Team Description of AmoiensisNQ2005 2D

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Abstract . This paper describes the main features of the AmoiensisNQ2005 2D simulation team. The main design and realization of the previous team will be addressed. We also describe our future research directions in the paper.

1. Introduction

The AmoiensisNQ2005 2D simulation team was designed and realised by the RoboCup team of Xiamen University. The RoboCup team which adhere to Automation Department of Xiamen University is built by graduated students and under graduated students who love the RoboCup. She is the stretch and improvement of the AmoiensisNQ2004 simulation team. The design of AmoiensisNQ2004 simulation team is base on the basic code of TsinghuaAoles2002 team which is the champion of Robocup2002 simulation group. As a new team, we got 9th out of 36 teams at Robocup2004 simulation group of China. Base on the code of TsinghuaAoles2002, AmoiensisNQ2005 make some development to the individual skill mainly focus on interception and dribble; we also design the high-level strategy, mainly about the formation, handle ball, vision and hearing. Further more, we write a online coach which can choose heterogeneous player within our team and identify the heterogeneous players of the other side and also can instruct the strategy about the placement.

2. World Model

The importance of the world model of each agent is go without saying. The high-level strategy requires a comparably accurate world model so it can support a proper strategy. The study and optimise of the world model has gone very far now, so we retain all the world model of TsinghuaAoles2002 and add some data structure to support our high-level strategy.

3. Individual Skill

We allocate the individual skill as to realise the high-level strategy. So the reliability of individual has a great impact on the high-level strategy. In the RoboCup, it determines the capability of a team to certain extent. Nowadays there are many effective and mature method of individual skill, it is no more the key point and difficulty in the RoboCup study. Base on the individual skill of TsinghuaAoles2002, we make some development to the interception skill: base on the interception geometry model and considering the bodyfacing and velocity, we calculate the two minimum interception cycles between our member and opponent. We consider the minimum cycles as the input of a well trained BP neural net and got a probability that we can successfully interception, then compare it with the threshold ; Each individual take different threshold according to its role, eg. The forward can take more risk in interception but the back will intercept only in comparably safe situation. Further more we add a fast dribble action in case that when facing one opponent the forward could surpass the opponent fleetly.

4. Vision Strategy

Owning to the dynamic and unreliable circumstance of RoboCup, vision strategy is a key factor in how to maintain a comparable accurate overall situation. In case that we are sure about the position and velocity of the ball, we choose different sight strategy according to different role and different area of players. According to the action type agent makes, we pick up certain directions agent cares and give each direction different priority. Concerning the present view mode, conclude a vision direction which got the highest priority.

5. Hearing Strategy

Agent cannot maintain a accurate model merely depend on Vision Strategy. Sometimes, hearing coordinate is in need. Owning to the restriction of communication band-width, we should recode the limited code pool as to efficiently utilize the band-width. The content of communication should be well planned too. We try to send more important and comparable accurate message to minimize the redundancy of information. We use hearing to share the information of ball and players between agents. The goalie use hearing to coordinate the action of the other players; handle- ball strategy use the attentionto command to realize the coordinate among players.

6. Formation Strategy

Because the simulation now is still 2D mode, we adopt 433 formation which has more balance in both offend and defence. In 433 formation, there are offend system & defence system. We use BP neural net to construct the basic formation point of players who will change the formation point according to its role and the location of the ball. In the fundament of basic formation point, we add the dynamic formation strategy: when we are in defence state, player have 4 choice: BLOCK, PRESS, MARK, FORMATION. We create a set of coordinate mechanism to ensure the each player of other side in our field would have at least one of our player doing one action to him. When we are in offend state, player adopt the basic formation strategy; when player is in the offside position, he will move back to the offside line automatically; when the linkman dribble in 30m advance of opponent's field, forward will give up the basic formation point and choose to get rid of the backs of opponent.

7. Handle-Ball Strategy

Handle-Ball Strategy is the key of the high-level strategy, it plays a crucial part in organizing effective offense and defense. The structure our Handle-Ball Strategy adopted is the top-down decision-making tree, it divides the field into fuzzy sub-area and process fuzzy consequence base on the circumstances of the game and choosing result by probability synchronously, besides, it can modify probability threshold dynamically to achieve the goals of continuous modification.

8. Online Coach

Online coach is the new direction of ROBOCUP research. We design an online coach independently. The online coach can select the proper heterogeneous players from which the sever provides, it has different select standard on the different roles: forward mainly focus on dash-power-rate, effort-max and player-decay, linkman mainly focus on stamina-inc-max and inertia-moment, back mainly focus on stamina-inc-max and kickable-margin, use a mathematic model to evaluate priority of each heterogeneous player, and choose to change the heterogeneous player whose priority is highest. Online coach can get the zero-noise information of the game including the players of the other side. Use this point, observing changing of the opponents bodyfacing, velocities and kickabl-margin, the type of opponents' heterogeneous player could be identified at about 500 cycles and the information will be informed to all of our players. When the game is not PLAY_ON mode, online coach has the ability to exchange information live, to sufficiently use this ability and give the instruction of the placement.

9. Results

As a new team of RoboCup, we understand the basic code of TsinghuaAoles2002 then have more time consuming in the design of high-level strategy. We got some achievement that in 10 competitions with TsinghuaAoles2003, the result is 5 wins 3 ties 2 lose. Online coach and 3D model is new directions of RoboCup research. Online coach and analysing opponent's action and modeling, to build a 3D team are our future research directions.

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