Kouretes 2012 SPL Open Challenge
Information Sharing through Visual Signals

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Motivation

It is easy to observe that any kind of communication between players in the Standard Platform League (SPL) currently relies solely on the wireless network. This is, however, an artificial communication channel, missing in real soccer games, whereby human players exchange and share information using audiovisual signals they generate. The key question we tried to address is the following: How could Naos exchange and share information, if there was no wireless or any other kind of network in the SPL field? Could they use the physical world?

Description

As a first step towards audiovisual communication, we consider the problem of generating an intuitive visual signal for sharing information about the most important element in a soccer game: the current position of the ball in the field. A robot having direct visual observation of the ball can assist its teammates by generating a visual signal that reveals the current position of the ball. The most natural and intuitive visual signal one could imagine is to fully extend one of the two arms so that it points directly to the ball. Another robot could visually receive this signal through its camera and use the vector defined by the first robot's arm to pinpoint the position of the ball. Note that this kind of information sharing about the position of the ball does not require any kind of localization of the two robots in the field or relative to each other. Furthermore, such a visual signal could be used for directing attention to any desired position or object in the field; a lead player could direct a teammate towards a certain position in the field and a future robot referee could easily point out the player that was penalized or the place where the ball went out of bounds!

Demonstration

During demonstration, our Nao robot will continuously generate a visual signal indicating the precise position of the ball in the field, not just the correct direction, even if the ball is moving or becomes temporarily invisible. This demonstration requires a tight coordination between vision and kinematics and will be supported by our work on reliable visual ball perception for estimating the exact ball position and our analytical derivation of the full inverse Nao kinematics for setting the joint angles so that the arm points directly to the ball with precision.