

Roboka Contest: Programming Virtual Humanoid Robots on the Internet

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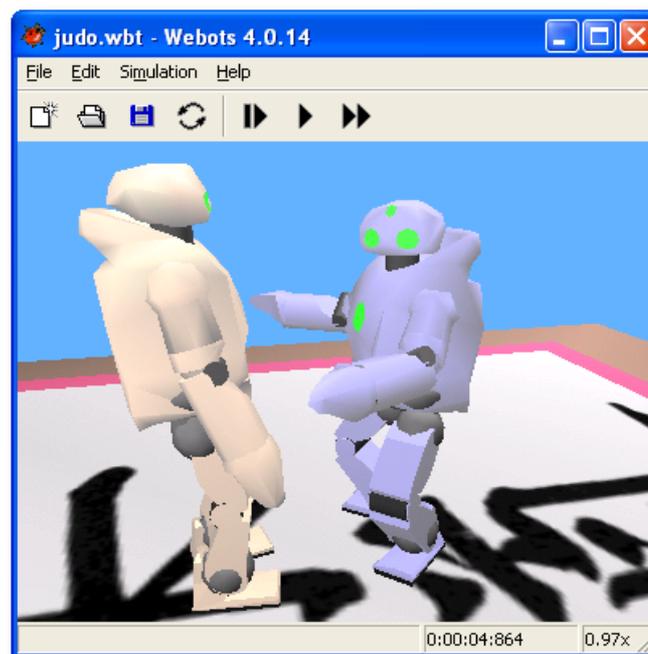
Abstract

The Roboka Cyber Robot Tournament is an international humanoid robotwrestling competition held on the Internet. This competition is open to anybody interested and is free. The goal of this programming contest is to share our passion and knowledge about robot controllers in a competitive and amusing physics-based robot simulation environment. In this way, challenging scientific work is much more enjoyable and can be compared in a fair competition. With only a basic Java knowledge, anybody can enter the competition. No special robotic skills are necessary to get started. Just register, program your controller and post it to your account. Every day at 14:00 (Central European Time) the competition is started with your actual controller. You can watch the tournament live or download the matches later. The Hall of fame keeps you informed of your actual position in the competition.

1. INTRODUCTION

1.1 GENERAL

The Roboka contest is a robot programming contest held on the Internet. It uses a free version of the Webots mobile robot simulation software [1]. This contest is organized by Cyberbotics Ltd. and co-sponsored the Robot-CH association, the BIRG research group (EPFL), K-Team SA and the EURON European Robotics excellence network. It follows the four other robot programming contests organized in 1998, 2000, 2002 and 2003 by Cyberbotics Ltd.



1.2 FOCUS

Research and development in humanoid robotics has recently achieved spectacular results in both universities and industry. Humanoid robotics remains however a challenging research area, especially at the motor control level and the artificial intelligence (AI) level. The most fascinating issues include generating efficient and robust walking gaits, coordinating servo motors with sensors, performing image processing, handling human interaction, etc. The goal of this programming contest is to investigate the best suited control and AI techniques to apply to a humanoid robot engaged in a Robot wrestling game.

As Robot Soccer proves to be an interesting challenge for fairly simple mobile robots with many contests organized worldwide, Robot wrestling appears to be more suited for more complex humanoid robots. Robot wrestling involves two humanoid robots facing each other. As in real wrestling, the goal for each robot is to make the other robot fall down on the floor. This exercise requires the use of many interesting robotics techniques, including vision to locate the opponent, motor control to move towards the opponent, AI to choose the best action to desequilibrate the opponent, to fake, anticipate or avoid an attack.

As real humanoid robots are currently pretty expensive, a model of a humanoid robot is provided in the Webots mobile robots simulator. This model uses real time physics simulation to provide realistic movement and collision detection. Moreover, robot models include several simulated sensors, like cameras, distance sensors, touch sensors, inclinometer, etc.

1.3 CAUTION

Although wrestling is still sometimes considered as a martial way rather than a sport, we do not aim at developing warrior robots. Rather, we consider Robot wrestling as an ideal sport or framework for developing dexterous and clever bio-inspired humanoid robots that will prove to be useful and friendly to human beings. Any roboticist should never forget Isaac Asimov's three laws of robotics:

- A robot may not injure a human being, or, through inaction, allow a human being to come to harm.
- A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

1.4 SUBSCRIPTION

Subscription is free and open to anyone at any time until May 9th, 2005. However, earlier subscriptions are highly recommended. Subscribers will receive a special version of the Webots mobile robot simulator containing a model with couple of humanoid robots on a wrestling tatami. Online subscription facilities will be open from May 1st, 2004 at roboka.org

1.5 SCHEDULE

Beginning of the contest: May 1st, 2004.

End of the online contest: May 9th, 2005.

Finals: May 21st 2005 at Yverdon-les-bains, Switzerland, during the Swiss Robotics Days.

2. RULES OF THE GAME

Each competitor must:

- 1 Register a robot name to obtain an Internet directory where he/she will be able to upload his/her controller files.
- 2 Download and install the free version of [Webots](#) containing all the contest material (robot models and tatami). This software runs on Windows, Linux and Mac OS X.
- 3 Develop a Java control program driving the provided model of humanoid robot to perform a wrestling match. Such a program should process sensor information (camera, distance sensors, touch sensors, etc.) and control the servo motors of the robot.
- 4 Submit your Java control program (.jar file) into your Internet directory.
- 5 Watch the competition running online using [Weview](#) and analyse the behavior of your robot.
- 6 Improve your robot controller and go back to point 4.

Each competitor (i.e., physical person) can have at most one robot engaged in the contest.

Every business day, a round is played and the [hall of fame](#) is updated. The hall of fame is a table consisting of n lines. On each line contains a rank (the topmost line is rank 1, the second line is rank 2, then 3, etc.), the name of the robot and some other information on the robot (author, country, description, etc.). The hall of fame is initially empty. Each new competitor enters the bottom of the hall of fame. For each robot in the hall of fame (except the first one), the following algorithm is applied: This robot plays against the robot lying just above it in the hall of fame. If the first robot wins, then the two robots swap their position in the hall of fame. Matches are performed from the bottom up to the top of the hall of fame. For example, if the hall of fame looks like this:

```
#1 SuperBot  
#2 Jumpy  
#3 Judoka
```

Judoka plays against Jumpy. If Judoka wins, Jumpy and Judoka swap their positions and Judoka, as of new #2, plays against SuperBot. Then, if SuperBot loses, it falls down to rank #2, leaving rank #1 to Judoka. Hence with this scheme, it is possible from any robot to reach rank #1 in a single round, while it is not possible for any robot to lose more than one position.

A match is a simulation run with two robots on a tatami. A robot can win the match at any time if the other robot falls down. A robot is considered down only if its height (Y) drops below 0.5 for more than 5 seconds. If after 2 minutes, no robot has won, the match is over and the winner is the robot which reached the farthest point away from its initial position.

The finalists will be the robot ranked #1 to #4 after the last round to be played on May 9th, 2004. Their authors will be invited to the finals in Yverdon-les-bains, Switzerland to attend the finals. The winner will receive a Hemisson robot offered by K-Team SA and a Webots PRO package offered by Cyberbotics Ltd.

4. CONCLUSION

This contest had over 37 teams competing over a several months. Impressive results were achieved throughout the co-evolution of the robot controllers. Interesting vision systems, locomotion schemes, and strategies have been developed. We hope this could contribute to motivate students and researchers to get interested in complex mobile robotics systems. We plan to renew this contest, introducing a few improvements mainly about the realism of the simulation. So, if you are interested to enter the next edition of this contest, stay tuned on <http://roboka.org>!

ACKNOWLEDGEMENTS

This contest was organized thanks to the support of a large number of people and organizations. We would like to thank Prof. Auke-Jan Ijspeert and the BIRG group at EPFL for supporting this project from the beginning. We would also like to thank our sponsors: K-Team SA, Cyberbotics S.à r.l., the ROBOT-CH association and the European Robotics Research Network. Thanks to the students who helped us developing this great project: Stéphane Mojon, Muhamed Mehmedinovic, Jean-Philippe Egger. And at last but not the least a great thanks to all the people involved in this contest as competitors!

REFERENCES

- [1] Olivier Michel, "WEBOTS: PROFESSIONAL MOBILE ROBOT SIMULATION", in Journal of Advanced Robotics Systems, vol. 1, number 1, pp.39-42, 2004.

ABOUT THE AUTHOR



Olivier MICHEL

Dr. Olivier Michel is the founder and CEO of Cyberbotics Ltd. He received a PhD from Nice University (France) in 1996 and worked as a postdoc researcher in LAMI at the Swiss Federal Institute of Technology in Lausanne from which he created Cyberbotics in 1998. Cyberbotics developed the Aibo robot simulator for Sony and is now developing Webots which has become a reference software in mobile robot prototyping and simulation used by over 200 universities and research centers worldwide.