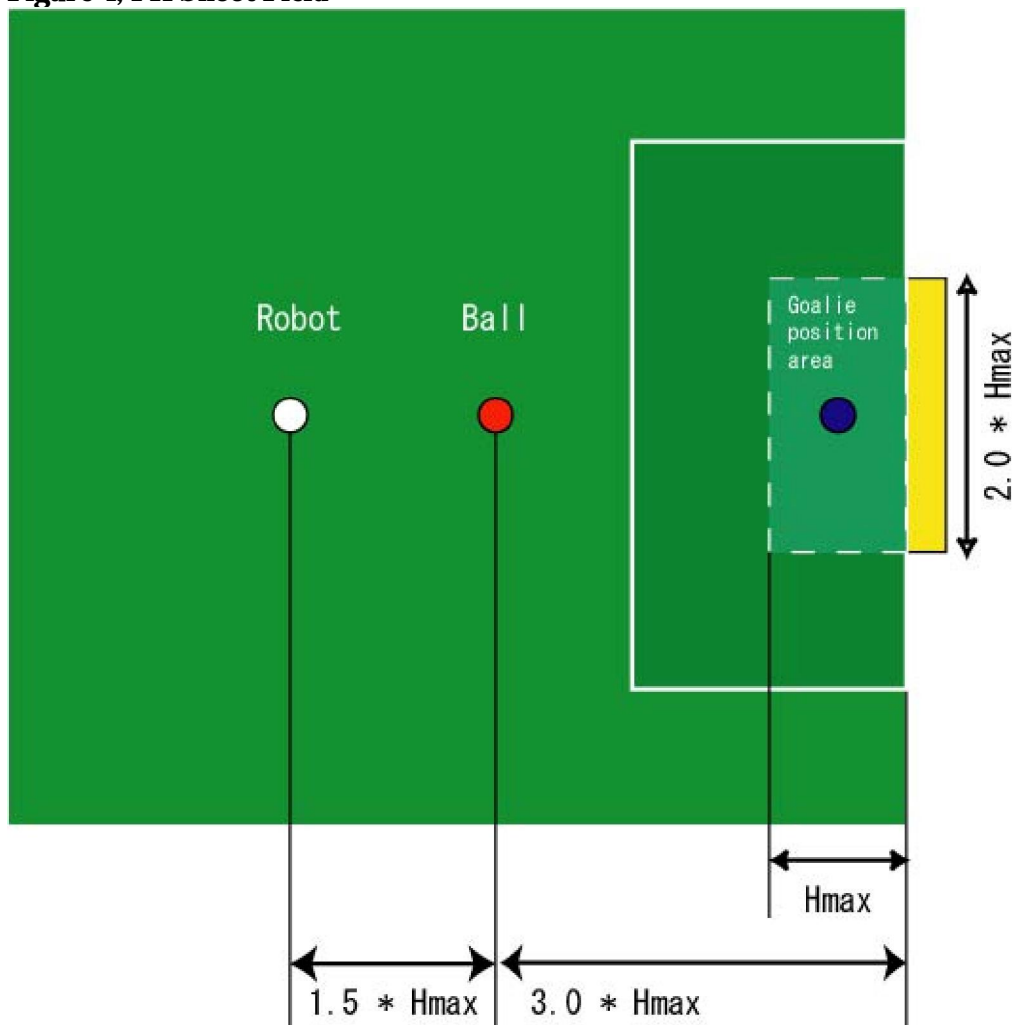
Goalie robot can be placed within 120cm from the goal line.

A session finish, once goalie robot (Team B) touched the ball. If the ball is free (not touched by Team B's robot), 60 seconds is allowed for Team A's robot to attempt to score the goal. During this period, the session finish whenever goalie robot touch the ball.

One game is consists of 5 sessions for each team.

If both team have same number of score after 5 sessions, sessions will continue until one team score more than the other team.

Figure 4, PK Shoot Field



B) Soccer

A game of soccer will be played using N robots for each team, where N can be 1 - 3.

Game Period

- | A game consists of two 10 minutes periods with 10 min break in the middle.
- | Loss Time: a referee counts loss time, and added to the end of the second period of the game.
- | If both team tied in the score during the two periods, one 10 minutes extended period is played with the Golden Goal rule.
- | If the game is still tie in after the extended period, penalty shoot out session will be used to decide the winner. Each team shall have five trials.
- | If the game is still tie, 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 * Hmax

Length (L) = 9.0 * Hmax

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 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 Shoot: In the event, defending players obstructed the offense players in the penalty area, the team affected will award with the penalty shoot out.

2.3 Free Style

Five (5) minutes will be given to each team for them to show any demonstration on

humanoid.

Evaluation will be given by a panel consists of seven independent jury.

Each jury shall rate each demonstration with the scale of 1-10 points for (A) technical merits, and (B) artistic impression.

One highest score and one lowest score is discarded, and total points for the remaining jury is assigned as a score for the team.
