

A Keen Eye for the Game

Soccer Robots become Double World Champions with Cameras from IDS

World Champion at last – at least in robot soccer! At the RoboCup 2007 held in Atlanta/USA from July 1 to 8, the NimbRo team of the University of Freiburg, Germany, won the soccer competitions in both the TeenSize and KidSize classes of the Humanoid League, taking two championship titles home to Germany.

Featuring artificial eyes from the uEye® camera series from IDS, powerful machine vision laid the foundations for this success.

The RoboCup is one of the most prestigious robot competitions in the world. This year 29 teams from 14 countries participated in the "Humanoid League." In this league fully autonomous robots with a human-like body and human-like sensing compete in soccer matches. The ambitious long-term goal of RoboCup is to develop a robot team that can win against the human world soccer champion team by the year 2050.

The successful robots from Germany have been developed by the Department of Computer Science of the University of Freiburg and use cameras from the German machine vision specialist IDS Imaging Development Systems to emulate human eyesight. For this purpose each humanoid has three USB cameras from IDS's uEye® LE series, equipped with extremely wide-angle lenses to achieve the necessary all-round vision. The recorded images are transmitted via USB to a 1.3 Ghz mini PC built into the robot's torso. There they are processed at a frame rate of 30 fps. From the image analysis data and the signals of a tilt sensor, the computer decides the appropriate response behavior and controls the approx. 20 joints that are needed for the robot's running, kicking and stand-up motions.

IDS has designed the uEye® LE camera series with USB 2.0 interface to meet a wide range of applications. The development focuses on the requirements of e.g. microscopy, security technology and non-industrial image processing. Various monochrome and color models with CMOS sensors and resolutions from 752 x 480 (WVGA) to 2560 x 1920, i.e. 5 megapixels, are available. They are provided either as board-level versions with or without lens adapter or as a version with a CE-Bcertified plastic housing.



Special project-specific designs are additionally available on request. Besides drivers for Windows and Linux the cameras ship with a comprehensive software package: Over 20 demo programs complete with source code make the cameras easy to integrate into the specific application. Interfaces for all standard machine vision programs are also offered, e.g. ActivisionTools, Common Vision Blox, HALCON, LabVIEW or Neurocheck.

Equipped with these cameras, the NimbRo team from Freiburg showed an excellent performance in Atlanta, winning two World Champion titles. In the TeenSize class (2'2"-4'3"/65-130 cm), robotlady Robotina - 4 feet tall and weighing about 20 lbs - and her goalkeeper Bodo won the penalty kick competition against the PAL Technology team from Spain. In the KidSize category (< 2' /60 cm), the robots Rudi, Jürgen and Lothar defeated the defending champions Team Osaka from Japan. The NimbRo robots succeeded above all through their solid tackling skills and strong teamwork. The thrilling match ended with a score of 8-6 and can be watched on the project web site at www.NimbRo.net.

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