

# RoboCup 2009

**GRAZ** June 29 - July 5 2009  
Stadthalle Graz  
www.robocup2009.org



## Introducing Nao: The friendly two-legged robot with a heart of electronics plays football at RoboCup 2009

### The autonomous robot is looking for goals in the Standard Platform League

Although making his debut for the RoboCup this year, one thing is clear: Nao will definitely conquer the hearts of the spectators! 58 centimetres tall, a white-red or blue humanoid body reminiscent of an astronaut, and two spherical eyes which flash in alternating colours. But despite the charm, he's a highly intelligent, autonomous robot whose abilities will be put to the test in the Standard Platform League of the RoboCup 2009. With his appearance in the RoboCup, the two-legged Nao will relieve Sony's four-legged "Aibo" who is going into a well-earned retirement after a successful RoboCup career.

He can smile, stick his head out to the side in a cheeky sort of way, and for a short moment you can almost forget that he's a robot and not a human. Nao is one of the highlights of robotics research. He's a very impressive autonomous robot – not just because of his design, but also because of his abilities and applications. In the RoboCup 2009 in Graz, he'll play in the Standard Platform League for the first time – this is where teams play football against each other using the same robots.



Nao: friendly player in the Standard Platform League (© TU Graz/Frankl)

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### Intelligent and amiable

Nao, who was originally presented as an entertainment robot in his first version in 2005, comes from "Aldebaran Robotics", a French robotics company. The "fun robot" was made into a valuable partner for robotics research and teaching in the "Academics" and "RoboCup" editions.

Based on a Linux platform and freely programmable, Nao has an abundance of application possibilities and features. With an integrated computer and WLAN function, he can establish a secure internet connection and upload and download data. Nao can recognise and localise voices, reproduce any manner of sound via a sound system, record and send photos and videos, recognise faces and coloured objects, and he can vocalise a variety of texts by means of text-to-speech function, such as emails which have been sent to him directly. And of course he can move. Thanks to 25 degrees of freedom, in other words axis movements, Nao can carry out plenty of movements. He can walk, sit, stand up, turn round, reach out to objects with his hands, turn his head, dance, kick and avoid obstacles. All by himself and completely autonomously.

### Nao – Technical Data

#### Body and Multimedia

58 centimetres high  
4.3 Kilos  
Two loudspeakers  
Four microphones  
Two digital cameras

#### Mobility

25 different possibilities of movement  
Inertia sensor for high stability  
Sonar for recognising obstacles

#### Design

Thomas Knoll and Erik Arlen

#### Software

Linux, Windows XP, Mac OS X  
Programmed in URBI Script, C, C++, Python

#### Interactions

Integrated computer and WiFi connection  
Voice recognition  
Face recognition  
Speech synthesis  
Internet connection for downloading and broadcasting  
Text-to-speech function from e.g. text messages, emails, books, newspapers, etc.

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