

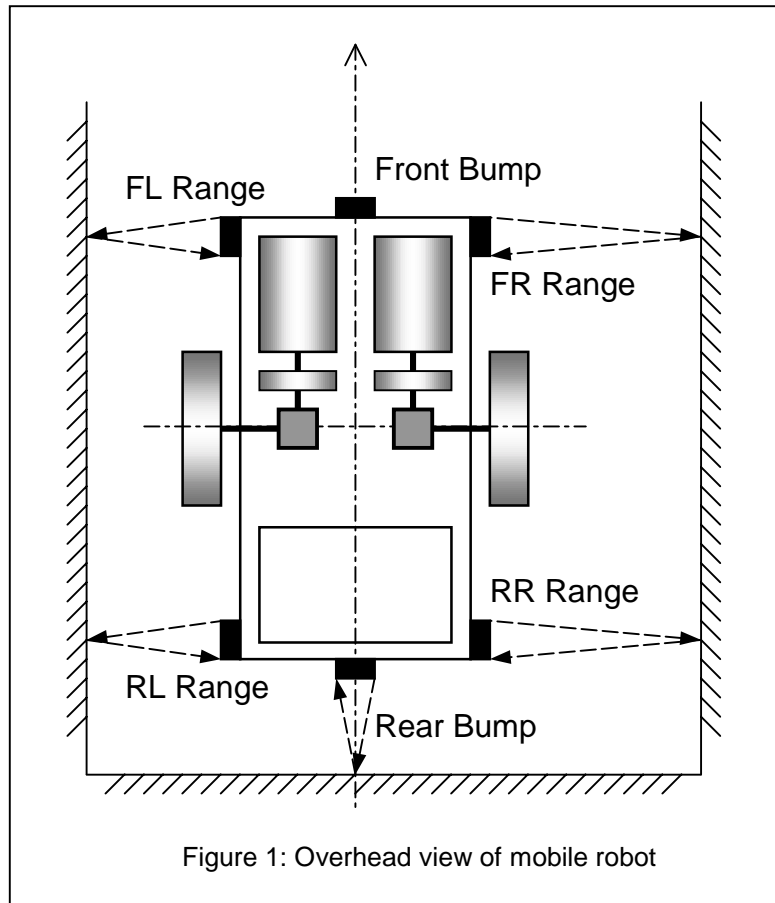
Infra-Red Sensor Array for a small wall-following mobile robot

The circuit provides for four active infra-red ranging units with a digital output proportional to range, and two active infra-red 'bumper' sensors triggering at a pre-set range. Figure 1. shows the general arrangement of the robot.

A 4-channel ADC chip, an AD 7824 provides distance from wall information to 8-bit resolution. The useable range in this case has been set to lie between 15mm and about 100mm assuming white walls as found in a micromouse maze. The effective range can be increased by using larger values for R1. However, this will also increase the minimum range.

Front and rear 'bump' sensors simply provide a logic '1' signal when a wall is about 70mm away.

Resistors R2 and R3 are low-valued to provide good IR illumination, but to conserve battery power, are only switched on by the microcontroller one at a time as each sensor is 'polled'.



The digital side is designed for an 8051-type microcontroller, with the range LEDs and sensors mapped into the external memory area while those for the 'bump' sensors are directly connected to spare port lines. Dual latch X2 is needed because of the multiplexed address/data bus structure of the 8051.

The ADC is operated in what the data sheet describes as Mode 1. A data read from any of the memory-mapped addresses gets the result of the last conversion while triggering the next conversion from the selected channel. The software polls each channel in sequence, having turned on the appropriate LED each time. It is necessary to allow time for the received signal to stabilise as the LEDs take a relatively long time to come to full 'brightness'. An extra feature is to take a reading on each channel *before* turning on the LED and subtracting this from the 'lit' value in order to provide some compensation for ambient conditions.

Front *and* rear side-sensors are provided so that the robot can sense if it is at an angle to the wall.

