McMaster University's Artificial Computing System

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Introduction

This will be McMaster University's first entry into the AAAI Mobile Robotics competition. As such, this year will serve as a testing ground for future developments. It is the goal of the designers to experiment with new techniques and approaches based on their engineering background.

Project Objectives

The developers of this robot intend to simplify the complex task of making a robot intelligent by classifying the types of problems faced by the robot. In that way, the robot can determine the best course of action depending upon the task required. Obviously, a lot of time will be spent determining the key factors necessary to identify each type of problem.

To simplify the task of classifying the problems faced by the robot, we intend to use our engineering physics background to develop an approach. By understanding the key underlying physical factors specific to a situation, and using these to develop a solution, the amount of processing required of the system will be greatly reduced. Only essential data will be collected, with the actual system determining what data and how much data is needed to solve the problem.

In keeping a general approach to problem solving, the robot will need to identify situations that have been previously encountered. The key to identifying similar problems is collecting the proper data to determine the robot's situation. For example, finding four solid objects enclosing the robot could be interpreted as a room. What to do in this room would then be the new problem faced by the robot. The initial task of finding the four walls would be simplified by first getting the correct data to identify the objects as walls and not obstacles to be avoided. We hope to avoid relying on properties specific only to one goal to keep the algorithms general. Complex tasks would then be accomplished by separating them into components that can be dealt with. Only then will specific properties of the task be used to allow the system to make assumptions in determining solutions to certain situations.

System Components

In keeping with the theme of dividing the programming task into manageable pieces, the hardware will follow the same design philosophy. Specific computations will be carried out in certain areas of the system. The main processor, where the decision making is carried out, will communicate with the sub-processors to request and receive data. The central intelligence of the system will run on a standard desktop computer, on board the robot platform. Other tasks such as data collection and motion control will be accomplished through use of embedded controllers. Existing technology will be used for the sensors of the system. Specific components used for data collection will include ultrasonic ranging for quick obstacle avoidance. As well, laser ranging and scanning will be used for acquiring positional data and information about surroundings. The intelligence of the robot will be distributed throughout the system to minimize the load on each processor. The sub-processors will then notify the main system that important information is available. In this way only when new information is ready will the main processor look for the data. This is done to mimic the brain, or the main processor collecting information from the senses, or sub-processors.

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