

Self-Mapping Mobile Robot (MapBot)

FUNCTIONAL DESCRIPTION

Submitted to

Dr. Aleksander Malinowski, Dr. Winfred Anakwa, Design Review Team

by Stephanie Luft

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Objective

The objective of the Self-Mapping Mobile Robot senior capstone project will be to develop a robot that can independently map an area of its environment and locate itself within the map and the environment.

System Block Diagram

The robot system, shown in Figure 1 below, will consist of the Pioneer 2 mobile platform, previously used in the GuideBot project, a series of distance sensors, a compass, and a laptop computer currently mounted on the mobile platform. The system may include a remote computer for running calculations, storing map data, and interfacing with a user.

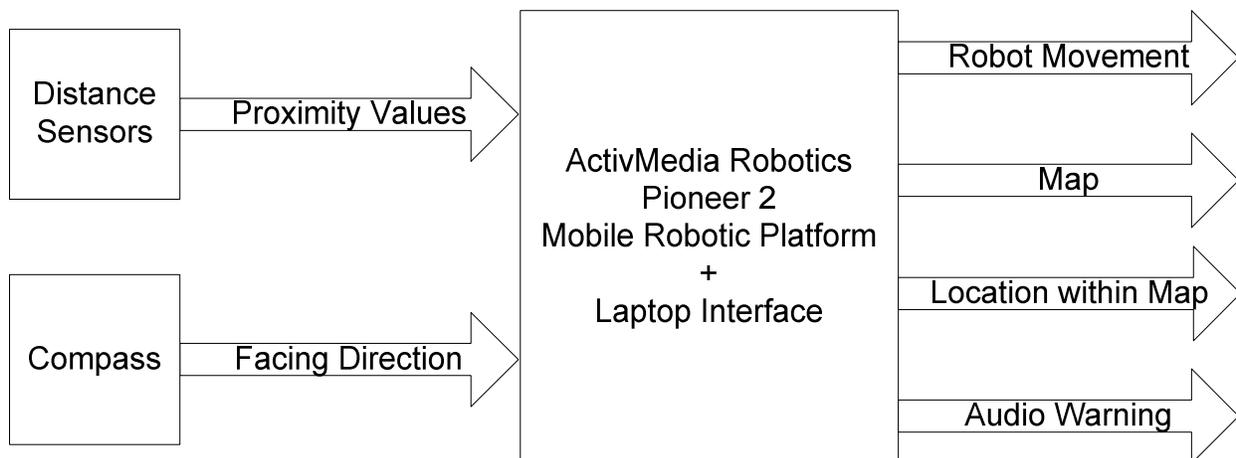


Figure 1: System block diagram for the MapBot

The sensors will allow the robot to detect obstacles and points for mapping. The compass will allow the robot to orient itself more efficiently than the use of sensors alone would permit.

The robot will move throughout its environment at the command of a user or the software. It will use data from the sensors and the compass to create a map of its environment and locate itself on the map. The robot will be able to make an audio warning sound if it encounters a problem, for example finding itself in a small, closed-in space or an obstacle approaching too quickly to avoid it.

Functional Modes

The robot has one main functional mode in which it will map its environment and locate itself on the map. It may have a data-transfer mode if a remote computer is used for processing and interfacing. The main mode can be broken down into several functionalities:

- Sensing: reading data from the distance sensors and compass
- Semi-random motion: for mapping and maneuvering in an unknown environment
- Obstacle avoidance: including sounding a warning if an obstacle is too close
- Self-locating: determining the robot's location within the environment and the map
- Plotting: creating the visual representation of the robot's environment and showing its own location
- Interfacing: allowing the user to command the robot to map an area and displaying the map to the user.

The functionality described above will be implemented using a high-level programming language with a readily-available software development application. This will be stored on the laptop and/or remote computer and interfaced to the robotic platform, sensors, and compass.