The UTUtd2003 Simulator Team: Globally Computable Geometric Area

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Abstract. With regard to UTUtd2002 Team's policies, this year we have gone far in to advanced and contemporary studies in fuzzy evaluation technologies. In the following, we briefly introduce the main ideas in UTUtd2003 development. The low-level abilities employed in designing our team is mainly based on Tsinghuaeolus Team 2002.We have mainly focused on fuzzy action evaluation and selection algorithms as a proper conceptual framework of decision making. ...

1 Introduction

As mentioned in [1], the environment simulated by the soccerserver can not be considered as a reliable source of information. How to make decisions having this unreliable information has made robocup a challenging problem for researchers all around the world. Since the fuzzy set theory has been suggested as a proper conceptual framework of decision-making [3], we have mainly focused on fuzzy action evaluation and selection (FAES) algorithms [4]. Before delving into making the problem show us its delicate fuzzy viewpoints, we will define the 3rd dimension which will be used later. By 3rd dimension we don't mean bringing Z-axis to work but instead simulating it by assigning a probability function to all the points in the field in each cycle during the match, then every point in the field then shall be considered consisting of:

1. X
2. Y
3. Z = P(X,Y,A)

Where 'A' is the action to be done on that point in a given cycle. This helped us a lot in devising the entire system.

2 Globally Computable Geometric Areas

The main problem is that in every given cycle during the match each agent, having ball or looking for it, has to perform the best action he can. The main point to consider is that any selected action will not be suitable just for the agent itself but also, in a rather more important degree, will be appropriate and useful to other agents around him by providing them situations to approach their time-critical goals. This can come true considering Globally Computable Geometric Area. Assigned to each high-level action, like passing or shooting, there are some global parameters, which mean variables that are the same for every agent in the field. Based upon these global parameters, each agent can construct the desired Geometric Area independently for each action. This would be interesting noticing that the constructed Geometric Area is almost the same for a given action in a given time for every agent on the field. We define the Geometric Area G for the action A, as a set of vertices in the field (expressed in a non-linear equation) that while in those vertices in the next 5 cycles, the action A will be accomplished successfully with a probability of 95non-linear equation and interpolating the achieved points we reach the desired geometric area that would be suitable for accomplishing the desired action.

3 Sample Applications of 3rd Dimension and Globally Computable Geometric Area

Taking into action the 3 rd dimension method and globally computable geometric area we can perform complex behaviors in field. Because of the space limitations and simplicity reasons, here we take a look at simplified versions of the shooting mechanism and passing system briefly. Then you can see how these two actions can be seen as a single behavior in the field by combining their involved parameters.

3.1 Shoot

Fig. 1 shows a situation that is very probable to happen in field. Relying on some very basic and simple computations, it will be obvious that agent A cannot make the ball pass through the goalie and score a goal. Here our global parameters consist of XY line, G(x, y) and a few more parameters which are provided for both A and B by their world model or via our saying mechanism. Thus the Geometry Area as shown in the Fig. 1 can be computed by both A and B independently. As mentioned above, here the geometric area would be the Fig. 1 region within which shooting towards a special point on the line XY would result in scoring with above 95% probability. Agent A does not find itself within the computed geometric area so it will send the ball to the first agent among its teammates which is in the area mentioned above, (agent B in this example). Note that in this example the shape of the area is chosen very simple for studying purposes and shall not be the same in reality.

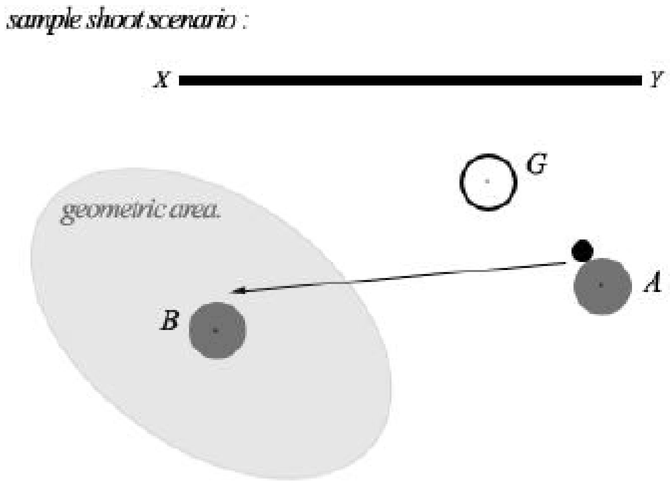

Fig. 1. Sample shoot scenario

3.2 Pass

Most of our passing parameters are based upon UTUtd2002 Team. But the old method has been enhanced in many ways by adding the new 3rd Dimension and Globally Computable Geometric Area .Considering the situation illustrated in Fig. 2, which is one of the most challenging situations where most of the teams do not show an appropriate behavior against this illustrated defensive system. The positioning of the opp.1, opp.2 and opp.3 are showing us a chain defending system in real football games which has its' origins in Italy. In such situations agent A can not make it pass through this defensive wall by passing directly to the agent B or by dribbling the ball among opp.2 and opp.3 in which they will get the ball easily. Our approach in such situations is to compute the geometric area based upon some globally accessible parameters. As a result both agents A and B know where the ball should be passed to be safe and out of reach of the opponents, so agent A will send the ball to a defined point within the region where agent B has already started dashing towards. With this system our offenders were able to easily make it pass through nearly all defensive systems in robocup. Weve shown a very simple computer region in Fig. 2

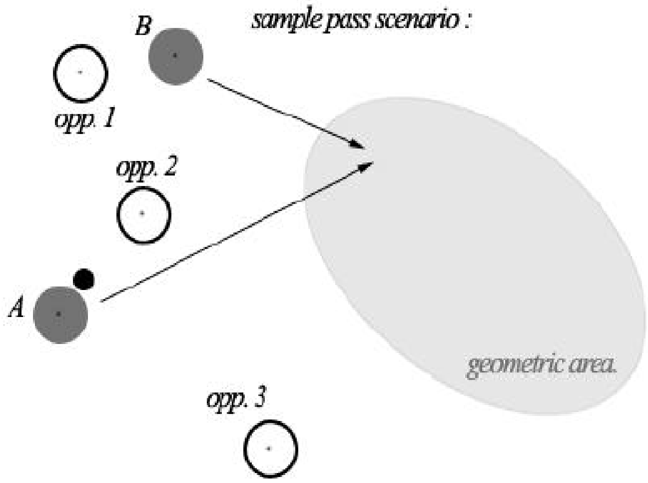

Fig. 2. Sample pass scenario

4 Future Works

After taking part in league for 3 years, we are now concerned about low-level skills of our team and are working to build or improve the necessary ones. Also it must be born in mind that working with a fuzzy decision making system like the one we have devised is a very time-consuming workout and even little changes in a parameter may result in a very big improvement or decline of a formula and also side affects on playing style and behaviors of all agents. We are also working on a method to integrate all behaviors of a team into a single fuzzy decision making system[4].

References

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