

2007 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Engineering

PROJECT : Soccer Playing Robots

AWARDS : Engineering First Award

SCHOOL : King's College

FINALISTS : Martin Spencer

COUNTRY : New Zealand

Abstract

Category: Engineering

Title: Soccer Playing Robots

Name: Martin Spencer

Country: New Zealand

Soccer Playing Robots

The purpose of this project is to design and build two soccer playing robots to compete in the Robocup Junior soccer competition. The rules of the competition include that robots must be autonomous, must fit inside a 22cm diameter cylinder, and the game is played on a table with walls around it and with a ball which emits infra red light.

The stages in development included:

- The layout of the motors and sensors on the robot
- A method of detecting the infra red light from the ball
- A method of controlling the ball
- A method of detecting the robot's surroundings
- A method of finding the goal and kicking the ball at it
- Designing the circuit board
- Programming the robots and developing a strategy for playing soccer

Most of the problems above were solved satisfactorily. Two DC motors were used to drive the robot using skid steering. A Flyeye sensor was used to detect the infra red light from the ball, and a dribbler with a spinning rubber drum was developed to control the ball in front of the robot, with a laser beam so that the robot knows when it has got the ball. Sonar was used to detect objects around the robot, and a compass was used to enable the robot to point in the direction of the goal. A solenoid was used to kick the ball.

The circuit board was developed using the program EAGLE, and contains an ATMEL MEGA8535 microcontroller as well as two motor drivers and several other components. The robots were programmed using C, and the basic strategy used for playing soccer is as follows: While the robot cannot see the ball, it drives around randomly using the sonar to avoid obstacles (i.e. the walls and other robots). When the Flyeye sensor picks up the infra red light from the ball, the robot drives towards it until it cuts the laser beam, at which point the robot starts dribbling the ball and points toward the preset direction of the goal, then kicks it. If at any time the robot loses sight of the ball, it goes back to searching for it.

In the New Zealand Robocup competition, the robots performed well. They ended up winning the final by ten goals to seven.

評語

1. The design and fabrication of the robots are very impressive.
2. The demo and the video show that the control of the robots is nice.
3. For scientific competition, more quantitative analysis is suggested to be added for showing how good the robots are.