JMU 2D Team Description 2008

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Abstract. This paper presents mainly about the motivation and research focus of Jimei University 2D Team. JMU, as a simulation team, developed from JMU RoboCup Research Group whose aim covers both education and research, is the result of a project that belongs to Jimei University. We took part in China Open 2006 in Shouzhou and China Open 2007 in Jinan. We had exciting results in these tournaments.

Keywords: Robocup Fuzzy Math algorithms Neural Network algorithms

1 Introduction

JMU has developed on the basis of TsinghuAeolus team. After we had made progresses, we started to make researches on new algorithms. We have built a competent stimulation team with much effort on basic kills and agent architecture. The team has shown impressive skills in passing and kicking-off balls. In the decision-making module, we use Genetic algorithms mainly. And we also use Neural Network algorithms and Fuzzy Maths algorithms. It is a multifunctional system with multi-algorithm module. Based on these algorithms, we project the multi-agents.

In the Section Two, we introduce the Neural Network algorithms and Fuzzy Maths algorithms in the decision-making module. Section Three gives a description of the features of our team. Section Four is an introduction of our world model. And Section Five presents some problems and our plan for future work.

2 Decision-making module

In order to process the information received during a ball-game in a more precise and perfect manner, JMU's (Jimei University) 2D simulator will be placed in constant motion, using the decision-making module to predict and interpret movements made by the players on court.

To achieve maximum co-ordination between players and then attack effectively during a ball-game, tactics need to be first strategised and ameliorated. And these will require accurate and real-time calculations done on-the-spot. JMU's 2D simulator will make use of Neural Network algorithms method mainly, combined with Fuzzy Math algorithms to programme out 'passing-routes' to be travelled by the ball.

2.1 The use of Neural Network algorithms and Genetic algorithms in JMU

In order to achieve the most advantageous attacking position during a game, the JMU will make use of Neural Network algorithms to process information selectively. Due to the time factor, the JMU will make use of Genetic algorithms to maximize the efficiency in its network calculations and to compensate for the time-lag in learning through the Neural Network algorithms.

2.2 Use of Fuzzy Math algorithm in predicting ball-routes

Theories of Fuzzy Math will be applied here to construct an overall view of the game-play. Via processing and making amendments to the mathematical functions involved, the best ball-passing routes are thus planned and predicted.

The main intelligent unit of our team is then constructed mainly based on the above mentioned calculations.

3 Special Features

3.1 Team formation and layouts

4-3-3 style formation is used in JMU's 2D simulator. This formation brings benefits to both the offending and the defending at the same time. Based on the design of BP neural network the focal points of fundamental formations identified. We have included single-layer-structured neural networking connected with 10 nodes in the simulator's programming and also BP networking with a very basic 4-10-2 layout. A formation class was initially created in our programme to achieve the fundamental layouts later on.

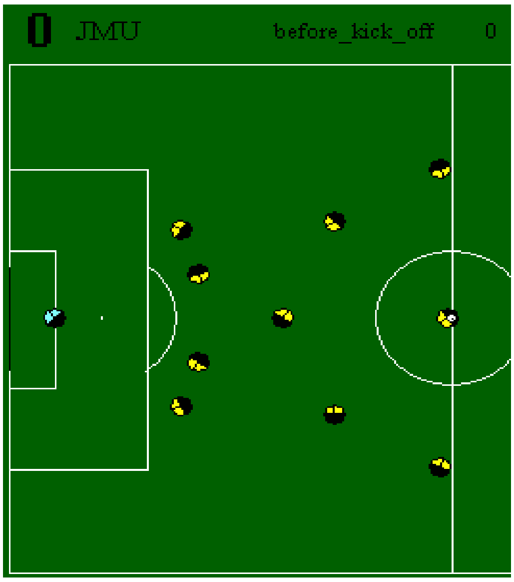

Figure 1. beginning formation of JMU

3.2 Useing human potential energy during an offence

In calculations done using human potential energy, a robot is first placed in a virtual dimension with both forces of repulsion and attraction co-existing. In this way, an attraction field is created pointing towards the direction of the target. And a repulsion field created pointing towards directions that are obstacle-free. As this form of calculation is simple and achievable, the JMU 2D player is able to acquire information regarding the game-play and in turn, generate opportunities of winning.

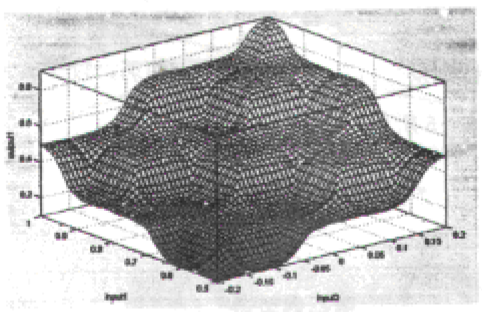

Figure 2 human potential energy analyze curved surface

3.3 Useing Geometry in improvising data downloaded

To make ball-passing between players more accurate, geometry is employed in amending the passing-routes planned beforehand. As geometric calculations can be done within a short interval, it is thus, extremely beneficial during ball-games where time is considered to be most crucial. Movements of the ball can be predicted and made known to players using geometric calculations before they decide where to head for the ball.

The diagram below is an illustration of how geometry is employed in correcting erroneous passes:

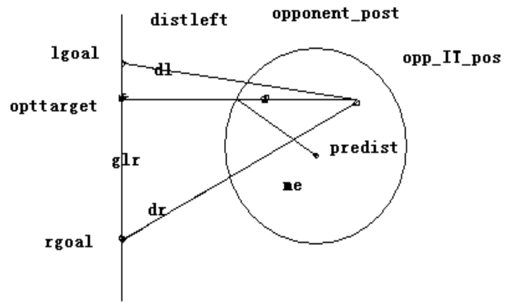

Figure 3 Geometry arithmetic in path program

3.4 Serves made by goal-keeper are of a higher efficiency

JMU goal-keeper is very smart and active. When a match is on, the goal-keeper always keeps its eyes on the ball. It is sensitive to the position of the ball, and it will move according to the position of the ball. When the ball is coming, it will rush towards ball quickly. As soon as the goal-keeper catches the ball, it will run to the corner of penalty area and shoot out the ball to the strikers. Therefore, we can try to avoid the 'serving crises' and decrease the chance of the opponents in scoring. We call it as 'efficient serving strategy', just as shown in Figure 4 **:**

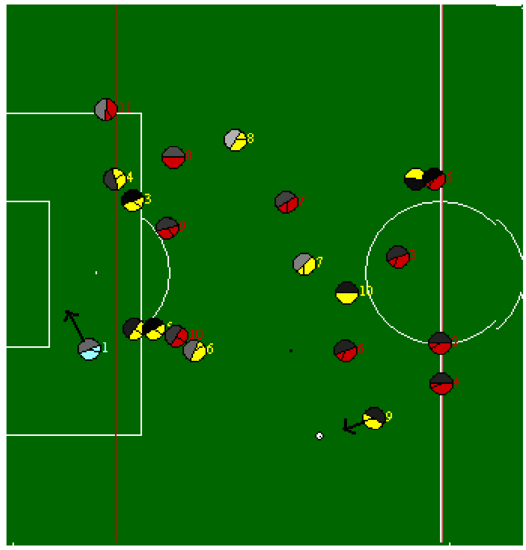

Figure 4. defending method

4 World Model

To achieve real time performance, we adopt a modular approach, which is shown in figure 3. In such a design, each action is implemented as a module and every module has a different priority. Agent starts with initialization, such as reading configuration files and initializing some variables. And then agent invokes two main loops. One is used for information perception and the other is the action-generating loop. The information perception loop receives environment information and builds a world model. Action-generating loop creates several schemes according to the world model and his role, makes decision after evaluating those schemes, and finally executes the best one of them.

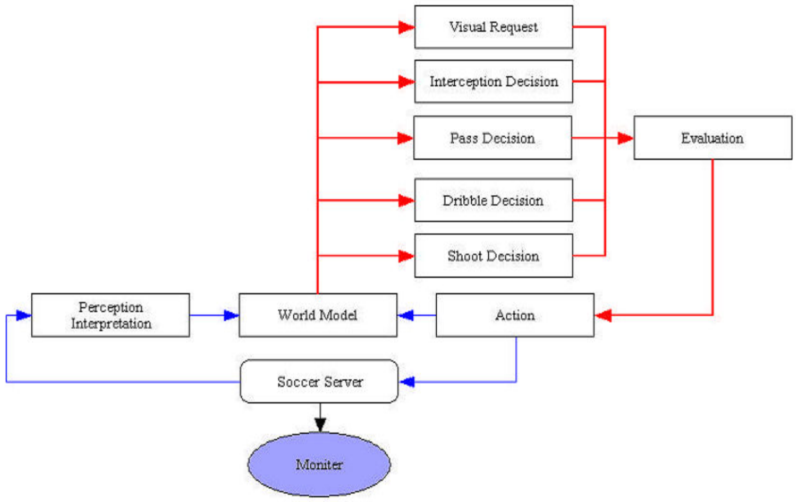

Figure5. Agent Architecture

5. Conclusion

In this paper we have discussed about making use of Neural Network algorithms and Fuzzy Math algorithms in team formation, as well as the use of human potential energy and geometry in ensuring accurate passes. Certain problems may still persist. For instance, passing done in the opponents' penalty area is still inaccurate to a large degree. However, we strongly believe that problems as such can be resolved via further implementations of human potential energy and Geometric calculations. And we plan to work towards perfecting this system in the near future.

Reference

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