



The individual robots can perform different functions in the game, such as the position of defender, striker or goalkeeper.

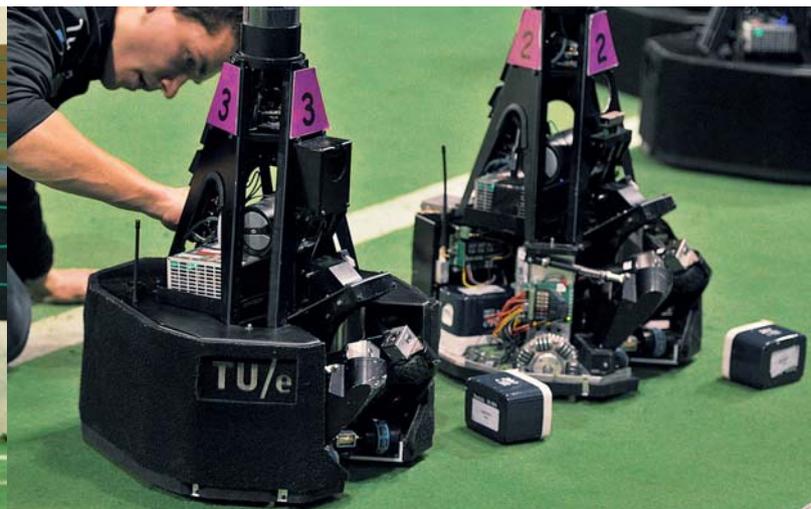
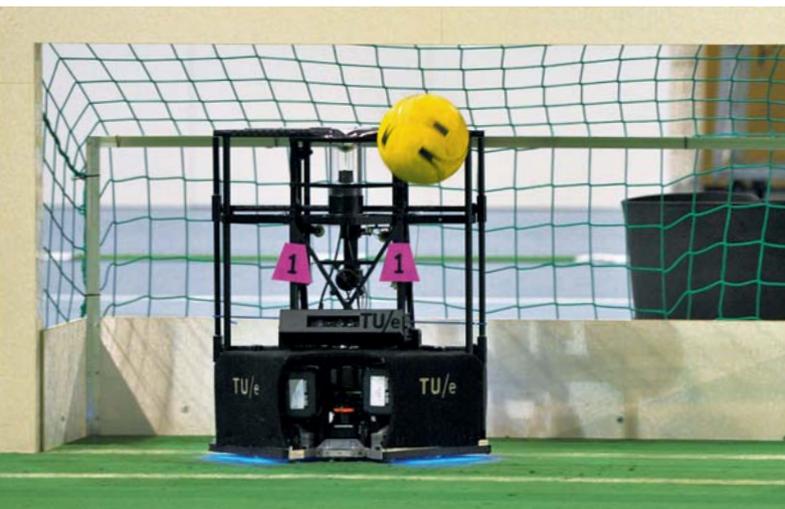
EtherCAT "Turtles" from "Tech United" win RoboCup 2012 world championship

Dutch RoboCup team wins world championship

At the 16th RoboCup world championship, which took place from June 18 – 24, 2012 in Mexico City, the footballing robots from the Dutch team "Tech United Eindhoven" won the title in the Middle Size League. After four second places finishes in recent years, Tech United became world champions for the first time at the annual technology championship.

The goal keeper is a specially designed robot that is equipped with special software – and EtherCAT-capable.

The football robots contain a Beckhoff Embedded PC from the CX series, which controls the drives and all other functions via EtherCAT.



The RoboCup world championship takes place annually at different locations. The meetings, at which teams compete with each other, are attended by around 2000 scientist and students from around the world. In parallel with the contests a congress takes place, at which new scientific findings on artificial intelligence and robotics are exchanged.

At the final of the RoboCup world championship, the Dutch Tech United team met the Iranian MRL team. The robots from Tech United, equipped with EtherCAT, led 2-1 at the break. In the second half Tech United extended their lead to 4:1 for a comfortable victory.

Six players make up a team in the Middle Size League, the largest and fastest class in the RoboCup competition: the maximum speed is around 4 m/s. Each of the three-wheel robots weighs about 35 kg and operates completely autonomously and without remote control.

“Tech United” from the Netherlands wins world champion title

The team “Tech United” from the university of Eindhoven, who were already European champions several times, made it to the final of the RoboCup world championship for the fifth year running: “Tech United” played in the final every year since 2008 but was ultimately beaten



The Tech-United team celebrates its first world championship title at RoboCup 2012 in Mexico City.

every time by the teams from Portugal, Germany and China. All the more reason to celebrate when the team won the world champion title in Mexico: The numerous night shifts, with tests of the “Turtles” in hotel rooms and last-minute firmware updates, paid off.

The EtherCAT “Turtles” have mastered the new rule which stipulates that the robots must not dribble the ball across the center line, but cross the line with a pass. It has now paid off that “Tech United” was

the first robot football team to introduce direct passing of the ball during the German Open in 2010. The passes were placed precisely and exactly, with many scoring opportunities during the match. Another rule change was typically Mexican: the sombrero, a flat plate on the head of the “Turtles”, with impedes lob-balling. Precise passes based on clear communication between the robots were the key factor that ultimately led to victory.

Motion control and data acquisition with EtherCAT

In the league of medium-sized robots two teams of up to five robots play on a 18 x 12 metre indoor playing field. Each robot has sensors and an on-board computer for analysing the current match situation and possible opportunities. The “Turtles” use EtherCAT for data acquisition and motion control: Sensors, actuators and motion control loops use ultra-fast Industrial Ethernet.

The robots cooperate with each other and receive the referee’s instructions wirelessly via radio signals. Human interventions are only allowed to substitute players. The robots play fully autonomously, i.e. they develop their own tactics and cannot be coached during the match.

Still a long way off:

robots compete with national football teams

Over recent years research in the football robot league has made remarkable progress. Only a few years ago the main sections of the playing field were still colour-coded, in order to facilitate orientation. Today only the ball is coloured, goals only count if they are scored from the opponents’ half of the field, and the ball must cross the center line with a pass.

Such modifications of the competition rules, which lead to new challenges, ultimately serve to realize the big RoboCup goal: By 2050 the intention is to assemble a team of fully autonomous, humanoid robots that can win against a human football world cup team.

The automation components of the Tech United robot are sponsored by Beckhoff and IAL, the Dutch Beckhoff distributor: EtherCAT is used as the interface for the drives, sensors and actuators. A compact control cabinet Industrial PC from the Beckhoff C6920 series forms the hardware platform.

Further Information:

www.techunited.nl

www.robocup.org

www.ial.nl