



ECEN 4213 Embedded Computer Systems Design

August 30, 2021

Lab #: 01

Topic: Introduction

Final Report

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1 Exercises

Lab 01 is divided into four independent assignments. This section details the results of each assignment.

1.1 Exercise 1: Setup Wi-Fi on the Raspberry Pi

Successfully implemented with TA signature.

1.2 Exercise 2: Create working directory for class

Group directory created and confirmed by TA.

1.3 Exercise 3: Construct LED/Button switch circuit

See commented code in Lab1Ex3.cpp.

1.4 Exercise 4: Implement the ADS1015 ADC

See commented code in Lab1Ex4.cpp.

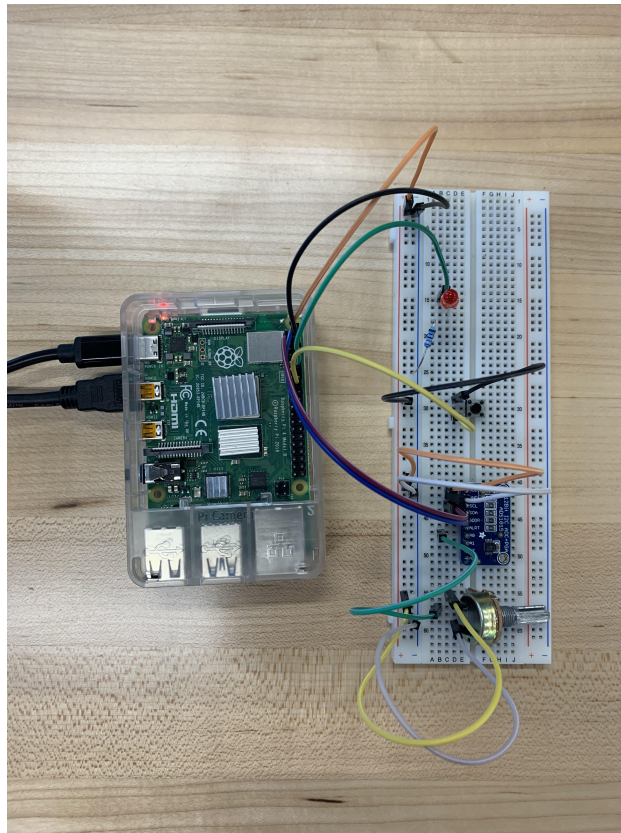


Figure 1: RaspberryPi with an ADS1015 ADC

2 Supplemental Questions

1. Briefly summarize what you learned from this lab.

We reviewed how to interact with the Raspberry Pi's GPIO pins using the WiringPi library. We also saw how I2C works at the low level, by having to manage addresses, registers, and data bytes.

2. In EX3, we use the polling method to detect the event of the button. What is the disadvantage of using the method to detect the external event?

There is a high likelihood of either A) missing events or B) wasting CPU time when utilizing the polling method. Event A occurs when the button presses occur between polls, which indicates that it will not be detected by the polling method. Event B occurs when the MPU is set to rapidly poll such that fewer external events are missed. Each poll requires I/O interfacing and memory access, both of which are temporally demanding. Thus, the polling method is only acceptable if the event frequency is low or the cost of a miss low.

3. When you read the ADS1015 data and convert that to a measured voltage, there is a piece of code that modifies it. Explain the function of this code.

The data read from the ADC is read LSB first, meaning it is effectively "backwards" compared to the desired form. The piece of code uses bit shifting to rearrange the two bytes of data.

```
1 Line a. low = (data & 0xFF00) >> 8;  
2 Line b. high = (data & 0x00FF) << 8;  
3 Line c. value = (high | low)>>4;
```

Line a stores the actual LSB in the variable "low". *Line b.*, using a similar technique, stores the value of the MSB in the variable "high". *Line c.* combines the the MSB and LSB using a bitwise OR, resulting in the desired data format stored in "value".

3 Acknowledgments

I certify that this report is my/our own work, based on my/our personal study and/or research and that I/we have acknowledged all material and sources used in its preparation, whether they be books, articles, reports, lecture notes, and any other kind of document, electronic or personal communication. I/We also certify that this assignment/report has not previously been submitted for assessment anywhere, except where specific permission has been granted from the coordinators involved.

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