

Laboratory assignment eight  
Steering an autonomous vehicle  
EECS 203

Lab due on 4 June

Updated by Robert Dick (based on an existing lab)

In this laboratory assignment, you will be writing an assembly language program to control an autonomous line-following car.

Please return your lab kits before the end of the quarter, with the exception of the TTL integrated circuits, resistors, and LEDs, which are now yours.

If you want to continue building TTL circuits, see me and I'll tell you some good places to get power supplies, breadboards, and logic probes.

I hope you had fun in the course. This last lab should be easy, now that you have finished lab seven. However, it'll be fun to see your code controlling a robot!

## 1 Assignment

Please take advantage of your lab seven code and the numerous examples at the website. In particular, see the "carutils.asm" example.

Design a PIC16C74A program that will steer an autonomous vehicle based on inputs from two downward-facing optical sensors. The vehicle should steer itself in order to follow a black path on a white background. You need control only the steering motor, not the drive motor.

In addition to the buttons and LEDs used in laboratory assignment six, you have access to the following sensors and control signals:

1. Port B, bit 0, is an active-low output that causes the vehicle's front wheels to turn in some direction (controlled by bit 1)
2. Port B, bit 1, is an output controlling the direction the vehicle steers in (0—left, 1—right) if steering has been activated (controlling by bit 0)
3. Port C, bit 0, is an active-low optical line sensor located near the front-right of the vehicle
4. Port C, bit 2, is an active-low optical line sensor located near the front-left of the vehicle

In addition to controlling the vehicle, you must frequently copy Port C, bit 0, to Port B, bit 6, and copy Port C, bit 2, to Port B, bit 7. This will allow you to examine the inputs to the vehicle's optical sensors.

Bring a floppy disk or USB drive containing the assembly and hex files to your lab check. There, the teaching assistants will show you how to write the program into the electrically programmable read-only memory (EPROM) of the PIC16C74A microcontroller and run your program on the prototyping board.

## 2 Requirements

Please include your laboratory report, on the following topics, in comments lines at the start of your program. Please prepare a hardcopy to give the teaching assistants and me a place to mark.

1. A problem statement or objective for the laboratory assignment
2. The work you used in achieving this objective
3. The listing for your assembly language program
4. Comments and observations, including perceived problems and strengths of this lab assignment (I do pay attention to these)

### 3 Evaluation

The lab will be graded as follows:

| <u>Component</u>      | <u>Weight</u> |
|-----------------------|---------------|
| Program functionality | 4             |
| Code organization     | 2             |
| Observations/report   | 2             |
| Showing work          | 2             |