

# CSCE 236 Embedded Systems, Spring 2015

## Lab 6

Thursday, April 16, 2015

Names of Group Members:

### 1 Instructions

This is a group assignment to work on during class. You only need to hand in one copy of this, but make sure that the names of all of your group members are on this sheet to receive credit. Complete all of the sections below and make sure to get the instructor or TA to sign off where required. You should keep your own notes on what you complete since parts of future homework will build on this lab.

### 2 I<sup>2</sup>C Inter-Robot Communication

In this section we will modify the sample I<sup>2</sup>C code from the Arduino library to enable bi-directional communication between two Arduinos connected together. The Arduino calls their I<sup>2</sup>C library *Wire*<sup>1</sup>. Look at the Arduino example code for the Wire library, in particular the `master_writer` and `slave_receiver`.

Now, connect your Arduinos' I<sup>2</sup>C buses together. First, you must connect the grounds of the two boards together (to give them the same voltage reference). Then connect the SCL and SDA pins together. SCL is on pin A5 and SDA is pin A4 (they are also available above the AREF pin if you prefer). Test the `master_writer` and `slave_receiver` to verify that they function together correctly.

**Checkoff:** *Show the sample Arduino code working on your Arduinos.*

It turns out that with I<sup>2</sup>C a device can be both a master and a slave. Now, write code so that when one of the buttons is pressed, the light on the other Arduino will turn on. To do this, you simply need take the `slave_receiver` code and in the main loop add a transmission (same as from `master_writer`) whenever the button is pressed or released. You can use identical code on each Arduino, just make sure you switch the addresses. In addition to turning on the other's LED, print over the serial port "my button pressed" and "other button pressed." Note, you should not send this whole string over I<sup>2</sup>C, you should just send a single character (e.g. 'p' for pressed). In addition, due to the way the library works you may have problems if you try to print too much within these functions as both I<sup>2</sup>C and the serial library require interrupts.

**Checkoff:** *Show the code turning on and off the other Arduino's LED and the serial printing. Note that it should work from board A to B and from B to A.*

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<sup>1</sup>I<sup>2</sup>C is generically known as a "two-wire interface" (TWI) because using the I<sup>2</sup>C name used to require paying a licensing fee. SMBus is a stricter subset of the I<sup>2</sup>C protocol and is often used on computer motherboards to communicate with low-speed peripherals (e.g. a temperature sensor on the motherboard). In other words, there are three names (I<sup>2</sup>C, TWI, SMBus) that all refer to basically the same interface and protocol.