Rogi Team Description

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Abstract. This paper resumes the main features introduced to RoGi team for RoboCup 2001.

1 Introduction

RoGi team started up in 1996 at the first robot-soccer competition as the result of a Ph.D. course in multi-agent systems. Since 1997 it has participated at the international workshops held in Japan, Paris, Stockholm and Melbourne. The main goal has always been the implementation and the experimentation on dynamical physical agents and autonomous systems.

This year the team has dealt with new mechanics, an addition of roles and minor changes on the vision system.

2 Team Description

The system that implements micro-robot soccer is made up of three parts: robots, vision system and control system. The vision and control systems are implemented in two different computers and they are connected by means of a LAN, using TCP/IP protocol. This allows a faster communication between them. The control system analyzes data coming from the vision system and takes decisions based on it. The decision is split up into individual tasks for each robot and is sent to them via radio link.

3 Robot Description

The robots have on-board 8 bit Philips microprocessors 80C552 and RAM/EPROM memories of 32kBytes. The robots receive data from the host computer by means of an FM receiver. The FM receiver allows working with two different frequencies 418/433 MHz in half-duplex communication. The information sent by the host computer is converted to RS-232C protocol.

12 batteries of 1.2 V supply the energy to motors and electronics. There are two power sources, one DC-DC switching regulator, which provides stable 12 V to motors, and another one that guarantees 5 V to the IC.

A. Birk, S. Coradeschi, and S. Tadokoro (Eds.): RoboCup 2001, LNAI 2377, pp. 587–590, 2002.

The microprocessor do position and speed control, having as input the desired final position and the actual position, and as output the PWM of each motor. A voltage sensor is used to know the actual speed of the robot.

In addition, a single metal piece has been designed to sustain motors, batteries and electronics, making the robot more robust to collisions.

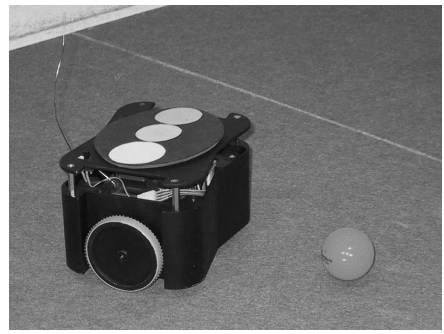

Fig. 1. New robot

4 Vision System

A specific hardware has been designed to perform the vision tasks, merging specific components for image processing (video converters, analogue filters, etc.) with multiple purpose programmable devices (FPGAs). A real time image-processing tool is obtained, which can be reconfigured to implement different algorithms. According to RoboCup Small Size League Rules, each robot has use a yellow or blue marker mounted at the center of their top surface. In order to provide angle orientation, additional color markings are allocated on top of the robots.

This year the identification algorithm has been modified and improved. Adding this changes to last year modification, the vision system has became more stable and reliable.

5 Control System

The control system is a multi-agent environment in which the agents decide the best action to do. Each agent takes first, a reactive decision based on data given by the vision system, and second, a deliberative one considering the teammates decisions. Once all the agents get an agreement, each one transforms the actions in orders understandable by the robot, and sends them via radio link.

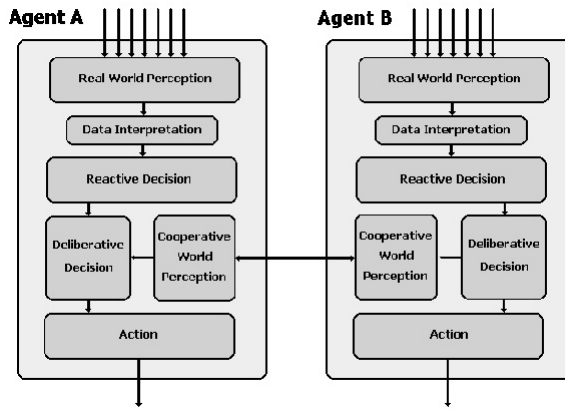

Fig. 2. Schematic structure of agents.

Reactive Decisions Step: Using a global real world perception (as seen in Figure 2) and a set of capabilities, agents take a private/local decision. Capabilities are action that agents can perform and depend on roles, that means that agents are different from each other by the role they play at the field. The world perception is the result of high level abstraction using fuzzy sets of data given by the vision system. With this knowledge of the environment and its capabilities, all the players take the reactive decisions using fuzzy logic. The agent converts this reactive action into its actual belief.

Deliberative (Cooperative) Decisions Step: Deliberative reasoning is implemented by communicating the former reactive belief. Every agent knows the beliefs of the other teammates. Beliefs contain the reactive decision, the certainty of this decision and the identification of the player-agent (reactive-belief, certainty, ID-player). When two or more agents realize their beliefs are in conflict, they use this certainty coefficient in a consensus algorithm based on a positional method to resolve it. In this positional method, players are specialized since they have assigned roles. One possible effect of their specialization is that they prefer to stay in certain position on the playground. Agents take advantage of this feature and modify their vision of the co-operative world according to the positions of team players. These modifications lead the agents to reinforce or to change the former reactive decision. As a result, collisions among playmates are significantly reduced comparing to non-adaptive perception of the cooperative world.

This year, in order to improve tactics new roles have been added, so that the team play can be adapted to opponents tactics.

6 Conclusion

This year, team most important feature has been the modification of robots. With the new body, motors and associated electronics, robots go faster and resist collisions in a better way. Adding new roles to new body the whole team behavior has been improved.

7 Acknowledgements

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