The Development of Web-based Learning Community System to Facilitate Learner’s Creating the Autonomous Robots

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Abstract

The purpose of this paper is to report the development a web-based learning community system called 'the Robot Studio,' in which learners are helped to create autonomous robots. As an online robot contest is held in the Robot Studio, learners upload some still and moving graphics, as well as program files of their robots, and participate in a competition where they can interact and rate their works each other.

1 : Introduction

1.1 : Research background

In the recent research, there has been great interest in autonomous robot which consists of attaching sensors, motors, gears and micro computers as learning material. In many junior high schools, these robots are created in the class. Outside the school, many autonomous robots are created in some field.

Dr. Hiroaki Kitano who has begun 'Robot World Cup Initiative' which aims at creating autonomous humanoid robot which can defeat the championship team of world cup soccer, build sub project called 'Robocop Junior[2].' Robocop Junior is the education-oriented robot world cup where even elementary school student can understand technology of robotics. The purpose of Robocop Junior provides an exciting introduction to the field of robotics and a highly motivating opportunity to learn about hardware, software and teamwork while sharing technology with friends[3].

1.2 : Prior research

In learning research, many workshops are organized for children to create autonomous robots from the constructivism view. Workshop is defined as face to face group learning in short term where people learn something while communicating with each other. Mori et al (2001) held many workshops periodically where many children create autonomous robots such as Lego Mindstorms and the cricket developed in MIT Media Lab[4].

However, there are the following problems left in workshop. Because workshop is generally conducted as face to face group learning; remote learner can’t participate in them. And it is difficult for learners to maintain their learning activity.

We focused the Computer Supported Collaborative Learning: CSCL by means of solving the above problem. Most CSCL research aims at building knowledge-building learning community on the computer network). In learning community, some learner participate and engage in joint enterprise and practice (Wenger 1998) while communicating with each other. And CSCL enables even learner in remote setting to participate asynchronously in the learning community on the computer network. Dr. Kitano who is one of the most famous robotics scientist points out that the most important learning activity of robots are ‘creating a robot’, ‘competing with others’, ‘communicating with others’ and ‘studying the mechanism of robots’. Also he insisted that we need a networked learning community to enable the children who is interested in robots to engage in. In the networked learning community which he planed, any learners communicate with other learner, participate in the competition of the robot in robot contest and encourage each other while creating the robots. Learner’s competition and interaction stimulate learner’s motivation, facilitate creating the robots and enhance the learner’s skill[5].

According to Kafai & Resnick (1996), it is in the community where learner discuss, help and advice with each other that children achieve effective learning through design of artifact[1]. It is insisted that each learner of a learning community motivate other learner, and that the networked learning community has a possibility to facilitate the creating the autonomous robots.

So, we developed and implemented a web-based learning community system called 'the Robot Studio,' in which learners are helped to create autonomous robots. Robot Studio provides some online robot contests for learners to participate in.

2 : Development of Robot Studio

Robot Studio is the web-based learning environment (web application) that constitutes of web server and database server. Redhat Linux 7.1 is used as both servers’ OS. We use Apache1.3.19 as web server, PostgreSQL7.0 as database and PHP version3 as script. We use Robot Studio with any computers installed in Windows98/ 98SE / Me / 2000 / XP and Internet Explorer 5.5 or more versions. In Robot studio, we can hold some online robot contest for learner to participate in (Fig.1 ).

As an online robot contest is held in the Robot
Studio, learners upload some still and moving graphics, as well as program files of their robots to server. It means the entry to online robot contest. As learner upload them and enter for a robot contest, discussion forum is opened by every robots, where learners can see and share uploaded still, moving graphics and program, interact and rate their robot each other. Learners are expected to see other learner’s robot, and make comment and advice. They send messages on discussion forum freely.

3 : Summary and further research

In this paper, we have described the system configuration and function of the Robot Studio that we developed. Robot Studio has been used by 25 children including elementary school students and junior high school student since 27th, October 2001.

All children use LEGO Mindstorms as tool kit for creating the autonomous robot. LEGO Mindstorms is a real robot kit that has 700 parts such as attaching sensors, motors, gears, LEGO bricks and a programmable micro computer.

Our further research is that we investigate whether Robot Studio served as useful learning environment.

4 : References


