Kouretes 2013 SPL Open Challenge
Team Formation and Role Assignment

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Motivation

Coordination among robots on the same team is crucial for RoboCup games. This is stressed by some technical challenges of the Standard Platform League, which aim at encouraging research towards team coordination. Examples include the Drop-In Player Challenge in 2013 and the variations of the Passing Challenge in 2013, 2010, 2009, 2007, and 2006. As individual player skills are quite amazing in SPL, more and more teams focus on demonstrating similar skills at team level.

Description

Our coordination method offers mechanisms for team formation and role assignment. The desired formation of the team in the field is determined dynamically depending on the current position of the ball in the field. Specifically, the formation type (offensive, defensive) is determined, depending on which half of the field the ball lies in, and a number of candidate positions that represent special roles (supporter, attacker, defender, ...) is generated. The assignment of roles to robots relies on a team utility function to evaluate mappings of players (robots) to positions (roles) and decide which mapping is best for the current game situation. This parametric utility function combines a variety of features: distance of a robot from a candidate position, desired orientation at a candidate position, probability of collision with other robots given a target position, a global field scoring function, and a measure of robot health/stability (hinted by the number of times a specific robot has fallen or has been penalized).

Demonstration

During demonstration, three or four Nao robots will be placed in the field. A person will be asked to place the ball in the field, at a location where it is not visible by all robots. The robots will then communicate to share information and agree upon a certain formation and role assignment. Then, they will move according to the plan. Afterwards, the ball will be placed at a qualitatively different location, the robots will coordinate, and before they complete the new plan, the ball will be moved to yet another location. The robots are expected to switch to a new suitable plan. This demonstration relies upon the synergy of various modules: local state estimation (localization of self and ball), inter-robot communication, global state estimation (for fusing the local beliefs), formation generation, role assignment, role execution (behavior), and path planning.