RoboCupJunior 2002: The State of the League

Elizabeth Sklar

Dept of Computer Science, Columbia University
1214 Amsterdam Ave
New York, NY 10027, USA
sklar@cs.columbia.edu

Abstract. The RoboCupJunior division of RoboCup has just completed its third year of international participation and is growing rapidly in size and popularity. This paper describes the state of the league and looks closely at three components: participants, challenge events and educational value. We discuss the technical and educational progress of the league, identify problems and outline plans for future directions.

1 Introduction

The third international RoboCupJunior tournament was held at RoboCup 2002. As indicated by the number and range of registrations, the initiative has exploded in popularity. Fifty-nine teams from twelve countries participated (see table 1). For the first time, the event attracted teams from a wide geographical region.

Table 1. Countries represented

country	number of teams	country	number of teams
Australia	8	Korea	5
Canada	1	Macao	2
Denmark	1	Norway	1
Finland	1	Slovakia	1
Germany	5	Thailand	4
Japan	29	USA	1

This paper outlines the state of the league. It is divided as follows: participants (section 2); challenge events (section 3); educational value (section 4); and issues (section 5). We discuss the league from both technical and educational standpoints, identify problems within the league, discuss a variety of issues associated with expansion and close by outlining plans for the future.

G.A. Kaminka, P.U. Lima, and R. Rojas (Eds.): RoboCup 2002, LNAI 2752, pp. 489–495, 2003.

a. Social event. b. Volunteers. c. Teammates.

Fig. 1. Participants

2 Participants

The event in 2002 faced new challenges in terms of the number of participants, language and cultural issues, as well as differences in attitude regarding the meaning and mission of the Junior initiative.

In total, 236 students and mentors were involved. Table 2 lists each team and indicates which teams participated in which challenges — dance, one-on-one soccer and two-on-two soccer. The challenges themselves are discussed in the next section. Students ranged in age from 9 to 18 years of age. The participation rate of females increased to 16.5%, up from 10% in 2000. All events were conducted in both English and Japanese.

The tournament took place over a two-day period. During the first day, a round-robin was held for all the soccer teams. Most round-robins consisted of 5 teams, so every team played at least 4 games. During the second day, the finals for all the soccer teams took place. In addition, on the second day, friendship games for the soccer teams not participating in the finals occurred; and the dance event was held.

A social event was held on the evening between the two days of competition. This was a party put together by the local sponsors (Fukuoka City) and included many aspects of Japanese culture, including food, origami, music and dancing. Attendance was excellent, by both students and mentors.

Most teams were chosen to come to the international tournament through local selection events. These events seemed to vary greatly in size and scope from one region to another. All teams were asked to submit an application for participation at the international level, since it was anticipated that more teams would want to come than would be feasible in the venue. Some regional organizers submitted "placeholder" applications because their selection tournaments were not scheduled to take place until after the application deadline. The application included a short essay describing the team. Below are a few excerpts from the team essays:

- *We are the only girl robotic team of our school. We have two robots, snow and white. Snow is the field player and white our goalie. We hope that we will be selected ... so that the other girls of our school will see how exciting science can be.*

Table 2. Team statistics

dance	1-on-1 soccer	primary 2-on-2 soccer	secondary 2-on-2 soccer	number of members	team name	country
			X	3	3Peace!!	Japan
	X			3	AC IOI bot	Thailand
			X	3	AC119	Thailand
X				3	AHIMO	Japan
			X	3	ALEX	Japan
X				5	beautiful sky	Japan
			X	5	BIG WAVE	Japan
X				4	Blood Hound Monkeys	Australia
X			X	6	CanadA.I. (as in A.I.)	Canada
X				3	Choukou Dance Robo	Japan
X				4	Da Piratin' Penguins	USA
			X	5	E-Strikers	Australia
			X	3	HARRY	Japan
			X	4	ILI	Australia
			X	3	K-five	Japan
		X		5	LEGOFriends	Japan
		X		3	Lion	Republic of Korea
			X	5	LITTLE BY LITTLE	Japan
			X	4	Macao United Team A	China
			X	4	Macao United Team B	China
			X	4	Mount Soboku	Australia
			X	3	Norway	Norway
			X	4	Page 1 of 2	Australia
			X	5	Pilatoren	Germany
		X		3	P-K	Republic of Korea
			X	4	psychos	Germany
		X		3	PUKKABORO	Japan
		X		3	Red devil	Republic of Korea
			X	5	red of the dragons	Japan
			X	5	Robotic Atom Junior	Japan
			X	5	Saarland Mind Over Matter	Germany
			X	5	Saarland Omniwheelers	Germany
X				8	SAKURA	Japan
		X		3	Samurai-damashii	Japan
		X		5	Schole Asoka A	Japan
		X		5	Schole Asoka B	Japan
			X	4	SG-1 [Martin]	Thailand
	X			4	SG-2 [George]	Thailand
	X			3	Slovakia	Slovakia
X			X	4	snowwhite	Germany
			X	3	SPIRIT OF SUE	Japan
	X			3	Team Denmark	Denmark
	X			3	Team Finland	Finland
X				6	Team Hori-Hori	Japan
			X	4	Team TROUSSIER	Japan
X				3	The Groove	Australia
X				5	The Samurai	Japan
			X	4	Thunder From Down UNder	Australia
		X		3	Tiger	Republic of Korea
		X		5	Tokai 1	Japan
			X	5	Tokai 2	Japan
X			X	3	Victory	Japan
		X		4	Victory friends3 SUGOIZO!	Japan
			X	4	Waggles	Australia
		X		3	Windows	Republic of Korea
		X		4	winning3	Japan
			X	3	W-wing	Japan
			X	3	YAMAKASA	Japan
			X	5	YOSHIZUKA	Japan
12	5	13	32	236	← TOTALS	

– *We [are from] Genkaijima Island, ... a small island located off Hakata bay, about 30 minutes from Hakatapier by ferry. We are all buddies, born and grown up together on the island. Our junior high school has been promoting activities in the community, learning something through information and deepening international understanding through exchanging programs under the catchphrase "Let's launch out into the sea for the future with the Genkaijima Island spirit."*

– *"Little by little," is our team name. It comes from the Aesop's Fables, "The Hare and the Tortoise." ... Our big plan is that, with the steadfast endeavor, our robot will outdo the hare and come out on top.*

- *We will have truly valuable experiences learning a lot through teamwork and exchange with many children from overseas.*

- *The motto of our robots ... is "Simple is Best".*

- *Our team uses original parts (not a commercial kit) and assembled ourselves. We used half or more of our efforts to make more sophisticated program to control robot.*

- *In the dance competition..., you get to use creativity as well as programming skills so it's more fun than doing soccer or rescue.*

3 Challenge Events

Teams entered one of two soccer challenges (one-on-one or two-on-two) or the dance event. Three teams participated in both soccer and dance: CanadA.I. (Canada), Snowwhite (Germany) and Victory (Japan).

In the soccer event, a one-on-one competition was tried for the first time at the international tournament. A relatively small number of teams entered (5 for one-on-one compared to 45 for two-on-two). While this event allows teams with only one robot to participate, the game itself may be somewhat limiting since the field is small (1/2 the size of the two-on-two field) and there are no teamwork issues to address. Nonetheless, there is a strong sentiment, particularly in European countries, to retain the one-on-one challenge.

A new *friendship game* was introduced this year as an exhibition event. Teams were paired, each team supplying one robot, and the pairs participated in two-on-two games. In this way, teams that brought either one or two robots were able not only to experience the added complexity of the two-on-two game, but also to interact with other teams in a shared project. The teams that did not reach the finals participated in the friendship games while the finals were taking place.

Perhaps the group as a whole that showed the most progress this year was the dance event. Twelve teams participated, each demonstrating unique and creative ways of combining technology with art and music. Some teams' routines told stories. Many teams shared their country's culture through traditional dances, music and costumes — worn by both robots and students. Several teams built robots out of wood, like puppets, dressed and decorated for the occasion.

Another advancement was in the expansion of robot platforms, by both soccer and dance teams. In 2000, all teams used LEGO Mindstorms (see figure 3a). In 2002, teams used a variety of other off-the-shelf kits, including the Fischertechnik Mobile Robot (figure 3b), the Elekit SoccerRobo (figure 3c) and the Tetrixx robot. This year, a non-trivial number of teams built their own robots from basic components, rather than using off-the-shelf kits. Many of these were the dance robots, as described above.

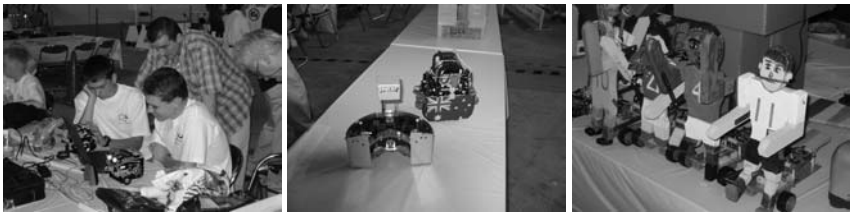
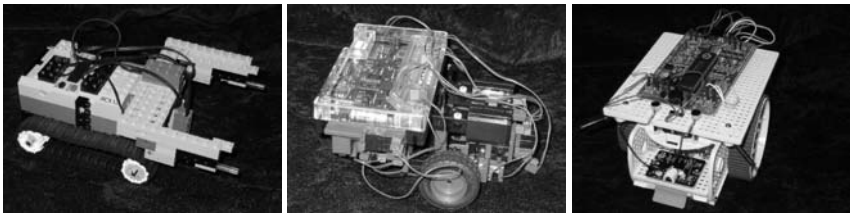


Fig. 2. Soccer and dance teams



a. LEGO b. Fischertechnik c. Elekit

Fig. 3. Robot kits

4 Educational Value

As in past years [1,2], mentors and students participated in a study examining the educational value of RoboCupJunior. This year, participants completed both paper-and-pencil surveys as well as video-taped interviews (of students only). 57% of teams completed the surveys, totalling 104 responses. Preliminary results from the students' surveys are shown below.

In the survey, students were presented with multiple questions about each of nine skills[1]: math (mat), physics (phy), computer programming (pgm), mechanical engineering (mec), electronics (ele), general science (sci), communication (com), teamwork (tem) and personal development (pdv), which includes aspects of self-esteem, organization and motivation. They were asked, on a skill-by-skill basis, did RoboCupJunior and/or your robotics experience have a positive effect? Responses were given on a 5-point Likert scale. The results are shown in figure 4.

It is interesting to note that 60% of the students indicated that they did not feel their math skills were affected by their participation in RoboCupJunior or their experience with robotics. This result concurs with the prior studies and points out that while students recognize the obvious relationship between robotics and engineering (mec and ele) and programming skills (pgm), work is needed at the curricular level to connect math skills to proficiency in robotics.

[1] The abbreviations in parenthesis correspond to the labels along the horizontal axis of figure 4.

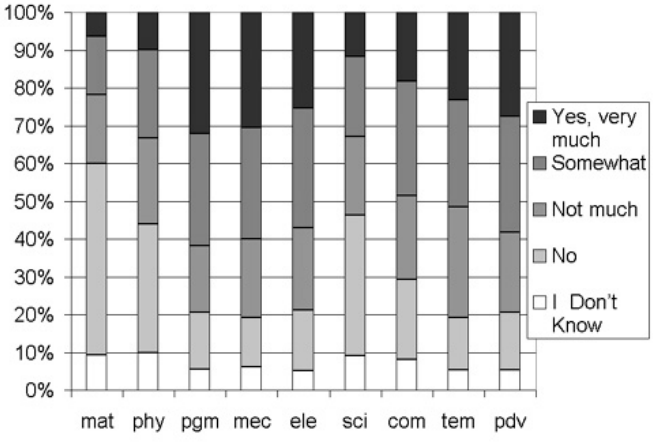


Fig. 4. Perceived effects on various skills, according to students

This is important because, as any robotics researcher will agree, strong knowledge of mathematics is required for success in technological fields; and students must be cognizant of the connection.

5 Issues

Issues relating to the competitive nature of the games were extremely prevalent throughout the tournament this year, much to the dismay of the organizers — and indeed, many of the students. Much of the tension surrounding the competition seemed to stem from mentors and parents.

There was an attempt to mix teams based on geographical region; however this was thwarted due to complaints from local teachers. The difficulty lay in the fact that the international teams were in the secondary school age group, while most of the local teams were in the primary school age group. Thus, a division of teams based on age would mean that the local primary age teams would play with each other — just as they had in their local selection tournaments — while the international teams would mostly play with other international teams and have limited opportunity to mix with the local teams. However, the notion of unfairness in the competition due to matching teams of disparate ages prevailed over the desire to create a friendly atmosphere in which teams from different cultures could share experiences with technology.

There was a disappointing relationship between students' attention to the survey described in section 4 and their performance in the competition. Students whose teams did well were happy to complete the survey and ranked their experience highly. Students whose robots did not win games were less positive about their experience. The contention is that the educational value is preserved

regardless of competition performance. To mitigate this situation, perhaps future studies will be conducted outside of the competition event. In addition, perhaps more awards are needed in order that students whose robots lose games still receive rewards for their participation and for their learning experience.

The rapid expansion of the league presents many challenges for the future. If all countries are required to send their "national champions", then how do new countries with little or no national following get involved? In a geographically large country, is it practical to hold a national championship? Finally, emphasis on the competitive aspects go against the RoboCupJunior mission, so how can teams be chosen to go a selective event without using competition to decide who gets to go? This problem seems inherent in the initiative, and so must be addressed at a high level in the organization with agreement of all active members from participating countries.

6 Summary

This paper has given a brief overview of the current state of the RoboCupJunior league. Topics regarding participation, challenge events and research were presented. Issues relating to the rapid expansion of the league, as well as the increased competitiveness amongst participants, were discussed.

The mission of RoboCupJunior is to create a learning environment for today and to foster understanding among humans and technology for tomorrow. It is hoped, as the league continues to expand in terms of the number of participants, the span of countries involved and the range of challenges, that the more contentious issues surrounding the competition can be left behind in favor of the more positive aspects relating to education and exchange of cultural traditions and technical ideas.

References

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2. Sklar, E.I., Eguchi, A. and Johnson, J.H., RoboCupJunior: learning with educational robotics, in Proceedings of RoboCup-2002.