

2.12 Introduction to Robotics
Laboratory No. 3

Section: _____, Date: _____

Students Name: _____

Objective

The objectives of today's laboratory are:

- Implement basic functions of sensor-based control on the lab robot, and
- Plan a strategy for performing the de-mining task described below.

Lab Report

You are expected to turn in the questions/check sheet. Each group turns in one report at the end of lab session.

SAFETY

The hardware and motor that you will be using for 2.12 this semester use considerable current. The Robot controller uses up to 1.5A of current continuously, while the motor draws up to 4A of current. These currents are dangerous and please use common sense when operating the equipment. Most importantly, when you are wiring make sure all the power is turned off.

Basic robot functions:

Implement the following basic functions on your robot system. These are needed for building your de-mining robot.

1. Timers are sometimes very important in programming if you need a delay or need synchronization. The website has a tutorial to get a timer to work. You can read the documentation below if you want to know what the program you will download does.

http://www.ifirobotics.com/docs/timers_white_paper_2004-jan-14.pdf

The timers are built into the program and the variables are available in programming. There is a variable for counting 25 milliseconds and 1 second intervals. When you download the code to the RC, you will see the variables that I have defined on the printf screen. Also, digital outputs 3 and 4 oscillate at 25 ms and 1 second, respectively.

In order to use these timers, you have to program a bit. For example, since the timers are always counting from the start of the program, if you want to count 2 seconds with the millisecond timer, you would have to follow this pseudo-code.

- a. Initialize a variable, say
TwoSecondTimer = Current Value of 25 ms timer;
- b. Then, write a statement that will trigger when
(Current Value of 25 ms timer – TwoSecondTimer) > 80 ms
- c. When that triggers, do something and reinitialize variables.

Now, practice with the timers to do the following items. This may be very difficult depending on your background in programming.

2. Turn both motors backwards for approximately 2 seconds when detecting a wall with one of the whisker sensors.
3. When detecting a mine with the magnetic proximity sensor, turn the buzzer (or a LED) on for 2 seconds.
4. Optional. Make a zigzag motion by turning one of the two motors at a time and altering the two.

De-Mining Robot Project Task Statement

Goal and Rules: Find the location of fake mines buried in a minefield. Identify as many mines as possible within a given time, say 2 minutes. Every time a fake mine is found, the robot must stop at that position and turn the buzzer on. If the mine is a newly found one, a credit point is given to the project team. If the mine has already been found by the robot, no credit is given. The robot resumes searching a mine, when a joystick command is given.

The Minefield: About 10 magnetic fake mines are buried in a 12'x12' minefield, as shown in the figure below. The minefield is surrounded by a 6" wall with cushion. The four corners of the square minefield are made round (10" radius) so that the robot can easily turn when hitting the corner. A start point is marked in the minefield. Each project team places their robot at the start point for mine search.

