ME218b Smart Product Design

Laboratory Assignment Number 8 for ME 218b

Due by 5:00 pm on February 9, 2018

Goals:

This lab is intended to give you and your team experience in designing the interface to another real world sensor, writing software to gather information from that sensor, communicating with another device using SPI and then generating physical outputs based on the sum of that information. It is intended that your team construct a **throw-away** platform that you use just for this exercise to explore some of the issues that you will have to deal with in the upcoming project.

Part 1: A Simple Mobile Platform

Reading:

Section 20 (all subsections) in Tiva Data Sheet, COK Chapter 21 *Permanent Magnet Brushed DC motor Applications*.

Components Required:

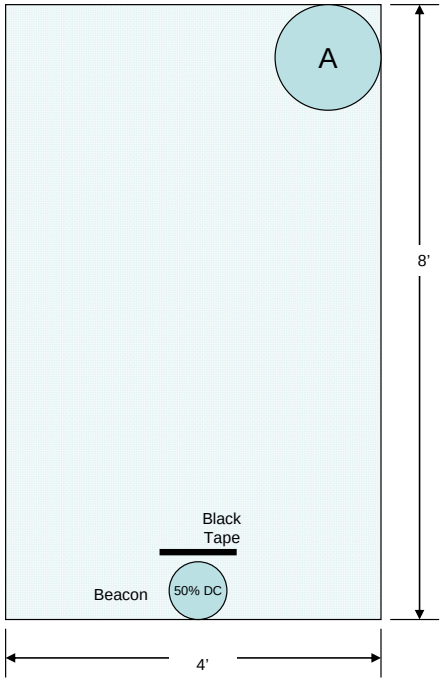
TIVA Board (Tiva module mounted on Tiva Protection Board), Power Distribution Board, 1 ea. Command Generator PCB, 2 ea. DC gear motors and wheels (loaned out for this lab) and assorted other components of your choosing.

Background:

This is a team lab, intended as a prelude to the project. This is your chance to take a first stab at building a mobile platform **without feeling the need to be married to the first design you try**. There will be more than adequate time in the project to use what you learn now to implement a different design. From this you may infer that the project will need a mobile platform. That is all the information about the project that is available at this time.

Assignment:

You are to design and build a mobile platform that will be able to begin in a random orientation at position A. There will be a beacon placed approximately as shown in the diagram below. The beacon will pulse infrared light at a frequency of 1.25 kHz. Your droid should query the Command Generator over SPI (protocol and command descriptions in Appendix A) and follow the commands to position itself. Get a sign-off from a TA/Ed/lab coach after demonstrating your completed vehicle.



❑ **1.1)** Your vehicle must be constructed from scratch using the motors and wheels provided and carry the Tiva board, Command Generator and other electronics of your choosing. It should use a tether to supply power and may connect to the PC to display debugging messages. The motors and wheels may not be modified and must be returned in good working order at the end of the lab.
Note1: the motor leads are somewhat fragile. Please be sure to strain-relieve them to prevent fatiguing the motor connections.
Note2: The USB connection on the Tiva was never intended to take any loads. Last year people broke a number of Tivas as a result of the USB cable fatiguing the USB connection to the point that it broke off of the board. It is then un-repairable in our lab. The lesson: **strain relieve the USB cable** so that the long USB cable that you will use in debugging does not destroy the Tiva.

In the report:

The report should include a description of the mechanical hardware design, electrical hardware design (schematics and design calculations), and pseudo-code, PDL, or flow charts for the software. Additionally, include a narrative description of the hardware and software (brief and to the point, max. 1 page each), and a listing of the final software that was implemented. In your Reports folder include the original source files (.c) for this part of the lab assignment. Each person on the team should submit a copy of the team's report to Gradescope.

Time Spent:

Preparing **outside** of the lab_____

In the lab working this part_____

Time Summary

Please add the time that you spent preparing the report to the times that you logged in each section and enter the data from the table into the Time Summary for Lab 8 assignment on Canvas.

While this information is being gathered solely to produce statistical information to help improve the lab assignments, it is a required part of the lab assignment.

Appendix

TIVA Launchpad Carrier Connectors

11/7/2014

JP5

PB0	1	20	PA2
PB1	2	19	PA3
PB2	3	18	PA4
PB3	4	17	PA5
PB4	5	16	PA6
PB5	6	15	PA7
PB6	7	14	PC4
PB7	8	13	PC5
NC	9	12	PC6
GND	10	11	PC7

JP6

NC	1	24	NC
GND	2	23	PD0
PE0	3	22	PD1
PE1	4	21	PD2
PE2	5	20	PD3
PE3	6	19	NC
PE4	7	18	NC
PE5	8	17	PD6
PF4	9	16	PD7
PF3	10	15	PF0
PF2	11	14	PF1
NC	12	13	NC