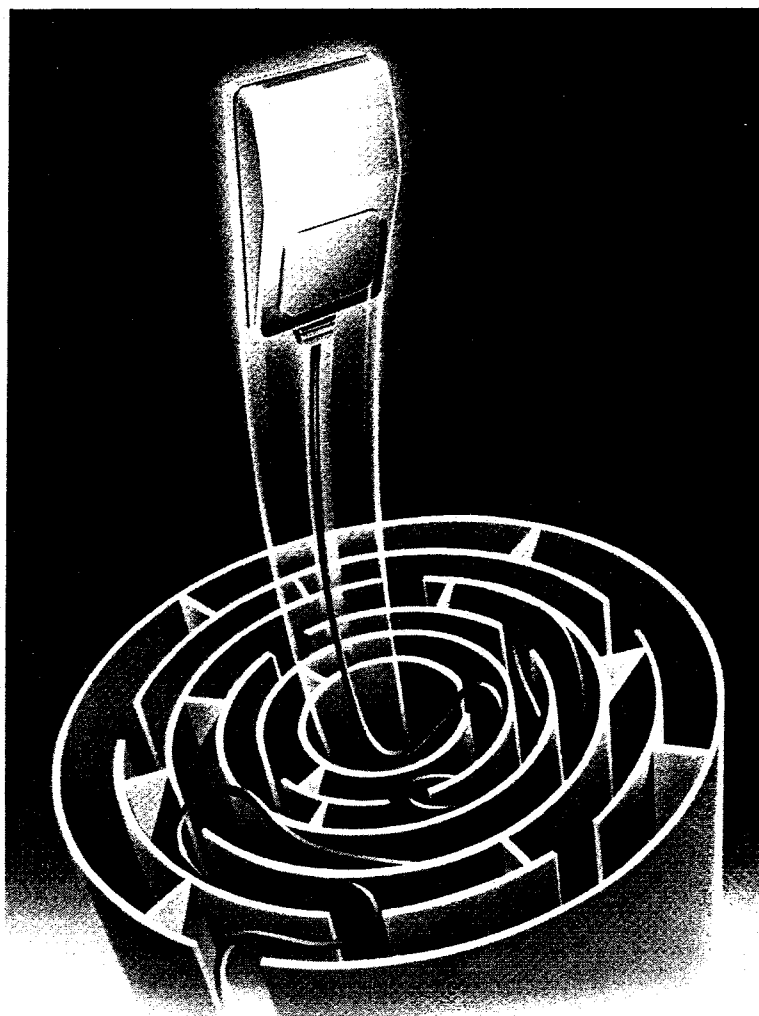# *Third Annual*

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GOALS: A REAL-TIME OBSTACLE AVOIDANCE METHOD FOR MOBILE ROBOTS

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With the emergence of mobile robots, there arose a need to develop methods that would allow these robots to travel in their particular environments. One necessary component of movement in our world is the ability to avoid objects that are in the way of a desired goal. Hence, many "obstacle avoidance" algorithms have been implemented for mobile robots, with varying degrees of success. What we offer here is our own obstacle avoidance technique.

Entitled GOALS, for Global Obstacle Avoidance using Localized Sensing, this algorithm has slowly evolved from simple experimentation to a fully documented obstacle avoidance method. The robot in use is a LABMATE TRC mobile platform, with an array of 16 ultrasonic sensors around the front and sides. Each of these "sonars" sends out an ultrasonic signal. By timing the delay of the return of the signal, the sensor obtains a good estimation of how far away an object is. By using the combined information received from the sonars, a "world view" can be discerned.

After the goal is set by the user, GOALS looks for clear paths in the direction of the goal. By analyzing both long and short range sensory data, the best path is chosen and a local goal set. By driving toward the local goal and gathering more sonar information, a new local goal will be set, and this process repeats until the final goal is reached.

One problem that arose during this developmental process was that the sonar sensors did not always return reasonable values. This lead to the robot attempting to avoid objects that did not exist. Also, the algorithm had no memory capability; hence, a previously avoided obstacle would only continue to be avoided if the sonars returned consistently accurate readings.

This dilemma was resolved by implementing a map of the environment based on the sonar readings. Instead of using the current sensor values to choose a path, GOALS now relies on a sonar map, where the probability that an object exists is depicted. Hence, one bad reading would lead to a low probability entrance on the map, and many readings in a given area would indicate the presence of a real obstacle.

Currently, the ability of GOALS to navigate an obstacle-laden path is fair, but many improvements can be made. Included in these is a new, and hence faster, sonar array, and the ability to build more accurate, self-correcting maps. Even without these enhancements, the GOALS algorithm presented here is a simple, yet reliable obstacle avoidance method.