

Nao-Team HTWK, Open Challenge Description: Robust vision without calibration

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In the open challenge we present a new method of segmentation of Nao's camera images.

This method does not need any predefined color calibration, instead objects are recognized by their shape.

This eliminates the need to generate color tables, which usually is a very time consuming process that needs to be redone whenever something changes. The algorithm is robust in changing light conditions, which we were able to show with a preliminary version at the GermanOpen 2010.

The venue for the GO2010 had windows directly above the playing field, so there were differences in both light intensity and temperature between sunny, cloudy and nightly conditions. However, we were able to play and recognize fieldlines, goal posts and the ball without any changes to the segmentation.

As seen in the Robocup2010 games

so far, differing ball colors have been an issue for many teams. With our segmentation method, we are able to exchange balls of different red and orange shades while playing without interrupting the recognition.

Also, the method allows for a simple visual obstacle and field border recognition. This eliminates wrong positives outside the field.

The algorithm works in real-time (less than 20 ms) on a full resolution image (640x480 px, YUV422). It therefore is able to outperform our old color-table based segmentation from 2009 and is used in the games played at Robocup 2010 in Singapore.

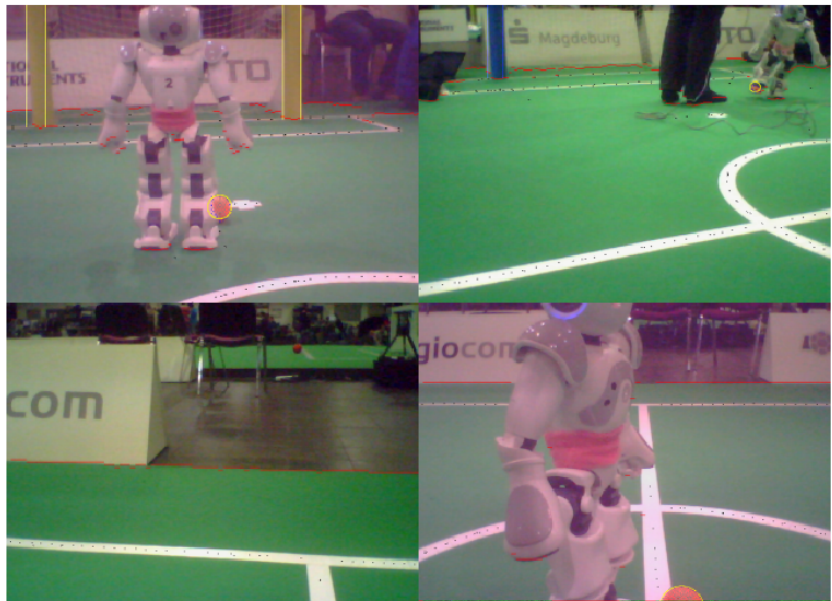


Figure 1: 4 images captured at the Robocup GermanOpen 2010 in Magdeburg at varying light conditions (day/night). Recognized objects are labeled as follows:

Ball: yellow circle, **Field line candidates:** black dots, **Goal posts:** vertical lines (yellow or blue), **Field border/Obstacles:** red lines