

Technical Challenges for the RoboCup 2006 Legged League Competition

May 31, 2006

1 Introduction

There are three technical challenges that will be held at the RoboCup 2006 Legged League Competition. 2006 consist of a modified version of the open challenge and two new challenges. The three challenges are:

- The Open Challenge (Section 2)
- The Passing Challenge (Section 3)
- The New Goal Challenge (Section 4)

For placing first in a challenge a team will receive 24 points, each position thereafter will receive 1 less point. I.e 1st = 24pt, 2nd = 23pts, 3rd = 22pts ... 24th = 1pts. In the case of a draw, each team will receive the average of the points allocated to these positions. E.g if three team tie for 2nd, they will receive $\frac{23+22+21}{3} = 22$ points. If a team does not compete in a challenge the will receive 0 points, also if a team competes but fails to score a point (or receive a vote) they will receive 0 points. The team with the highest total score after all challenges is deemed the overall challenge winner.

2 The Open Challenge

This challenge is designed to encourage creativity within the Legged League, allowing teams to demonstrate interesting research in the field of autonomous systems. Each team will be given three minutes of time on the RoboCup field to demonstrate their research. Each team *must* distribute a technical description of their research (1-2 pages) before the round-robin starts. Teams who do not submit a description or propose a non-technical challenge will be ineligible to compete. The winner will be decided by a vote among the entrants. In particular:

- Each team *must* distribute a technical description of their research before the round-robin starts.
- Each team may use any number of Sony AIBO robots. Teams must arrange for their own robots.

- Teams have three minutes to demonstrate their research. This includes any time used for initial setup. Any demonstration deemed likely to require excessive time may be disallowed by the organizing committee.
- Teams may use extra objects on the field, as part of their demonstration. *Robots other than the AIBOs may not be used.*
- The demonstration must *not* mark or damage the field. Any demonstration deemed likely to mark or damage the field may be disallowed by the organizing committee.
- The demonstration may *not* use any off-board sensors or actuators, or modify the AIBO robots.
- The demonstration may use off board computing power connected over the wireless LAN. This is the only challenge in which off board computation is allowed.
- The demonstration may use off board human-computer interfaces. This is the only challenge in which off board interfaces, apart from the Game-Controller, are allowed.

The winner will be decided by a vote among the entrants using a Borda count (http://en.wikipedia.org/wiki/Borda_count). Each entering team will list their top 10 teams in order (excluding themselves). The teams are encouraged to evaluate the performance based on the following criteria: Technical strength, novelty, expected impact and relevance to RoboCup. At a time decided by the designated referee, within 30 minutes of the last demonstration if not otherwise specified, the captain of each team will provide the designated referee with their rankings. Each ranking is converted to points: ten points for the top ranked team, nine for the team ranked second and so on down to one point for the team ranked tenth. Any points awarded by a team to itself will be disregarded. The points awarded by the teams are summed and the team with the highest total score shall be the winner.

3 The Passing Challenge

This second challenge is intended to encourage teams to develop passing and catching skills. In this challenge each team will be required to provide three robots, all robots must be in the same coloured uniform (the decision on red or blue uniforms can be made by each team).

Each robot will be placed on the field inside a circle of radius 30cm (Figure 1). The centre of the circles will be no closer than 75cm and no further than 200cm apart. The triangle formed by the circles will not be equilateral, i.e. the distances between robots will be different.

The centre of each circle shall be written to each team's memory-stick as a text file in the topmost directory: *points.cfg*. The format of the file has one target point per line, the *x* coordinate followed by the *y* coordinate. There is an example file available at the league web-site: <http://www.tzi.de/4legged/>, in the "Downloads" section – also shown



Figure 1: An example placement of the robots for the passing challenge. The circles will be drawn on the field but will not be visible to the robot.

in table 1. The coordinates are given in cm, and the origin of the coordinate system is at the center of the field. The x-axis points from the blue goal (negative x) to the yellow goal (positive x). The y-coordinates to the right of this axis are negative; on the left they are positive. Each team is responsible for writing code to read the file with circle locations.

-150_90
-90_0
0_45

Table 1: An example points.cfg for the passing challenge

Initially the robots will be placed inside a circle and in the 'set' state for 15 seconds, this will enable them to localise. The robots will then be placed into 'playing' and given two minutes to pass the orange ball around.

A pass will be regarded as successful when:

- The passing robot releases the ball from inside its circle *and*
- the catching robot stops/controls the ball inside its circle. Stops/control will be left to the referees discretion. Examples are :
 - The ball comes to a complete stop.
 - The ball is caught and held by the robot.
 - The robot is capable of hitting the ball from one circle to another without the need for stopping or grabbing the ball.

A pass will be deemed *partially* successful if:

- The passing robot releases the ball from inside its circle *and*
- the catching robot touches the ball inside the circle but the ball then travels outside the circle.

A pass is deemed unsuccessful if :

- Either robot makes contact with the ball *when* the ball is outside a circle *or*
- the ball exits the field.

A robot is deemed to be inside a circle if two legs are inside the circle. The ball is inside the circle if some part of the ball is inside the circle or on the line. That is, the line is regarded as inside the circle.

Robots may pass between each other in any order, but will be rewarded for passing to a different robot than that which passed to it. Scoring of the challenge will be as follows :

3 pts For a successful non “return” pass that directly follows a successful pass reception.

1 pt For a successful pass.

0.5 pt For a *partially* successful pass.

If two teams score the same number of points, the result is a draw.

All normal game rules apply in the challenge, except:

- When a ball leaves the field it will be replaced back in the closest circle.
- A robot may “ball hold” when the ball is not in the circle. This allows a robot to retrieve a ball and then return to a circle to pass.

If a rule is violated then any pass resulting from this violation will receive no points.

4 The New Goal Challenge

The New Goal challenge is intended to trial a new version of the goals. This challenge will require the construction a new yellow goal consisting of two posts and a crossbar (Figure 2). The dimensions are shown in Figures 3 and 4.

The procedure for this challenge will be similar to that of the variable lighting challenges attempted in previous years, but will use the 2006 penalty shootout rules. The team attempting the challenge places a single *blue robot* (robot with a blue uniform) on the field. That robot must score as many goals as it can into the yellow goal in three minutes (Note: this is the opposite goal from a normal penalty shootout). The team that scores the most goals wins. If two teams score the same number of goals, the result is a draw.

In addition to the single blue robot, **three** red *opponent* robots are also placed on the field. All of these robots are paused, frozen in the *UNSW stance*. None of them shall move during the challenge. One is placed *somewhere* inside the yellow goal's penalty area. The other two are placed in the half of the field containing the yellow goal, at least 30cm away from the edge. The exact locations of all the robots shall be determined by the referee, and will be the same for all teams.

There is a single ball upon the field. Initially it is placed in the center kickoff position. Upon each score, the ball is moved back to the center kickoff position. The robot is not moved by the referee and must make its own way back to the center of the field to reach the ball again. The robot will have its back button pressed when the ball is moved back to the center to indicate a score. Teams are warned that the normal game use of the back button, penalization, does not apply in this challenge. If a ball is kicked out of the field it is placed back at the center of the field.

Since the 2006 penalty shootout rules are used, the attacking robot *can not* enter the yellow penalty area to shoot (the robot may enter the blue penalty area). If the ball goes inside the yellow penalty area but not into the goal, it will be replaced at the center of the field. Additionally if the attacking robot touches the ball inside the yellow penalty area the ball will be removed and replaced at the center of the field.

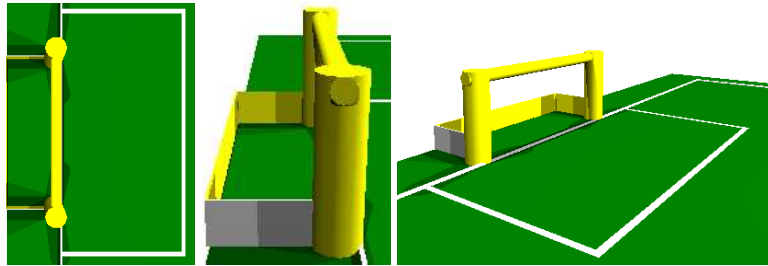


Figure 2: Above,side and diagonal views of the new goal.

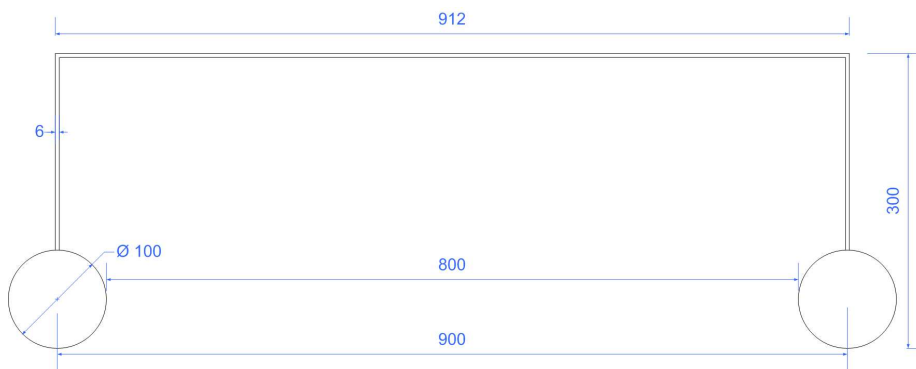


Figure 3: Dimensions of the new goal (without crossbar), viewed from above.

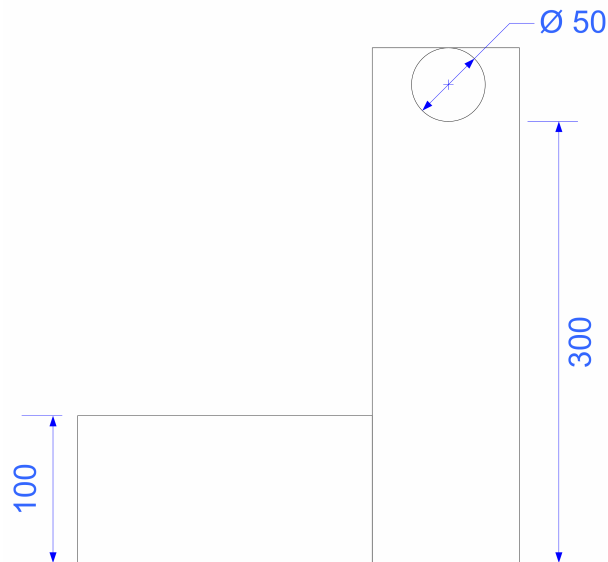


Figure 4: Dimensions of the new goal, viewed from the side.