Team Description Paper 2013

Nao-Team HTWK

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1 About the Team

The Nao-Team HTWK is a RoboCup team that consists of graduate and under- graduate students of Leipzig University of Applied Science and was founded in February 2009.

The team participated in RoboCup German Open 2009 for the first time and immediately reached the second place as well as the first place in the Technical Challenge of RoboCup 2009. In 2010 the Nao-Team HTWK reached the Quarter finals and the first place in Open Challenge during the RoboCup in Singapore, while achieving a fourth place at RoboCup 2011 in Istanbul as well as Robocup 2012 in Mexico City.

2 Team Members

Nao-Team HTWK 2013 includes 11 student members from the Department of Computer Science, Mathematics and Natural Sciences:

Rico Tilgner, M.Sc., Student of Computer Science
Thomas Reinhardt, M.Sc., Student of Computer Science
Tobias Kalbitz, M.Sc., Student of Computer Science
Stefan Seering, B.Sc., Student of Computer Science
Robert Fritzsche, B.Sc., Student of Computer Science
Samuel Eckermann, B.Sc., Student of Computer Science
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Martin Engel, B.Sc., Student of Computer Science
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Jonas Hinerasky, Student of Computer Science

3 Notable Work and Fields of Interest

3.1 Vision

The object recognition in Nao's camera image and identification of the field and objects on it is an essential part of playing soccer. The biggest problems for most color-table based methods are their inability to cope with changing light conditions and the need to generate the color-table, which can be very time consuming. Changing lighting conditions (e.g. between daylight and artificial light which is common at the German Open) make it impossible to classify objects solely based on their color. Also, differing ball colors (Robocup 2010) or unexpected carpet colors (Robocup 2011) pose another problem for purely color based methods. Therefore, a real-time capable segmentation with no need for calibration would be advantageous. By applying the knowledge of the objects' shapes

we developed a object recognition algorithm that can handle changing light conditions and colors robustly without the need for prior calibration.

An overview as well as an in-depth description of the method is available in [1] and [2] (in German) respecitvely.

3.2 Walking engine

Until the beginning of 2010 we used closed-loop walking motions evolved through a genetic algorithm. These motions were fast but not omni-directional (eventhough walking along a curve was possible). This was a big disadvantage at the German Open 2010, so we decided to develop a completely different walking engine. Our walking engine, introduced in Robocup 2010 and refined in the following years is based on a parameterizable walking model and is supported by a newly developed balancing algorithm. The big advantage of this system is full omni-directional capability and the ability to make fast direction changes whilst still being very stable.

The new walking engine was tuned for stability and speed manually and achieves forward speeds in excess of 300 mm/s.

References

[1] Nao-Team HTWK. Team Research Report 2011. Technical report, HTWK Leipzig, 2011.

[2] Thomas Reinhardt. Kalibrierungsfreie Bildverarbeitungsalgorithmen zur echtzeitfähigen Objekterkennung im Roboterfußball. Master's thesis, HTWK Leipzig, 2011.