Innovation via Competition: Taking the Next Leap

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1 Introduction

Competitions have been used to pit state-of-the-art robots against each other in recent years with great success in at least one area: this has been one of the most advertised events at many AI meetings. However, besides the hype, can contests actually be useful to further drive developments in robotics? We believe that they can. In addition, we propose a model of technology-sharing such that competitions could provide the support foundation. To that end, we propose a set of recommendations for robotics competitions.

2 Problems

Each year, an organized robot competition finds itself in the hands of a new set of organizers. They are faced with many questions: What new events can we dream up? What will be the rules? Should X be worth more points than Y? Should it be limited to state-of-the-art robotics institutions, or should high school students with some Legos be allowed to compete? What's Alan Alda's telephone number? It is no doubt a daunting task.

In addition, it doesn't seem to do much to drive the field to further innovations. Teams compete against each other, but little is said about what technologies are actually employed "under the hood." Although many competitions may have associated papers in a proceedings, they rarely contain strategies that actually get used—by the time the contest rolls around something better has been developed.

3 Recommendations

1. Be consistent: don't change the problem from year to year. As years go by, contestants can continue to work on the finer points of the problem or on more refined solutions. on the other hand, there are some things that should be varied each heat and year. Starting positions should change each run, and object colors each year. Emphasize generalization in limited domains. Encourage robot adaptation rather than hard-coded spatial maps.

2. Problem tasks should have multiple levels of complexity. We should think of more open-ended problems (such as a treasure hunt) rather than a narrowly define task (such as fetch the ball). A treasure hunt-oriented task could leave room for differing levels of sophistication and equipment. For example, instead of creating many categories of participants (i.e., robots with vision, robots with arms but no vision, robots with wall sensors but no arms, etc.) simply award more points for the more sophisticated prizes. In this manner, a robot might get 50 points for placing the green ball in the box with Richard Nixon's face on it, but only get 5 points for pushing the blue box to the wall.

3. Create modular tasks and solutions. If there were a standard method of interfacing hardware components, and a similar interface at the software level, teams could develop on-the-fly. Imagine Team A's mobile robot with Team B's robotics arm. In order for this to happen, robotics vendors would need to develop interfacing standards. This could spur other internal competitions (i.e., "Team C's robotics arm is better designed than Team B's—see if you can team-up with them.") The vendors have done a wonderful job of creating cost-effective robots. Let's take the next leap and encourage modular software and hardware specifications.

4. Emphasize the technology. All teams should be required to produce a "specification sheet" at the time of the competition. These sheets would detail how the robot actually works. There could be a poster area for just these spec sheets.

5. Scoring should be based on global performance. Don't penalize a robot for striking a wall; simplify the requirements by measuring a more global measure, such as total time taken to complete the task [1].

4 Conclusion

We believe that competitions can be exciting and fruitful. This will require some work up-front, but, with the help of robotics vendors, this could be rewarding for all those in robotics.

References

[1] Fred Martin. An open letter to professors Jake Mendelssohn and David Ahlgren. *http:// lcs.www.media.mit.edu/ groups/ el/ Projects/ handy-board /misc /freadm423.txt*, 1997.