Robotics Club Summer Project
Micromouse Simulator
Project Report

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Objective:

The objective of this project was to develop a test platform for micromouse algorithms. The difficulties involved in the actual production of a micromouse and test mazes has been a serious hindrance to pursuing the intelligence aspects of a micromouse, and the availability of a simulator is expected to expedite the process, hopefully culminating in the development of a functional mouse by   the time of techfest in January'08.

The project also called for the creation of a specification of the functions are to be provided by a generic mouse independent of the algorithm, so that mouse design parameters such as the sensor positioning, motor drive types, etc. can be easily replaced without requiring the rewriting of the algorithm part of the code.

Approach

The approach adopted to solve the problems detailed above was to introduce an additional layer to the typical micromouse program structure.
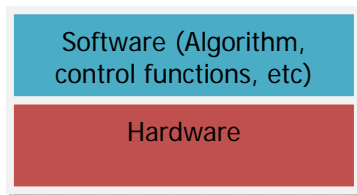
A Typical Stack :
Software and hardware are intrinsically tied together, any change in hardware requiring major reconstruction of the software
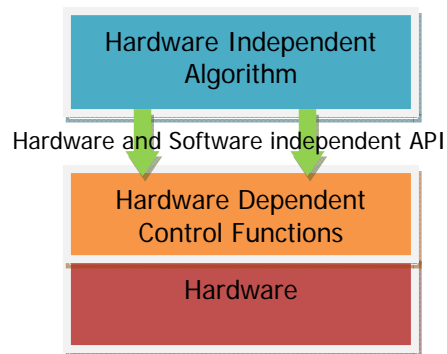
An Improved Stack :
Software and hardware are independent, making algorithms and hardware almost hot-swappable.

The introduction of the intermediate stack with the control functions is what makes the simulator-tested algorithms easily portable to a physical mouse, with minimal changes in code.

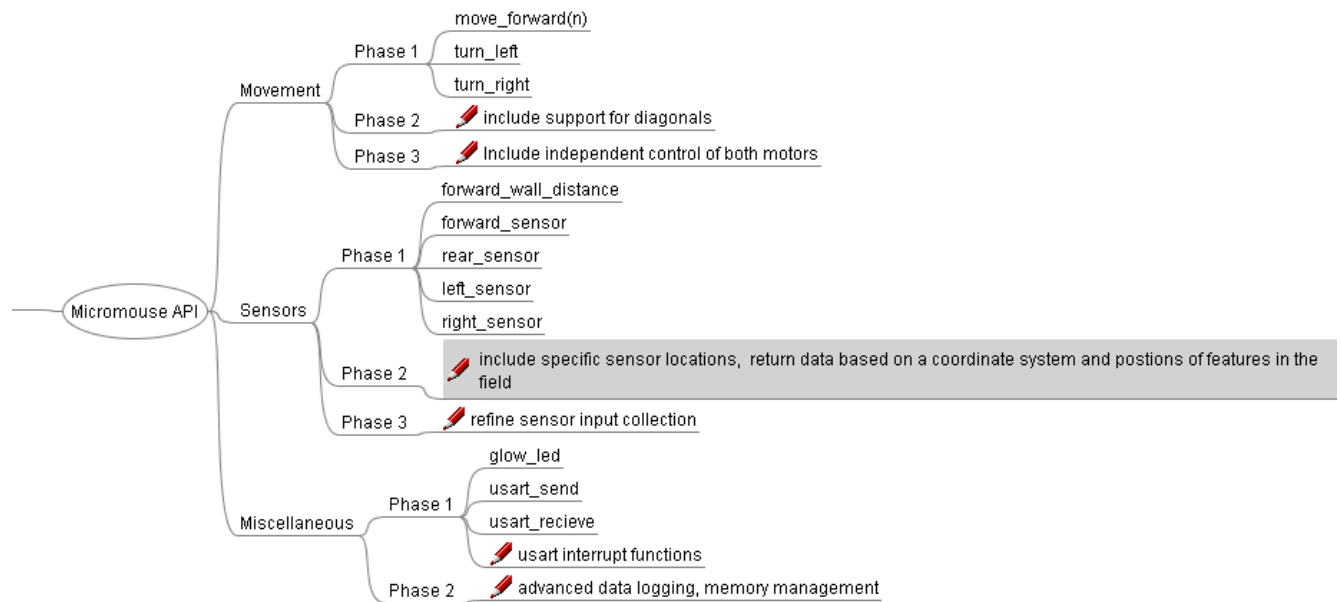The first phase of the project was to try to define the Hardware and Software Independent API.

Figure : Micromouse API Overview

The functions included in the first phase of all the sections have been completed, and the development of the coordinate system and data processing for the later phases is in progress. At this point, the simulator is capable of being used to test algorithms for maze solving in an ideal environment, but not lower level processes such as wall-following and memory management

Once a relatively clear picture of the various functions that would be necessary was obtained, these functions were written into a Java based simulator. The Simulator program itself replaces the Hardware and Hardware-dependent control function layers of the improved stack with itself, communicating with the algorithm via socket programming as shown below :

Simulator Stack
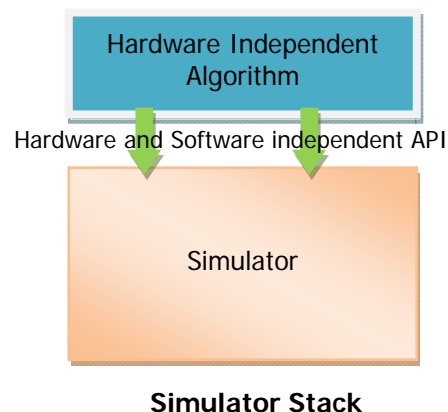
Future Directions

The future work that is planned by the club includes:

- Completing Phase 2 of the API

- Moving the Algorithm onto a microcontroller instead of running it on a computer to account for the limitations in clock speed in a real scenario. (this will be done by incorporating support for USART in the simulator.

- Development of an actual algorithm for maze-solving.

- Building a physical mouse and writing the Hardware-dependant control functions layer to test the simulator in a real environment.

- Participating in the Micromouse competition in January '08