

FUZZY LOGIC CONTROLLER FOR AN AUTONOMOUS MOBILE ROBOT (GLADIATOR)

VAMSI MOHAN PERI
AB STRA CT

In this thesis the development of an autonomous wall-following robot is presented. The wall following controller is a two input, two output system. The inputs are two proximity measurements to the wall, and the outputs are the speeds of the two rear wheels. For the embedded fuzzy logic controller, the behavior must be approximately encoded for the target processor, and then downloaded to the chip for execution. The target system is a small mobile robot equipped with an embedded microcontroller based on a Microchip PIC16F877 microcontroller. The robot is driven by two independent servo motors. Three ultrasonic range sensors are used by the robot - two on one side (the controller inputs) and one in the front (for emergency stop in case of an obstacle). Since all the control circuitry and computation are embedded in the robot, it is self contained and travels without the need for any data link to external processors such as a PC. For downloading the fuzzy control software and communicating with the microcontroller during testing, the robot must be connected to the PC via a standard RS232 serial link. The detection of a wall by the sensors activates the controller which simply attempts to align the robot with the wall at a specified reference distance. Once aligned, the robot follows the wall and attempts to maintain alignment by compensating for lateral drift. The fuzzy rule base and the generation of the processor-specific code was done using a compiler called PIC-C which provides the capability of converting C code into PIC16F877 assembly code.