

Team Description of

SBU-RT

RoboCup Team of

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Hardware :

1 - Vision system:

There are two CCD cameras with a special video capture card by two video input channel that send up to 30 frames in a second by the quality of RGB 16bit.

2 - Main computer:

Server :

MainBoard ATC-6240

CPU PIII 500

RAM 128 Mb.

HDD 17 Gb.

Each robot :

ATC 5200

CPU P 333 MHz

RAM 32Mb.

With new system for booting

3 - Communication :

ORINOCO WaveLan card , Gold , IEEE 802.11b 2400-2483.5 MHz.

4 - Computer interface board :

A special ISA Card designed to control all of the motors , There is a ram memory mapped

In the memory space of computer which is shared with a microcontroller , the path which will be traveled by the robot will be converted as a array of instructions coded for the microcontroller . This array is stored in the memory .

In the other hand , the feedbacks of motors will be coded by microcontroller and stored in the share memory , which the main computer has access to . This data will consist of positioning information calculated from the shaft encoders.

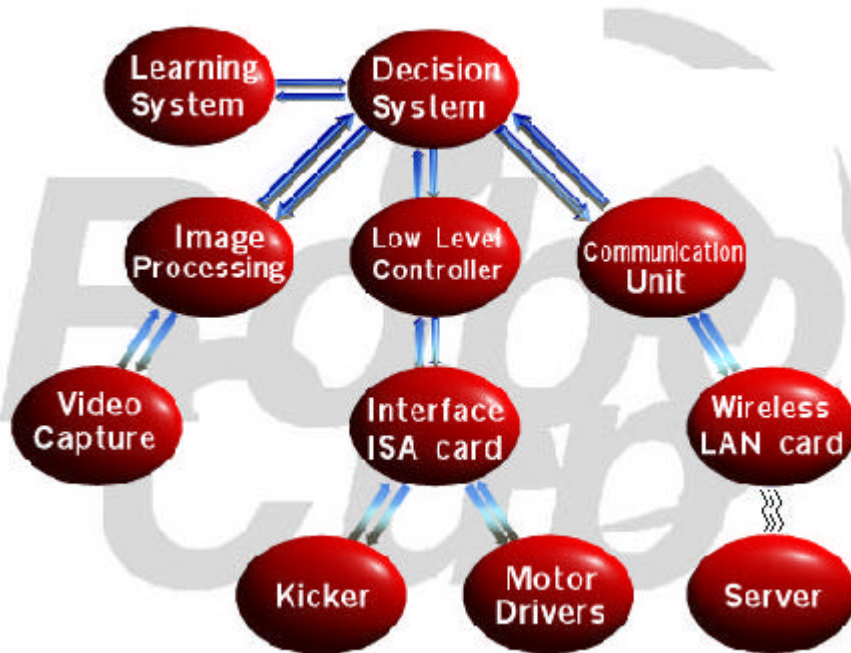
5 - Power Supply:

There are two independent power supplies. For the computer of robots and for mechanical systems.

1-There is a rechargeable battery with a switching power supply circuit which will produce the desired voltages of computers.

2-There are some A/D's, limit switches , etc, with an independent circuit for mechanical parts.

Software :



All of programs are written by C++ in Dos mode containing 4 parts :

3D Vision :

There were so many problems in robots' object detection in normal vision systems applied in RoboCup 99 and 2000. In these system Robots can just detect objects with definite parameters , In future robots will be used in a real environment and they must detect all objects with any parameters, Therefore

we decided to work on 3D vision system . This method is not so much difficult

but it is very suitable for our purpose . It is worth to mention that its calculation is very simple and its result is very exact .

The program processes the images given by video capture card, and finds objects , and positions, then sends these information to decision system and server.

This program consist of three sections, first finds object by its color in two frames then by the definition between two frames, position of the objects will be found and the end by comparing with the previous frame, calculates the speed of object. this program also can recognize noisy images .

Controlling programs :

Our control program compose of three levels :

1- Low level controller :

There is an assembly and C++ program that convert high state form to separate orders that interface card can follow them, this part also calculates all mechanical equations, for instant, rotating around a point ,calculate the wheels degree and the speed. This control program use some mathematical method to select the best way in the field considering the way of ball escape.

2 - Learning system :

This part works in "Neural Network" method and can learn parameters about an opponent team members. This program determined an advantage and a disadvantage of environment and save them in new neurons and growing the network for next use .

3 - Decision system :

It calculates all suitable ways that robots can do next time by using of " Image processing ", "learning system " and "server " data then calculates the best path for moving or kicking and sends instructions for low level controller. It uses neural network and decision tree for these aims , This system can save information of playing and use

them in fussy conditions, For instant when a robot loses the ball, and it can't find the

ball in receiving frames this system will active and by using the old data as a reference it can predict the place of the ball , by the accuracy of 80% .

Communication unit:

There is a wireless network on robots for communication and data transferring with server(out of playing field). They are some special game managing systems, image processing programs which makes server to have free Processing Cycle and there are some programs runs on each robot consuming a high processing cycle which may cause some problems in the server by using a certain Network OS based on DOS, so by using hardware interrupts instead of a common network OS ,the network will be controlled in an exclusive communication .

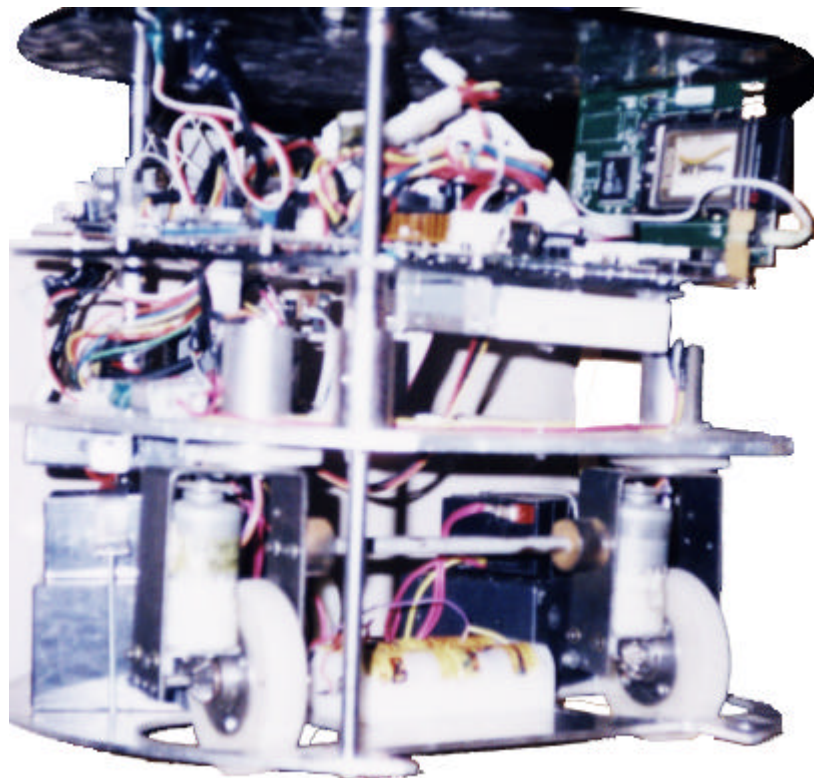
Each robot can communicate to another robots via the server and pear to pear, every message will active a program which analyze it and send a response . There is protecting program which will terminate any meaningless messages .

Coaching unit :

The coaching system is a program which runs in the server of robots (Main Computer out of the playing field) , The information of robot's vision process will be sent to server. It builds a virtual playing field then sends instructions and complete data to each robot .

This coaching system can change the playing strategy related to events occur in the playing field. In multi agent controlling this program organize the behavior of system.

Mechanical systems :



Moving system:

There are three independent wheels controlled by the main computer. Each wheel can move around vertical axis and one of them moves

the whole of system . There are four dc motors with a shaft encoder .

These three wheels are located in a 120 degree of a circle and

this especial architecture gives a multi-system operation and software

can simulate any mechanical strategy. Each algorithm simulates a certain mechanical device with its advantages which will be executed by a

program and the computer interface board .

Kicking system:

Kicking system is based on pneumatic solution by the ability of 40 efficient kicks per a charge . The ball speed is controlled by the main computer and the robots can pass the

ball to each other .Each kick will take place when the ball locates in a special distance ,

calculated with the special sensors of gripper .

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