FU-Fighters 2003 (Global Vision)

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1 Introduction

Our F180 team, the FU-Fighters, participated for the fifth time at the RoboCup competition. This year we used our improved omnidirectional team: we added a dribbling device and a shooting device. This year we also use a second camera in the vision system and learning algorithms in the behavior control. Our team won second place in the SmallSize league competition last year.

2 Team Development

FU-Fighters Leader:
Raúl Rojas (college professor): organization
Team Leader:
Alexander Gloye (scientific staff): organization, behaviour contol, web site
Team Members:
Achim Liers (scientific staff): electronics
Anna Egorova (student): vision
Michael Schreiber (student): mechanics
Mark Simon (student): vision, user interface, behaviour control
Oliver Tenchio (student): mechanics
Fabian Wiesel (student): electronics

3 Mechanical and Electrical Design

For RoboCup 2003 we improved our omnidirectional robots, which we used in RoboCup 2002 in Fukuoka, Japan, see Fig. 1. The robots are equipped with three DC-motors that have an integrated 19:1 gear and an impulse generator with 16 ticks per revolution. We self developed special wheels which allow for better omnidirectional movement than in 2001 [2] - see Fig. 1. Further, the robots use a linear kicking device and a dribbling device with a rotating vertical tube, which were deployed by many teams in the F180 league.

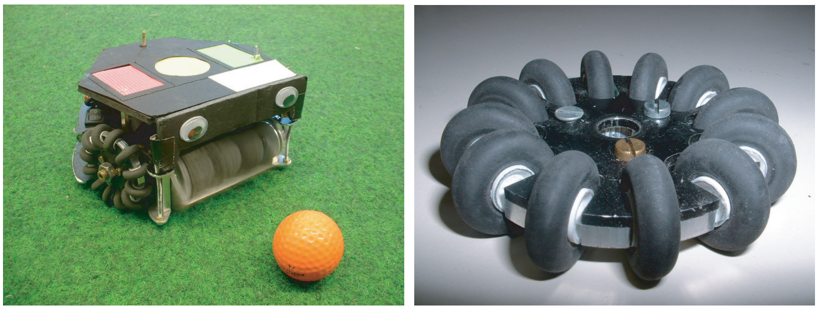

Fig. 1. Omnidirectional robot (left) and omnidirectional wheel (right).

For local control we use the same microcontroller board as in [2] but with a new radio transceiver module (Fig. 2) - the TXRX3 from Radiometrix[1]. This new module has a higher transmission rate up to 64 Kbps.

The host sends 6-byte packets that include header, address, control bits for dribbling and kicking devices, speed and rotationg directions, and checksum. The microcontroller decodes the packets, checks their integrity, and calculates the target values for the control of the motor speeds.

Our robots are powered by 8 Ni-MH rechargeable mignon batteries. We implemented locally a PID-control of the motor speeds.

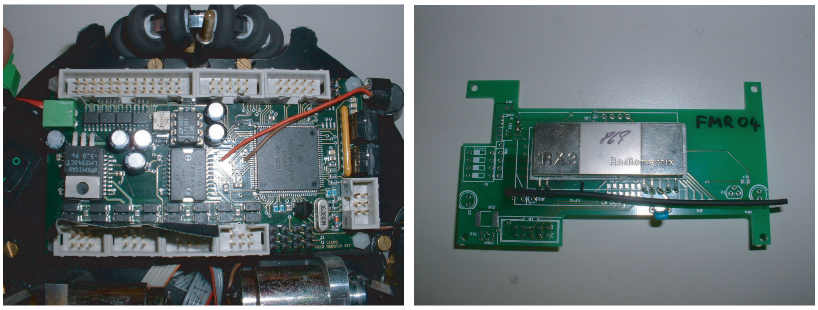

Fig. 2. Microcontroller board (left) and radio receiver module (right).

4 Computer Vision and Prediction

The only physical sensors for our behavior control software are two s-video cameras that look at the field from above and output two video streams in NTSC format that are captured by a PC, using two consumer frame grabbers from

[1] `www.radiometrix.com`

Hauppauge[2]. The computer vision system running on the PC finds and tracks the ball and the robots. We used an improved version of the system described in [4]. Unfortunately, the information about the world is extracted with a delay caused by communication, mechanical constraints, and the computer vision system. The feedback (the result) of an action decision is perceived typically between 100ms and 150ms after the decision has been made. We compensate this by predicting the positions and orientations of the robots for the next few frames [1].

The predicted positions and orientations are used for behavior control.

5 Hierarchical Reactive Behavior

We use a hierarchy of reactive behaviors to control the robots. A more detailed description of our control architecture is given in [3, 5].

6 Future Work

To allow for faster and more exact movement, fast local sensors for robot motion and obstacles are needed. We also plan to further develop the learning algorithms and the bevahiour control.

References

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[2] `www.hauppauge.com`