Team HillStone2017 in the 2DSimulation League Team Description Paper

Toyoji Kiura[1], Takashi Omori[1], , Norifumi Watanabe[2]

[1] Tamagawa University, 6-1-1 Tamagawa-gakuen,Machida-shi, TOKYO 194-8610, JAPAN,
kurto4is@engs.tamagawa.ac.jp

[2] Advanced Institute of Industrial Technology, 1-10-40 Higashi Oi Shinagawa-ku Tokyo 140-0011,
JAPAN,

Abstract. Team HillStone has taken part in 2D simulation league of RoboCup Japan Open Competition from 2009 in Osaka. We adopted a defensive strategy of allocating player to a ball position, and use a ILP algorithm for an effective tactics searching. We discuss a possibility of the strategy and evaluation in our simulation.

1 Team History

Team HillStone is consisted of joint effort by two Japanese research groups:

Tamagawa University (TU): a group from the faculty of engineering at TU has joined RoboCup Japan Competitions since 2009. They got the best result (third rank) at RoboCup Japan Competition 2014 in Fukuoka. Members from TU are interested in a compliant human-machine interaction architecture based on human intention estimation by robots. This research is motivated by a desire to minimize the need for classical direct human machine interface and communication. The student members are all undergraduate, and receive professional guidance by Prof. Omori of TU.

We participated in the world convention for the first time in 2016.

2 Team System Development

2.1 Development result in Tamagawa University

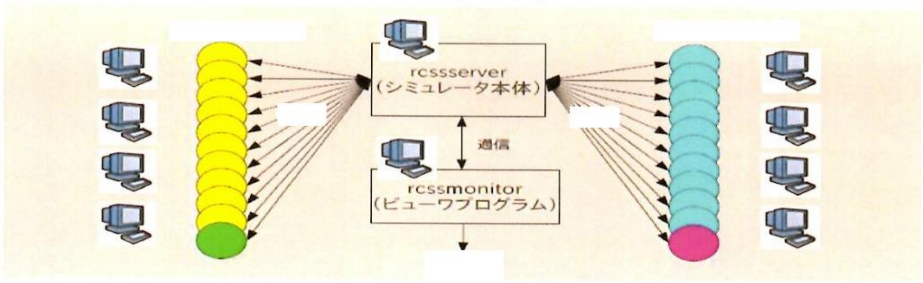

Fig. 1 System configuration diagram of soccer simulator

Figure 1 shows a system configuration of soccer simulator. TU students were not familiar to the simulator and its programming, we began understanding of the system. Currently, we are implementing a defensive formation and developing a one-two pass behavior. We are using the fedit version 2-0.0.0 for the defensive formation development, and are creating an allocation of players for the fedit2. A sample of created allocation is shown in Figure.2.

Fig.2 A sample of created player's allocation in fedit2.

Our strategy of defensive formation is to locate a player at a ball position where an opponent player must be there. By doing so, at least one player can press and defense to the opponent to prevent making effective pass or shoot.

But, the drawback also exists. A large stamina consumption occurs because the defense player has to run quickly toward the ball position when an opponent team player come into the defense zone. The other is a higher risk of foul because the running action is almost same as a tackling action. To avoid these drawbacks, as a future challenge, we must create is a chain of cooperative actions program for the defenders

before we join RoboCup World Championship. The program works as follows. In a case of opponent player carry a ball into the defense zone, we plan our defenders come and enclose the ball holder from multiple direction to block all effective pass course.

I would like to develop mark to disturb the path. Figure3 shows that MF1 predicts and interferes with the path trajectory of opponent3.

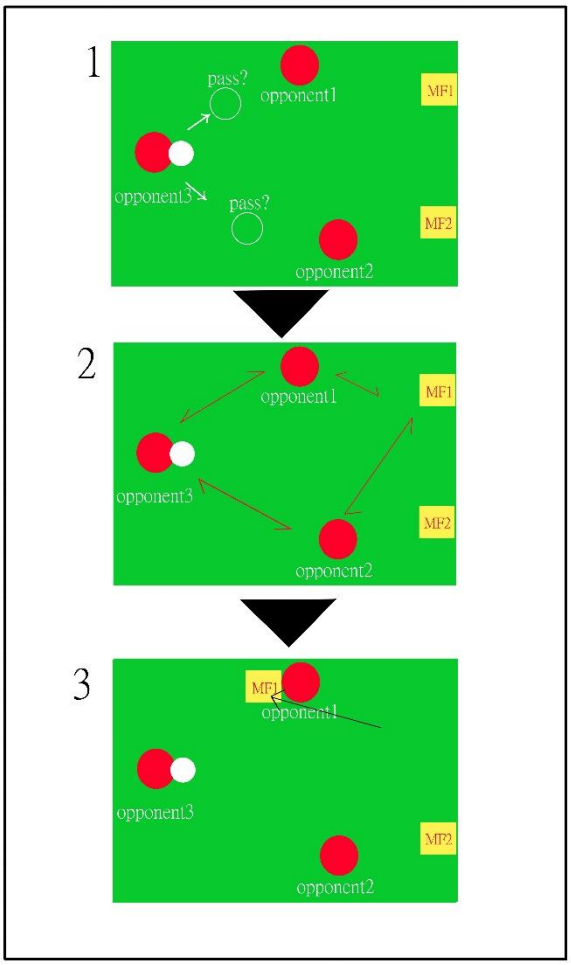

Fig.3 Mark overview

A red circle represents opponent, a yellow square represents ally player. Opponent3 has a ball and trying to pass. MF 1 measures the distance between opponent3 and the player close to the opponent 3. Then, MF 1 determines that opponent 3 pass opponent 1 or opponent 2 (Fig.3(1)).Next, MF1 measures the distance between myself and oppo-

nent1, opponent2, and at the same time it makes similar measurements for MF2.As a result, MF1 marks myself closer to Opponent1. Similarly MF2 measure and mark opponent2 (Fig.3(2)).MF1 moves to a position close to opponent1 between opponent1 and opponent3 and interferes with the path (Fig.3(3)). In order to activate mark situation, we have to make a position arrangement at kickoff position, offense position, normal formation .We have to judgment algorithm of position arrangement timing.

Recently, Tamagawa University is conducting tactical development research using inductive logic programming.

Preceding the study are shown below.

2.2 Development result in Tokyo University of Technology(Preceding research)

TUT student of our team member is developing effective attacking patterns for each of an opponent team by using an inductive logic programming (ILP). ILP is one of a machine learning method. Using the learning method, we expect obtaining an effective attacking pattern for a specific team from a set of 2D soccer simulation log data. So this method facilitates our attacking tactics more suitable for the team. ILP though not widely used the soccer tactics search, an evaluation of the learning result will give us new insights on an applicability of machine learning to the 2D simulation and an idea of new learning strategy.

In our intuition, it is not easy to find general rules that are suitable for a final shooting approach. For the problem, we developed a new algorithm that makes use of one more abstracted positional relationship between a ball holder and an opponent player [2015]. In an example in Figure 4, a learning result says “good action includes a long pass that send a ball from a center circle to a side player near the goal”.

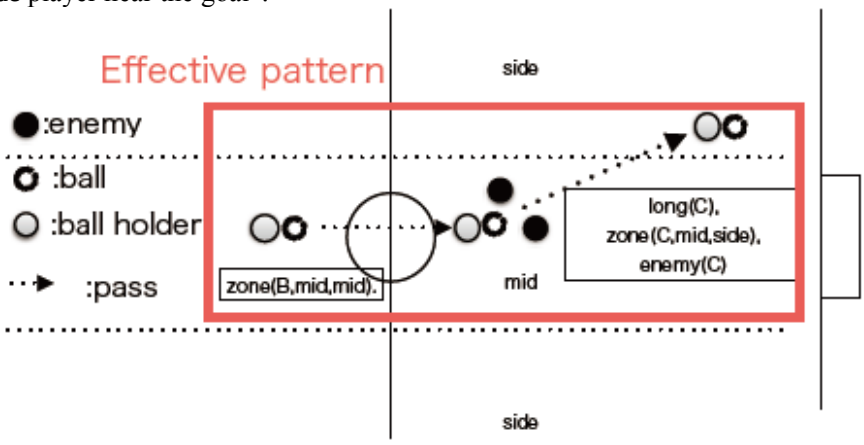

Fig.4. Examples of action chain extracted by a predicate logic

To evaluate effectiveness of the learning method, we executed 20 times of game simulation between our program and former HillStone program. The action chain hypothesis has successfully extracted from the log data. Other hypotheses extracted from the data were ones like “a good action includes a pass to ally when an opponent player is near” and “a good action contains a pass when the player is surrounded by the opponent players”. We expect the extracted hypotheses reflect actual characteristics of the opponent team.

The outline that Tamagawa University is doing is shown below.

Effective strategic patterns in RoboCup2D simulation are extracted using the inductive logic programming system Aleph. Due to the dynamic changes of the offensive and defensive behaviors, strategic pattern extraction in real soccer is difficult. Therefore, a behavioral model is constructed using J-league soccer player data based on the analysis of behaviors in scenes of mutual intention inference, and implemented the model to the RoboCup2D agents. Then, we extracted effective strategic patterns from log data of the soccer simulation with Aleph and verify the validness of the patterns comparing to the previous studies.[2016]

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