Wright Eagle 2001 - Sony Legged Robot Team

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Abstract. This paper introduces team Wright Eagle - the only Chinese team in Sony legged robot league of RoboCup. The architecture and four main modules will be described.

1 Introduction

"Wright Eagle" is the only Sony legged robot soccer team in China.[1] The target of our participation in this league is to push our research in artificial intelligence, especially the multi-agent system.

As a new team in the Sony legged robot league, it is the first time that we use the AIBO robot and OPEN-R system.

2 Architecture

Each robot control system has four main modules — vision module, localization module, decision module and action module. There are also some functions to collect sensor data and other information.

The system has a serial controlling pattern. Vision module is the start point of each cycle. It receives image information taken by CCD sensor from AIBO robot and analyses it. Next, localization module uses these results and other information to make localization. And then, Decision module works to decide which action should be perform. Finally, action module generates actuator commands according to the decision.

Generally, the Wright Eagle has architecture as Fig 1.

3 Vision Module

The vision module is a very important part of the system. It is a main source of field information. The job of vision module contains several steps as blow.

(i) Distinguish colors — Instead using standard CDT, we draw polygons on YUV color plane to define colors.

(ii) Merge color blocks

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A. Birk, S. Coradeschi, and S. Tadokoro (Eds.): RoboCup 2001, LNAI 2377, pp. 739–742, 2002.

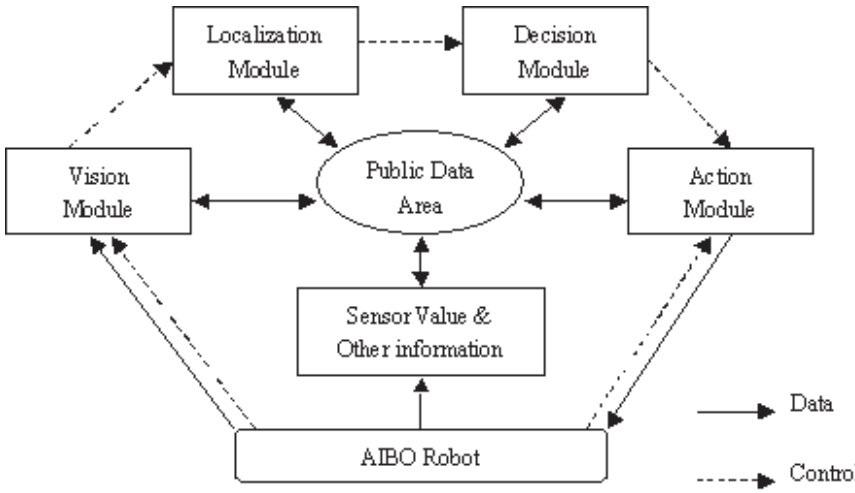

Fig. 1. Architecture of Wright Eagle 2001

(iii) Recognise objects —- We use domain knowledge to analyze color blocks that we have gotten. If two blocks have a color relation pattern of a landmark, we will check them if they also have almost same area and very near distance. The blocks meet these conditions will be recognize as a landmark. Vision module also can recognize ball, goals and players.

(iv) Estimate distances and angles of objects —- Vision module can estimate the distances and angles of ball, and landmarks. It also can provide the angles of goals and players.

Vision module also has a particular function called "Illegality Detection". We can use it to avoid recognition mistake. For instance, only the orange block that it is over green block can be recognize as a ball. This function is very successful to resist the interference from outside of field.

4 Localization Module

Localization of WrightEagle-2001 is quite simple. This module receives distance information and angle information of landmarks from vision module. When there is two landmarks' information in memory, localization illustrated in Fig2 will be performed. If only one landmark can be seen, information of it will be stored in memory and be used to correct player's angle.

In most situations of game, we do not need a very accurate localization result for making decisions. In this case, we partition the field into four areas and divide angles into four quadrants. For instance, player P illustrated in Fig3 is in rear right area and has a quadrant4 angle.

This module is right in most situations and acts well in games.

However, this localization is not very accurate. We are looking for a new approach to make better.

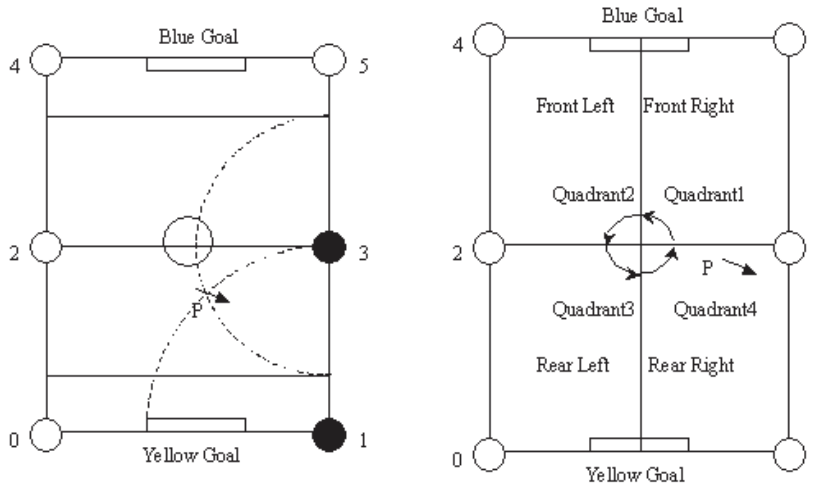

Fig. 2. Localization and Field Partition

5 Decision Module

The function of this module is making decisions that which kind of actions should be performed next step.

We define some situations for players. A set of actions will be performed when a player is under a given situation. Field players and goalie have difference strategies. Under most situations, goalie stays in penalty area and gaze the ball. When it finds the distance from itself to ball is short enough, goalie thinks the ball is in a danger location. It will walk out to clear ball away. Then, goalie backs to goal to keep it. The field player's strategy is as simple as goalie. First it turns around to search ball. After finding it, player walks to ball and try to adjust its direction to enemy's goal. Then, a kick or shoot action will be performed. These strategies work well in games. However, they also need promotion in future.

There is no communication between the players in games.

6 Action Module

We developed a set of custom actions, such as walking, turning and kicking. The advantage of these actions is stable. WrightEagle players seldom fall over in games. However, the main shortage of our actions is slow.

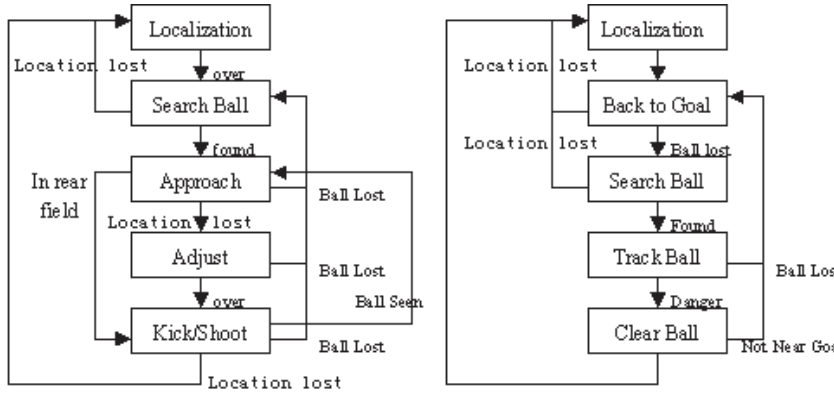

Fig. 3. Field Player Strategy and Goalie Strategy

We use OMoNet to achieve gaze and tracking ball.

7 Conclusion

It is the first time WrightEagle participate the RoboCup Sony legged robot games. We got a 5-8 rank. It shows that our approach to build a legged robot team is successful to some extent. However, compared with those very strong teams, our WrightEagle also has many parts to be refined. WrightEagle will be stronger next year.

References

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