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Innovative Quality Cultivating of College Students Based on Robot Contest

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Abstract: *Cultivating the innovative ability of the college students has been one of the core goals of our high education teaching reform. As a carrier of the high technology competition, robot contest includes multiple disciplines, such as electronics, communication, mechanics, control, computer and artificial intelligence, and it highly integrate the theory and practice. Taking the robot contest as the research subject, this paper analyzes the important roles of the robot contests in the innovative capacity cultivating of the college students, e.g., innovative ability, comprehensive ability cultivating, and quality education etc. It will provide a new idea for cultivating the creative practical ability of the college students.*
Keywords: *Robot contest, FIRA, RoboCup, college students, innovative quality cultivating*

I. Introduction

Robot technology is a product of high integration and blending of modern science and technology. It integrates the knowledge of mechanics design, communication electric, automation, intelligent control. With the development of robot technology and successive update of the teaching idea, in the world wide, a series of robot contests appear. Relying on the different robot contests, the universities can build a college students innovative capability cultivating platform, to practice the students' innovative and practical ability, cooperation and problem solving, and make them to adapt the requirements of quality education under the new situation.

As a carrier of the modern college students quality innovative education, robot contest get wide acceptance and develop very quickly in the world. In China, since 2008, department of education has held national high college skill contest, and robot technology application is enlisted in the contest list. Its purpose is to fasten the step of personnel cultivating and course reform and innovation, explore the new ways and methods to cultivate the high quality personnel of robot application and maintenance for the enterprises. These contests play a key role in enhancing the quality innovation education level of the college students.

II. International Robot Contest

(1) Robot Soccer Contest

Robot soccer contest was initially proposed by Professor Alan Mackworth of University of British Columbia in 1992. In his paper " On Seeing Robots", Professor Alan put forward the robot soccer contest imagine which goal is to defeat human football champion in 2050. This propose gets warm welcome and positive response, hence many famous research institutes and organizations entered this research area and pushed forward its development continuously. Nowadays, there are two robot soccer contests with the greatest influence in the world, namely, FIRA (Federation of International Robot-soccer Association) and RoboCup. FIRA robot contest was initially presented by Professor Jong-Hwan Kim of Korea Advanced Institute of Science and Technology (KAIST) in 1995. In 1996, the first period contest of the FIRA was held in Korean Daejeon [1]. After that, it was held each yearly. Now, it has held 20 periods successfully [1]. The first period contest of the RoboCup (Robot World Cup) was held in Japan Nagoya in 1997, now, it has held 19 periods. The contest terms in robot soccer contest mainly include simulation team, humanoid robot team, etc.

(2) Robot Outfire Contest

Robot Outfire Contest was initially presented by Professor Jake Mendelssohn of American Trinty College in 1994.The contest was held in a simulated house with four rooms and one hall. It demands the contest robot, exploring and analyzing the environment through sensors, to find a candle put in an arbitrary corner in an arbitrary room and extinguish the fire , then goes back to the start point as soon as possible. This contest was held every year, now, it has held 22 periods [1]. Nowadays, organizer divides the same grade contest into standard team and non-standard special team with innovative design, according to the different robot types, e.g., primary standard team and primary special team, middle standard team and middle special team, high-middle standard team and high-middle special team, and walking robot outfire team. Now, its has become one of the most popular and greatest influence intelligent robot contest.

(3) International Robot Olympic Contest

IROC(International Robot Olympiad Committee) organized the first international robot Olympic contest in 1999, nowadays, it has held 17 periods. The contests are divided into conventional contests and innovative contests according to different ages. Moreover, in 2010, the first period "Sunsung Cup" international humanoid robot Olympic contest was organized by Robot Technology and System National Key Laboratory of Haerbin Industry University. Contests include seven classes, i.e., field and track, ball, competition, gymnastics, dancing, amusement, operating, etc, totally 24 terms. The contest rules adopt that of the human Olympic games.

(4) Asia-Pacific Robot Contest

Asia-Pacific Robot Contest initialized in 2002, is an important international contest held yearly by Asia-Pacific Broadcast Union composed of China, Japan, Korean, Singapore, Thailand and Indonesia [2]. Until now, it has held 14 periods. This contest is faced to the college students in this area, especially the engineering students. Its aim is to cultivate the teen-ages' interest and like to the high technology, and improve the technology level of the participants, explore and cultivate future personnel for the development of the robot industry.

III. National Robot Soccer Contest

1. China Robot Contest, i.e., RoboCup Open Contest In 1999, under the support and authorization of the RoboCup international committee, the first China robot soccer contest, i.e., RoboCup open contest was held in Chongqing. From then on, it was held yearly, until now, it has been held 17 periods.
2. National Robot Contest, i.e., FIRA World Cup Robot Contest China Selecting Contest
   In 1999, under the organization of FIRA China Sub-Association, the first period of national robot contest, i.e., FIRA World Cup Robot Contest China Selecting Contest was held in Haerbin Engineering and Technology University. From then on, it was held yearly, until now, it has been held 16 periods.
   "Guangmaoda Cup" China intelligent Robot Contest (International Robot Outfire Contest China Selecting Contest)
3. "Guangmaoda Cup" China intelligent Robot Contest is a national contest held by China Artificial Intelligence robot professional committee. From 2000, it was held yearly, and until now, it has been successfully held 15 periods [3]. This contest includes 6 teems, i.e., robot outfire contest, robot soccer contest, robot innovation contest, robot rescue contest, robot high performance contest and robot dancing opera contest, where robot outfire contest is the international robot outfire contest China selecting contest.
   National College Students Robot TV Contest (Asia-Pacific Robot Contest China Selecting Contest)
4. National College Students Robot TV Contest as the Asia-Pacific Robot Contest China Selecting Contest, is held by China Central TV, and it is the most important contest in national college students robot technology [4]. The contest is initialized in 2002 and held yearly, now it has been held 14 periods.

IV. Role Of Robot Contest In College Students Innovative Ability Cultivating

4. 1. Robot contest and innovative ability

Nowadays, cultivation of national college students has not achieved sufficiently attention. Robot contest provides a good platform to cultivate the innovative ability of the college students. Contest content include knowledge from multiple disciplines which require the students to use the knowledge flexibly, cooperate and negotiate with the students from other majors to finish the contest. Contest form is very interesting, most contest subjects are relative to cultural background and social application value which can greatly improve the study interest and initiative. Contest content has competitive nature, all robot contests require the teams to compete in strategy, skills and time which require the students not bounded by the traditional ideas and brave to be creative during the preparation. Before the contest, students must employ the knowledge of multiple disciplines, such as mechanics, circuits, and control, to design the robot. During the contest, students should have good practical ability, team cooperation and excellent psychological quality. All these need the students to have good innovative idea and creative practice.

4. 2. Robot contest and comprehensive ability cultivating

Except the important role in scientific research, robot contest platform is also a good teaching platform. Robot contest idea driven by the project, especially, has excellent pertinence and goal. It can make the students to integrate the theory and practice closely, to enhance their practical ability and creative ability, cooperative and comprehensive ability. Contest is an important manner to improve the quality education of the college students, especially the robot contest, has an important role in quality education in the students of electromechanical and information fields. In the quality education proposed by the country, ability cultivating is core, and the robot contest provides a stage to sufficiently demonstrate the students comprehensive ability. Robot is a high technology product which integrates the advanced technologies, e.g., mechanics, sensor technology, computer technology and automatic control. Robot contest and electromechanical system innovative design platform can

be applied into the theory and teaching practice of the college students and graduates, to promote their practical ability and comprehensive quality, thus to improve their social competitiveness. Meanwhile, though the real competition, the students can sufficiently feel the competition atmosphere of the large contest, which has great effect to cultivate the good psychological quality of the students. Under the background of the enterprises emphasizing the comprehensive ability of the personnel, after the exercises of the robot contest, the students improve their creative ability and have excellent team cooperation capacity, which bring them larger competition advantage in seeking the jobs, as well as applying to study abroad.

4. 3. Robot contest and quality education

Robot education can lead the students to achieve knowledge, use information, create information, create in the practice, practice in the creation, all these can make the robot course to be new carrier of quality education. The purpose of the quality education is to make the students to grasp the four abilities: learn how to self-control, how to study, how to think, how to create. How to be creative is the core of the quality education. Robot contest can cultivate the creative ability of the students, during the guidance, teachers should not only pay attention to cultivate the creative ability of the students, but also emphasize the individual development, they should draw up a suitable guidance plan for each student, according to their different characteristics, intelligence basis, etc, to realize the maximal development for each student.

4. 4. Robot contest and teachers ability cultivating

Robot contest and the electromechanical system innovative design platform project have also generated good influence on the young teachers' cultivating. Through attending the robot contests, young teachers practice not only their organization and coordination ability, but also their live guidance ability. At the same time, robot contest can improve their professional quality, broaden their knowledge scope, accumulate experiences for their future teaching and research. Teachers can take the robot contests as the research subject and choose their interested research direction. With the improvement of the teachers' professional ability, they have higher comprehensive capacity to guide the college students [5]. Therefore, robot contest also generate great influence on the innovative quality education of the college students.

V. Robot Contest And Innovative Ability Cultivating Scheme

5. 1. Goal of the robot innovative contest

(1) Encourage the teachers and students to take part in the research together, accumulate the experiences and knowledge achieved in the contest, and edit them to contest guidance book to direct the future teaching and research.

(2) Reform the study manner, the core is study something in order to apply it. During the research, we can find the shortcomings of the study and take measures to correct and perfect them, improve the study interest of the college students, inspire their innovation enthusiasm, to achieve the close integration of research and study.

(3) Accelerate the development of the scientific research through the creative mechanism, establish excellent creative platform and mechanism, develop individual potential efficiently, establish flexible team cooperation mechanism, realize the harmonious combination from idea to practice.

(4) Enforce the communication with other robot competition teams to realize the integration of different ideas, to overcome the drawbacks and maintain the sustainable life of the contest, make the relative researches and teaching affairs to develop better.

(5) Take the robot contest as the example to study the principles of the innovative ability cultivation, systematically reform the contents, application time, application methods, and check approaches of the relative course experiments, practical training, course design, etc.

5. 2. Methods adopted in the practice

(1) Encourage and organize the college students to take part in the innovative and research works, and establish the perfect training mechanism.

(2) Establish the flexible negotiation mechanism. Adopting the public server and the SVN version controller, so the team partners can know the project progress even though they are in different places. Academic discussion should be carried out to analyze and solve the problems met during each week. Establish the online discussion group to implement the timely communication and share the information.

(3) Build the cooperation mechanism with other high colleges to make up the drawbacks. Make connection with other excellent teams of other colleges, at the same time, dispatch students to communicate and study with other teams at regular intervals, to enhance the innovative ability further.

(4) Accumulate the scientific research experiences, cultivate the students to write the technology papers. During the competition, teachers can guide the students to consult the papers, self-study, analyze the problems and

solve them. All these actions can improve the creative and comprehensive abilities of the college students greatly.

VI. Conclusion

Cultivating high quality creative personnel is a key problem for the development and expanding of the high colleges. As an effective carrier of cultivating the innovative ability and practical ability, robot contest can not only inspire the interest of the college students and become a driving force of the autonomous study, but also enhance their comprehensive competition capacity. During the robot contest, the theory and practical ability of the college students are integrated closely, and their creative potential is aroused sufficiently, as well as their team cooperation spirit, which promotes their comprehensive ability to deal with various practical problems. So these experiences can greatly enhance their social competition capacity in the future. Meanwhile, robot contest can promote the teachers to reform their teaching methods and improve teaching quality, therefore update their education idea and optimize the teaching system.

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