

B-Human: Open Research Challenge Proposal

Abstract. In recent years, the B-Human team continuously increased its research towards applications of Deep Learning in the SPL. While a ball detection based on Deep Learning appears to be state of the art, the detection of other robots is not very common among other teams. In this year's Open Research Challenge, we are aiming to demonstrate recent results in ball and robot detection. We propose a setup of three robots, in which one robot (referred to as the *player*) is taken its ability to visually perceive the environment. The *player* will score a goal just based on the communicated perceptions of its two teammates (referred to as the *observers*).

1 Course of the Demonstration

The *observers* are each placed at the two intersections of the center line and the side lines, looking towards the center circle. The ball is placed somewhere in the opponent half, for instance at the penalty mark. Finally, the blindfolded *player* is placed with random position and rotation inside the center circle by a volunteer to be selected from the spectators.

All robots are started through the chest button interface. The *observers* will move freely around the field to take useful observing poses and to estimate the pose of the *player* and the position of the ball. This information is transferred wirelessly to the *player*. For this challenge, we probably need to increase the limit of messages per seconds from one to five. The *player* merges the percepts it receives from the *observers* into an estimate of its pose and the ball position. Based on that, it aims to walk blindly towards the ball and attempts to score a goal. In case the ball is shot over the side lines it will be placed back on the field. In the case a robot leaves the field it will be placed back to its initial position. A possible constellation that could occur during the demonstration is depicted in Figure 1.

2 Research

Like many other teams, B-Human uses a ball detection implementation that involves the neural-network-based classification of candidate regions. Recently, we developed a full robot detection based on Deep Learning as well as an implementation for fast inference of deep networks on NAO robots. Both developments, which provide the perceptual base for our Open Research Challenge demonstration, will be presented in detail at the RoboCup Symposium 2019. Another research topic, which has always been of interest for our team, is fast and precise state estimation. By applying multiple probabilistic filter techniques, we are capable of fusing all information with the required precision.



Fig. 1: A possible constellation during the demonstration