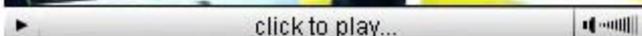
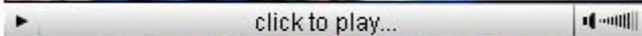


Team NimbRo Wins RoboCup 2007 Humanoid Soccer

Submitted by dsk on Sun, 2007-07-08 13:29.

Team NimbRo of the **University of Freiburg** today beat last year's champions **Team Osaka** in the kid-size humanoid soccer competition at RoboCup 2007! NimbRo's robots Jurgen and Lothar beat Team Osaka's VisiON 4G robots 8-6. See our [video](#) page for more of the highlights.



Interview with TEAM NIMBRO – DR SVEN BEHNKE

Submitted by mzk on Sun, 2007-07-08 14:19.

The following is our exclusive interview with the winner of the kid size league of RoboCup 2007

RoboCup Atlanta, Jul 06 2007

Waziwazi- What improvements have you made on your robot since last years competition?

Dr. Behnke- *My team constructed new robots this year's competition. We have actually five new robots. Two are for the teen sized class. One large one, she is called Robotina. She is kind of the larger sister of Robotinho. She is 122cm high, has 21 joints and is kicking penalties good right now. We also have a new teen sized goalie; he is called Bodo. He is about 80cm tall and is much lighter than Robotina. We did not want her to be the goalie, so we constructed a lightweight goalie. An improvement is also that these robots have a much more powerful computer inside now. They have a real PC, three industrial cameras, so they have a very high frame rate vision now and also can look in three directions now, so they have an omnidirectional picture of the world around them. The*

same technology is used in the kid-sized class with three new kid sized robots. They are called Rudi, Jurgen and Lothar.

Waziwazi- When developing your strategy for the RoboCup competition, do you incorporate methods from your Machine Learning Research?

Dr. Behnke- *We do apply machine learning; for instance, for optimizing gaits of the robots or for learning how to classify the ball and distinguish it from other objects that may be orange and on the field. So there are different parameters or modules of the programs that are improved by learning, but it is not possible to put a robot on the field and tell it how to play soccer. There are too many parameters to optimize and so many hand coding and also tuning of parameters necessary, but machine learning is active in some parts of the code.*

Waziwazi- In the 2004 RoboCup you modified a Robosapien for the competition. Did that influence the Gait used in your future robots?

Dr. Behnke- *The robosapien is a very unique design. It has very heavy feet with batteries inside, but it is still able to walk with very low energy, because the upper body swings like a pendulum. We followed a similar approach with our robots although the center of mass is much higher in our robots. They still have a very dynamic kind of balance. If you compare our gaits to other static gaits that you see here from other teams, it is a much more dynamic equilibrium that our robots have.*

Waziwazi- What did you learn from your research with your Robot Tony? And how will you apply that information in the future robots?

Dr. Behnke- *The robot Toni's special feature was a toe-joint and using this joint it was able to over extend it's leg to push it's self when it was shift the weight from the trailing leg to the leading leg. This is very useful for energy efficient human-like walking, but it is most useful for walking forward. In the RoboCup it is most important that the robot can move in all directions, it is called omnidirectional walking. We have special drives for the wheeled robots, also the four-legged robots are able to walk in all directions and our robots also have an omnidirectional gait. So the robots can walk forward, backward, left, right, and turn on the spot. For this we need a more flexible gait, the toe-joint would be more useful for walking forward. Right now we don't have toe joints on the robots, the main reason is that we really have to have a good reason for every joint that we put on the robot because it makes it more complex and more expensive. Just walking forward is not good enough for the RoboCup.*

Waziwazi- What is unique about your approach in designing robots?

Dr. Behnke- *We relatively inexpensive standard components that are also thought to be applied to smaller robots and we have built large robots from these components. Other teams use industrial robot components to build their large robots. They are much more expensive and maybe they are more precise, but this is really not necessary. On the other hand the components that we use are very lightweight and also the structure of the robots is extremely lightweight, so that we have robots that are easy to handle and that can survive a fall because they are so lightweight.*

Waziwazi- Which of the Robots are you most impressed with?

Dr. Behnke- *Team Osaka also constructed new robots and I am very impressed with their teen-sized robot. It sounds a little bit like steam engine but it walks in a very solid way.*

Waziwazi- Looking 10 yrs down the line, what do you expect to achieve in your robotics research? What is your vision?

Dr. Behnke- *Of course robots to be able to perform in more general environments than soccer fields. Soccer induces complex environments and color markings and we want to learn and apply technologies in household environments. My group also works with intuitive multi-model communication with people, things that could be useful for people like RoboCup at home...but we are targeting the museum guide application at this moment. Having such tech for the household will be very helpful.*

Waziwazi- Does the German culture readily embrace robots?

Dr. Behnke- *Right now I don't think this is the case. There are industrial robots to put together parts to produce automobiles, so it is readily accepted and there are automatic machines in the household like dishwashers and washing machines. But the Japanese culture is more accepting to human aid robots and maybe elderly care, everybody says I want to have human to take care of me as I am not able to take care of myself, but there are not as many humans who want to do this job. Maybe being dependent on another human is not as desirable as being dependent on some machine because you do not owe anything to a machine.*

Waziwazi- What role do you see Humanoid robots in Germany playing in the future?

Dr. Behnke- *I think in the near future this is pure research and I see some market for entertainment. The Sony Aibo was a success and the Robosapien was success and if there was a more complicated humanoid robot maybe like the Qrio, I could see also a successful market for this. But humanoid robots are the most complex robots so the market will be there for much simpler service robots like lawnmowers and carpet-cleaning machines.*

Waziwazi- As Robots are developed further and are able to take on more tasks that were previously performed by humans, how will that influence a society whose structure is based on a working class hierarchy?

Dr. Behnke- *Well, of course the machines will be placed very low in the hierarchy and society changes, so for instances the washing machine gives me more time because I don't have to stand there and wash my clothes, but there are many tasks that are still available for humans and these are more interesting tasks.*