The description of team "KIKS"

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1 Introduction

RoboCup participation is finish of a creativity educational program. Since 1989, when a 16 years old to 18 year-old student participates in NHK technical college robot contest, "thing structure education" is performed. We thought that the unit manufacture of the robot could be carried out simply by combining a mechanism. Then, the picture database of a mechanism was manufactured. Moreover, technical data compilation was performed for technical tradition. Furthermore, in order to work out an idea, the K-J method was used, and the presentation of an idea was performed once for about two months every week. As a result, it became national conference championship and the national conference most numerous participation school.

It aged 1999 and the speed of thinking of creativity, width, the depth, and originality were quantitatively evaluated using the S-A creativity test. The standard score of the creativity of the student who received creativity education does not have a common student and great difference, and the consistent result was shown. Since the value of standard deviation is small, this is considered because the educational effect of creativity did not appear notably. In order to fully evaluate the degree of the effect of creativity education, it is necessary to perform the education continued for a long period of time.

We chose RoboCup from 2001 as further developed type of creativity education. Artificial intelligence, image processing, automatic control, etc. have much technology in which the high student of creativity gets interested in RoboCup. It is aimed at the student who experienced the robot contest of 19 to 20 years old. The creativity education which used RoboCup was taken as Problem-based learning. Consequently,**" KIKS "achieved championship in RoboCup Japan convention F180 League in the second half in 2003 in only two years.** The student desires the participation to a world convention, as a result of reaching a world level. For this reason, in a creativity development program, there is most important thinking motive more than enough, and it is expected that creativity is extended by leaps and bounds.

Their creativity is measured by 16 years old and 18 years old by the S-A creativity test, and is again measured after a world convention end of 20 years old. The standard score of each item in the creativity factor of the student who has not received the creativity development program is compared. This expects that quantitive evaluation of creativity education is fully attained.

2   Robot Configuration

A robot is cheap, is strong and is based on handmade. The following robots can make below from an one set 1000US dollar. A drive system is a four flower drive all direction move mechanism. The tire is using the common gear of plastic nature. The amount of money is cheap because of the tire which used the common gear, the flexibility of the diameter of a tire is high, and an axle part module is made small. The kick mechanism is using solenoid. For this reason, the strength of kick power can be properly used by changing charge voltage. Furthermore, it has the dribble mechanism.
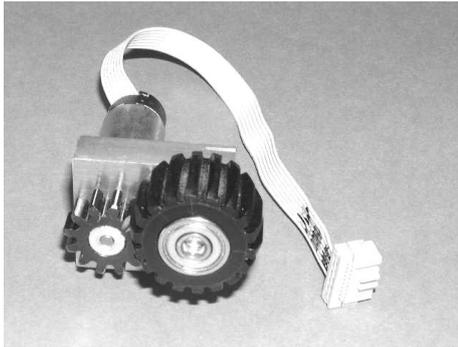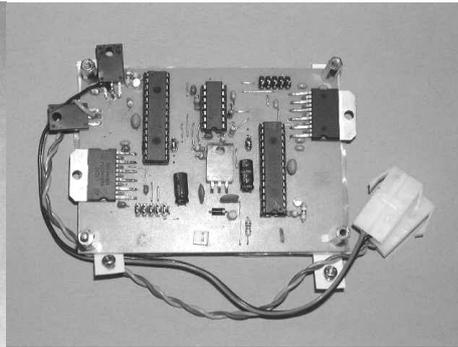

| **Fig.1: Gear Wheel** | **Fig.2: Motor Driver Board** |

Main CPU of a robot circuit is using H8. H8 receives the signal from a receiving module, and takes out the number-of-rotations data of a motor. this -- each object for motor driver control -- it sends to PIC16F873 by serial communication PIC16F873 are performing PID control for IC L for a drive6203 of a motor from the encoder output signal of a motor. The frequency synthesizer system which used the feeble electric wave 300Mhz belt performs the communication method of a receiving module. Operating frequency can be arbitrarily chosen at 25Khz step of 314.700-315.300Mhz. The maximum data transmission speed is 9.6Kbpses. We use RS232C for a communication protocol.

3   System Configuration

1. A picture server acquires a camera to a picture from global vision.
2. Picture server   The position of a ball and a robot is analyzed.
3. Transmit the information on the field to AI server by UDP.
4. AI server determines action of each robot.
5. Distribute action data to each robot using a transmitting machine.
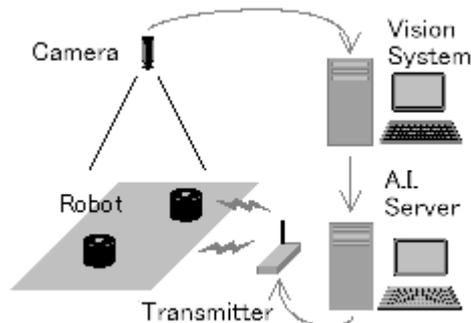

Fig.3: System Configuration

4   Soft Ware Description

Software of KIKS   It is created by Microsoft Visual C++ 6.0, and operates on Windows. VisionSystem and AI server of KIKS consist of the framework and User code. A framework is a common portion used as the base of software, and change is not needed fundamentally. By preparing it and making easy inclusion of the portion which is not common, a new developer should create only User codes (raveling, a communication format, judgment of operation, control, etc.) which become mounting peculiar to User, and can reduce such a term and a labor to development.

4.1   Vision System

Vision System of KIKS operates on Windows and uses one camera (TMC6700made from PULNIX- CL) connected by the camera link. This can acquire the picture information (648Pixelx484Pixel.YCrCb4:2:2 format) on the whole field surface (4.9mx3.9m). Moreover, this camera can take in the picture of 60 sheets in 1 second, and Vision System has sufficient speed to process the picture of only that.Distortion by the lens is contained in the picture obtained from the camera. In Vision System of KIKS, the righter value can be known about position information at least by applying

the compensation with consideration to distortion of a lens to the coordinates of the robot and ball which were obtained as a result of image processing. The various information (the position of a ball, an ally robot's position, an angle, and position of an enemy machine) acquired by processing a picture is sent to AI server by UDP communication.

4.2 AI server
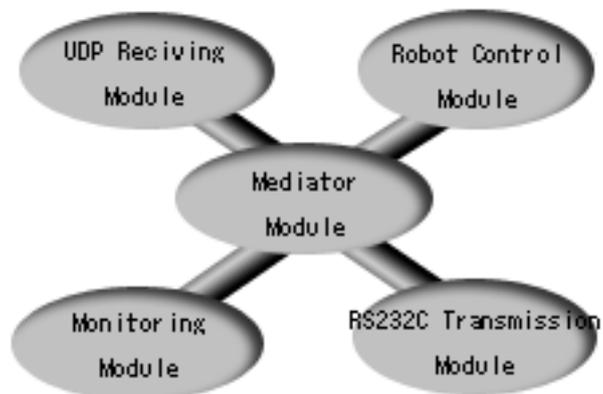
Fig.4 : Explanation of a module

Some modules with a different role combine and this program is made. There are View module, UDP receiving module, a RS232C transmitting module, of operation judgment / control module, etc. as those modules. Each module is exchanging data through Mediator module.Fig.4

Of operation judgment / control module is using the limited state machine (FSM:Finit State Machine). Each robot has some states (Shoot, Clear, Blocking, etc.) which suited the role of a keeper, a defense, and a forward. A robot determines action of oneself by it being in one state among these states. A robot changes action by changing in the state where the next differs from the present state according to the war situation and a command.

5.Conclusion

World convention participation is as a result of prolonged creativity education. By analyzing the accumulation of an S-A creativity test result over five years, we expect that the quantitive evaluation of the development of the composition element in creativity can be carried out.