

A Brief Look at the Robofoot Project

Robofoot is a student initiative devoted to the development of autonomous and cooperative multi-robots systems. The main goal of the project is to be the first Canadian team to participate in the Robot World Cup Soccer Games, the RoboCup (www.robocup.org), in the Middle Size Robot League. The RoboCup is an international competition, the occasion for robot teams of multiple universities and even private companies to challenge one another in a tournament which occurs at different places around the world. In fact, each edition of the cup attracts almost 100,000 visitors. The cup's ultimate goal is no less than:

"By 2050, develop a team of fully autonomous humanoid robots that can win against the human world champion team in soccer".

For its very first competition, Robofoot came back from Osaka with a pretty good record. The team ranked second in its qualification group, just behind Eigen (Keio University, Japan), the team that won the tournament. Having won 3 games and lost one, Robofoot entered the second round of qualification, in which, sadly, we were eliminated. We were so close to the quarter finals!



We were also involved in two technical challenges, in which we had to demonstrate interesting features of our robots and to show what they're able to do. Robofoot ranked 4th and 7th in these events.

To achieve those goals, students on the development team work on innovative solutions in various fields:

- mechatronics systems for mobile robots
- real-time computing
- computer vision
- hierarchical control
- communication and cooperation systems.

In this development process, Robofoot members strive for dynamism as well as professionalism in public relations (deployments in public events, sponsorship requests, etc.). In the current technological era, a project like Robofoot is a fun and educative way of promoting and bringing science to people of all ages. Robofoot does so by participating in multiple activities of educative nature.

Good Reasons to Partner With Us

- **International visibility:** more than 100 000 people (researchers, students and visitors) meet at the RoboCup event, participation in conferences, publications. Robofoot is the only North American team in the *Middle Size Robot League*.
- **Visibility at Ecole Polytechnique:** the equipment of the project is used by more than 50 students every trimester, internal promotion.
- **Local visibility :** promotion of the group's activities in local medias and throughout many public relations activities
- Association with a project that arouses everyone's interest

The following pictures show an example of a public relations activity in which Robofoot Group is involved.



Figure 1 : Demonstration of the player capabilities during the 2004 Robofolies at the Montreal Science Centre

Our robots

We currently have 6 functional robots and we're also working on our next generation of robots. Our actual players are efficient, but we would like to reduce their weight and make them faster. Here are the principal specifications of the actual robots.



Figure 2 : Pctures showing a player and our 6 robots together.

Electro-mechanical platform

The conception of the robots is made by CMC and the pieces are fabricated precisely with numerical apparatuses. The platform is composed of motors with a continuous current, batteries and many other components. A pneumatic kicker is used in order to allow powerful shots on goal.

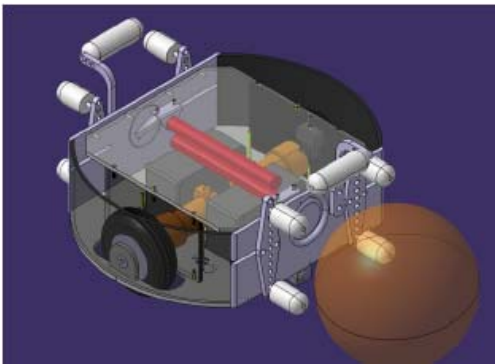


Figure 3 : CMC conception and kicker tests

Control software:

Each robot has an embedded powerful computer. On the operating system *Debian Linux*, a control software built in C++ by the team allows the robots to take good decisions and to locate themselves on the court by artificial vision, the whole in a way entirely autonomous and dispatched. Here are some images of the vision system and of the virtual environment used to view the scene.



Figure 4 : Omni directional vision system installed on each robot



Figure 5 : Virtual environment working in real-time and in simulations

Robofoot Group's Development Team

The project team is composed of graduate and undergraduate students in electrical, computer and mechanical engineering. Many students are continuously recruited. Here is a list of the current members on the team:

Voluntary students:

- Julien Beaudry (director, grad., electrical)
- Sylvain Marleau (grad., electrical)
- David Lalonde (undergrad., electrical)
- Pierre-Yves Mailhot (grad., mechanical)
- Liko-Paul Pinsonnault (undergrad., physical)
- Louis-Alain Larouche (undergrad., mechanical)
- Julian Choquette (undergrad., mechanical)
- Martin Arcand (undergrad., mechanical)
- François Savard (undergrad., computer)
- Pierre-Marc Fournier (undergrad., computer)
- Frédéric Genest (undergrad., mechanical)
- Mathieu Lamarche (undergrad., electrical)

Scientific support :

- Richard Hurteau (Professor in Electrical Engineering Department)
- Richard Gourdeau (Professor in Electrical Engineering Department)

Technical support :

- Richard Grenier (electrical engineering technician)
- Jean-Sébastien Décarie (computer engineering technician)





Projected Budget for the Next Season

INCOMES

<i>Financial assistance from École Polytechnique (to confirm)</i>	39,6%	28,500 \$
<i>Donor partners (to find)</i>	44,4%	40,000 \$
<i>Government programs and contests (to find)</i>	5,56%	4,000 \$
<i>Equipment sponsorship (to find)</i>	10,42%	7,500 \$
TOTAL		72,000 \$

EXPENSES

<i>Competition fees</i>	22.9%	14,100 \$
<i>Robots' upgrade 2004-2005</i>	21.0%	13,000 \$
<i>New player development 2005-2006</i>	40.8%	25,200 \$
<i>Development tools</i>	8.9%	5,500 \$
<i>Promotion and others</i>	6.3%	3,900 \$
TOTAL		61,700 \$



Contact Us

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