AAAI-92 Robot Exhibition

Specification and Rules

San Jose, California, July 12 – 17, 1992 Sponsored by the American Association for Artificial Intelligence.

Introduction

AAAI is planning to hold a robot competition at the national conference in San Jose in July of 1992 The competition will be open to all manner of reasonably sized robots and will involve a variety of events The details of the competition are still evolving; however, to make people aware of the competition and to get things started, a tentative specification and set of rules have been put together If you are interested in participating in this competition, please send mail to bonasso@starbase mitre org, and you will receive additional information as it becomes available We are also considering a preliminary event to be held in conjunction with the AAAI Spring Symposia Series held at Stanford in March of 1992 It is important to note that this competition is meant to be fun and educational more than anything else

"This won't be a slick, polished competition There will be a certain amount of chaos, but I can guarantee there will be a lot of excitement and enthusiasm This sort of robotics can serve to bring together several areas of AI including those working in perception, planning, robotics, spatial and temporal reasoning, and learning Indeed, these areas are already combining their efforts, and it seems reasonable for AAAI to facilitate and encourage this further and for the community at large to become aware of it and be inspired by it "   *—Tom Dean*

General

This event is cast as a competition to motivate participation in the spirit of trying to develop as animate, responsive, and intelligent robot behavior as possible The competition involves "house-breaking" followed by two stages involving spatial search and object detection/classification Object classification is possible using three kinds of sensors Parts of the scoring use an olympic-style judging The over-arching guidelines are a variant of Asimov's laws of robotics Humans are allowed to meander among the robots in the first stage, but the robots will be competing individually, not simultaneously, with other robots In order to reduce the possibility of radio or sensor interference, the competition will be conducted in three partitioned activity areas

In general, there will be three stages of the competition: 1) a qualifying stage where the robots are expected to "roam" or wander around an area while not damaging people or stationary objects or themselves; 2) a stage where the robots will be allowed to explore a designated area, logging any identifiable objects that they can; and 3) a performance stage wherein the robots will be required to move to an ordered series of waypoints representing areas and search for specified objects and return A fourth demonstration stage will be allocated for each entry group to demonstrate other aspects of their robotics work which may go beyond the competition (e g , object retrieval, multiple robots in cooperation) In all phases, a modified version of the three laws of robotics will be in force:

1) Within the capabilities of its dynamic range, a robot may not harm a human (The robot doesn't have to show that it can distinguish humans from other objects It just can't run into or over them)
2) A robot must obey the orders given it by its operator/programmer as long as they do not violate the first modified law
3) A robot must protect itself as long as it does not violate the first modified law A robot shall give a warning to its operator prior to executing human orders which will violate this modified law

Venue

Three polygonal areas or "rings" will be identified on the exhibit floor for the robot performances All three will be used during the first stage of the competition, the center ring being the site of the second and third stages Minimal areas will be forty by eighty feet with at least eight foot high ceilings The rings will be separated by wallboard or paneled partitions in order to limit inter-robot electrical interference The floor will be flat and consist of tiles, wood, or concrete—not carpeted A plan view of the geometric areas will be provided to participants prior to the competition

Things

Things in the environment will consist of "naturally ocurring" items in the exhibition hall, e g , desks, file cabinets, chairs, tables, shipping boxes Things will be "naturally mobile," e g , a chair on wheels can be moved either by humans or the robots, whereas a shipping carton loaded with a hundred pounds of lead weights will not be moved once placed in the exhibition areas They will all be selected such that they will be detectable with proximity sensors from the floor level to at least three feet above floor level, i e , there will not be discontinuities in the z axis of the thing at least to the three foot level. One such thing will be small and light enough to be graspable and transportable (see following)

There will be two classes of things: objects and everything else Objects will be made to be identifiable in at least three ways: with a bar-code, by a color pattern, and with an IR transmitter of a specific frequency All objects will be textured so as to lend themselves to stereo ranging One object will be a convex polygonal object, less than one pound, placed on a horizontal surface above the floor, one dimension of which will be less than four inches This object can be used as the target for a find and fetch task in a stage four demo An example is a twenty-four inch tall, three inch diameter, plaid-colored cardboard cylinder

All other things should be considered obstacles and can be used by the robot for other purposes such as navigation

Robots

Size To enter the competition, a robot, including all on-board sensors and power, must be no taller than six feet and may not cover an x–y area greater than twenty square feet.

Power· The robot must be powered by batteries or tethered to standard 110 volt power supplies. Robots powered by combustion engines will not be allowed

Sensors There is no limit on the number or types of sensors a robot may use Use of laser sensors must be approved on a case by case basis by the specs and rules committee

Speed No robot will be allowed to travel faster than two feet per second

Emergency stop: All robots must be able to be commanded to halt and remain in place within one second via remote control or by an on-board button/switch that can be reached by a human within one second

The Competition

General Because of electrical interference between robots, none of the competition stages will involve multiple robots.The first stage is considered a qualifying stage Robots that prove not to be "house broken" with regard to themselves, things, and human spectators, will not be allowed to continue in subsequent phases of the competition Since there is a qualitative difference between the first and subsequent stages, competition points earned in the first stage will not carry over to the other stages There will in effect be a first stage first, second and third place finishers, all of whom qualify for the subsequent stages (All other robots which are judged to have been sufficiently housebroken will also qualify; see details of the first stage scoring)