RoboCup 2010 TDP
Small Size League

Team RoboFighties (Pakistan)

Dr. Kanwar Faraz Ahmad (Project Supervisor)

M. Aneeq-uz-Zaman	aneeqzaman@yahoo.com
Salman Shafqat	salman_mts@hotmail.com
Imtiaz Noor	imtiaznoor@live.com
Ali Imran	imran17788pk@hotmail.com

Department of Mechatronics
National University of Sciences and Technology
Rawalpindi, Pakistan

Abstract. This document describes RoboFighties Small Size team activities to preparing for RoboCup 2010 Small Size League due in Singapore. It is a summary of our activities for the past one month and our work to meet the given deadline. This is the first time RoboFighties is participating in a robotic soccer event.

1. Introduction

We started our work on "Online Vision Based Navigation Techniques for Robotic Soccer Environments" as our final year project about one month back. Then our project supervisor, who had worked on mobile robots in his PhD, motivated us to participate in an international robotic soccer event. Last year we participated in the National Engineering Robotic Contest 2009 held in our university, which is the biggest national robotics event, and came in 4th place among 105 teams. The task was to build an autonomous robot capable of following a path by line tracking and placing wooden pegs into the stands placed on the four corners of arena. This also motivated us to use our previous experience and knowledge in the field of mobile robots in the robotic soccer.

2. Team Members

- Dr. Kanwar Faraz Ahmad — Project Supervisor
- M. Aneeq-uz-Zaman — Mechatronics Engineering Student, Software and AI
- Salman Shafqat — Mechatronics Engineering Student, Image Processing
- Imtiaz Noor — Mechatronics Engineering Student, Robot Software
- Ali Imran — Mechatronics Engineering Student, Software and AI

3. The Robots

We are using Rug Warrior Pro robots. These robots were available in our department. It is an excellent platform for testing our algorithms. We have also acquired substantial funding for purchasing new off-the-shelf robots especially for RoboCup.

3.1 Mechanical Design

The Rug Warrior Pro robots have very simple mechanical structure. It has two wheels with differential motor drive. The motors are capable of moving robot in a straight line at a speed of 8.5 in/sec.

3.2 Electronic Design

The brain of the robot is the MC68HC11 microcontroller from Motorola. Then the board is equipped with various sensors and actuators to max out the microcontrollers capabilities. The motors are driven by SN754410NE motor driver. The robot has RS232 COM Port to communicate with the PC. ADM232LJN IC is used to convert the RS232 voltage levels to TTL voltage levels.

Rug Warrior Pro robot does not have any wireless communication module. That is why we have used a pair of transmitter and receiver module from the Radiometrix for this purpose. The transmitter TX2-433-40-5V and receiver RX2-433-40-5V can establish data link with a maximum speed of 40 kbps, operating at 433 MHz and having a range of 75 metres and 300 metres in building and open ground respectively. The receiver is connected to the microcontroller of the robot through its optional expansion port. The transmitter is attached with PC to send instructions to the robot.

We are facing a lot of problems with the wireless communication. Although the data is being transmitted but with a lot of noise, making it useless. So we are currently using wired communication to implement our code and make a video. We are using serial communication for this purpose using a standard serial wire.

3.3 Software

As we were first working on final year project point of view, so we did some work on image processing in MATLAB. Our image processing algorithm is based on color based recognition. Although MATLAB is pretty slow but we were able to achieve around 20 fps in MATLAB which was enough for starting. Another reason for initially working in MATLAB was that it is quite easy to implement basic programming techniques. Our algorithm can calculate the coordinates of the robot in the world coordinates, orientations of robots and plot the trajectory of the ball. We realize that, according to current requirements, using SSL Vision is mandatory, so our next aim is to shift our work on SSL vision.

3.4 Overview of Algorithm

For the introductory video, our aim is to implement a simple obstacle avoidance algorithm. There are basically two robots which serve as an obstacle in the path of a third robot which is trying to get to the stationary ball. The vision system provides the coordinates of the robots and the ball and using these coordinates the algorithm generates an optimum obstacle free path for the robot to follow.

3.5 New Robot System

The new robots for which we have acquired funding are 12 cm in height and 16 cm in diameter. They are equipped with RF modules. On the mechanical side, they have omni-directional motor drive and kicker and dribbler mechanisms. The robots are capable of travelling in excess of 2 m/s.

4. References

- Flynn and Jones, Mobile Robots – Inspiration to Implementation
- Gonzalez and Woods and Eddins, Digital Image Processing using MATLAB