The Orient 2005

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1 The team organization

The Orient is the robot soccer team for the middle size league of RoboCup, and is organized by the Department of System Robotics, Toyo University, Japan. The Orient is the successor of UTTORI United that have been actively participated from RoboCup1997 Nagoya to RoboCup2002 Fukuoka. The Orient utilizes the legacy of UTTORI United, namely, omnidirectional mobile robots with omnidirectional vision sensor.

The team members are as follows:

- Akihiro MATSUMOTO (Professor)
- Toshinari AKIMOTO (PhD candidate)
- Takao SUZUKI (Graduate student)
- Hideaki SHIMIZU (Undergraduate student)
- Hiroaki ITO (Undergraduate student)
- Tatsunori YOKOE (Undergraduate student)
- Hiroaki NISHIGORI(Undergraduate student)

2 Game results of the past RoboCup competitions of *UTTORI United* and *The Orient*

year	domestic	international	Team name
1997	———————-	Nagoya, Japan 5^{th} place	UTTORI United
1998	Tokyo 3^{rd} place	Paris, France 4^{th} place	UTTORI United
1999	Nagoya 3^{rd} place	Sweden, Stockholm (no participation)	UTTORI United
2000	Hakodate 2^{nd} place	Melbourne, Austria (no participation)	UTTORI United
2001	Fukuoka 4^{th} place	Seattle, USA (no participation)	UTTORI United
2002	Tokyo	Fukuoka, Japan 5^{th} place	UTTORI United
2003	Niigata 4^{th} place	Padova, Italy (no participation)	The Orient
2004	Osaka 6^{th} place	Lisbon, Portugal (no participation)	The Orient

3 The Features of robots

The feature of robots of the Orient is inherited from UTTORI United, that is, omnidirectional mobile robot with omnidirectional vision sensor in the viewpoint of hardware, and cooperation through communication in the viewpoint of software.

We have been using omnidirectional mobile mechanism since the first RoboCup in 1997, and its superiority to other wheel mechanism is proved in the past competitions, and that's why other new teams have adopted to use omnidirectional mobile mechanism. Four out of five robots in our team have different configuration of omnidirectional mobile mechanism, that is the difference of the number of wheels, the wheel size and the wheel manufacturer, navigation speed, and the size and weight as a result. The difference is considered to be a characteristic of each player, like human football, then the combined team play leads different result of the team behavior.

Although UTTORI United used the sophisticated cooperation and coordination algorithm through wireless communication, the Orient only utilizes limited cooperation strategy for the moment. *Conflict resolution* is adopted in ball approaching. Pass is selected when one robot determines not to dribble to the goal. Color marker (goal, and corner post, team marker) is used for localization and team member searching. The role changing is specified by selecting the player parameter when the program starts. That means every player can play in different position, but in reality, we limit the role changing considering its navigation speed and vision processing speed.

ROOK

ROOK has an omnidirectional mobile mechanism with 3 motors, an omnidirectional vision, and a kicking mechanism with spring and solenoid. The transmission mechanism is a Japanese patent. He is the only player in our team who played with UTTORI United team in the past competition. The most reliable player in this team. He is an excellent goalie by its robustness and slow navigating speed. He was once the best point getter in RoboCup Japan Open 2003 in Niigata when he changed its position from Goalie to forward.

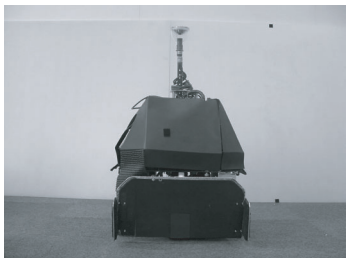

Fig. 1. Rook

MAMIYA

Mamiya has an omnidirectional mobile mechanism with 4 motors, an omnidirectional vision, and a kicking mechanism by pneumatic pressure. He is much smaller and lighter than ROOK because there is no transmission mechanism. He handles ball so softly and gently to the place where robot with differential drive mechanism cannot move. He plays usually mid-fielder, but sometimes goalie.

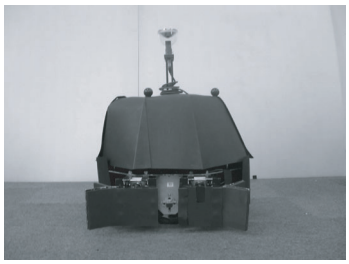

Fig. 2. Mamiya

JUPITER

JUPITER has an omnidirectional mobile mechanism with 3 motors, and an omnidirectional vision, and no kicking mechanism. By using commercially available "omni-wheels", its wheel inertia has become extremely lower than the previous models, thus his weight is very light. Motion is very fast, but the positioning accuracy is not so good because its motion depends on the surface of the floor. He changed its omnidirectional vision sensor from the analog model to digital model (same manufacturer), i.e. IEEE 1394 camera. He is a mid-fielder.

Fig. 3. Jupiter

GONTA

GONTA is the only model of differential drive mechanism (not omnidirectional).

He has a dog-like cover, and plays charmingly (small, weak, slow, ...). He is popular to MSL fans in Japan. He is an experimental machine by using USB camera and IEEE1394 motor driver on Windows (all other robots use Linux) on note PC.

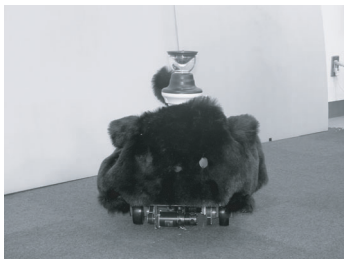

Fig. 4. Gonta

ARIEL

ARIEL has an omnidirectional mobile mechanisim with 4 motors, an omnidirectional vision, and a kicking mechanism with electric motor. Computer hardware and vision sensor is common with ROOK and MAMIYA, so that the software portability is assured. She is much smaller, lighter, cheaper, and easier to maintain than before. She uses high torque motor, thus her top speed is about 3 m/s.

Fig. 5. Ariel