

Robotic Systems

Lab 2

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Contents

1	Purpose	2
2	Introduction	2
2.1	Digital Signals	2
2.2	Analog Signals	2
2.3	ADC	2
3	Lab Assignments	3
4	Questions	4
5	Appendex	4

1 Purpose

The purpose of this lab is to get the student familiar with embedded systems and microcontrollers. This lab will cover analog and digital signals and how to interact with them using a microcontroller. By the end of this lab, the student will be able to recreate any of the examples in this lab as well as demonstrate their ability to perform tasks with the microcontroller.

2 Introduction

Analog and Digital signals are the basis to any electronic system. They carry information, power instruments, control mechanical devices and more. Being able to understand these signals is complex, but being able to control these signals is even harder. With the introduction of processors and controllers, they make this task much easier. Sending instructions to the processor or controller to make the system perform exactly as specified is one feature people can't live without. No matter how complicated the signal is, there may be a controller for it.

In this lab we aim to look at microcontrollers in particular. These microcontrollers are designed in general to deal with low power signals.

2.1 Digital Signals

Digital Signals are the essence of any digital based system. These signals operate by providing a discrete signal to communicate information. Digital signals are easy to work with as controllers and processors only use digital signals. These signals are used when information is needed to be stored, and have a greater signal to noise ratio. Communicating with digital signal is simple and almost any controller can.

2.2 Analog Signals

Analog signals are the natural signals of the world. Information through analog signals is usually more complicated than in digital signals as the information is embedded in the signal's properties.

2.3 ADC

An ADC is an analog to digital converter. ADC's come in a set resolution and determine the sensitivity of the system. The more bits the ADC can use to represent the analog signal, the more detailed the signal will be. ADC's are essential for any processor or controller to communicate to the analog world. Without this, these processors and controllers would be next to useless.

3 Lab Assignments

Start this lab by downloading the zipped folder on mycourses. This should contain 6 Folders. Ensure Platform IO is installed correctly. Use the installation guide if necessary. To complete this lab, open each folder in order and complete the tasks asked. Show the TA the final result to get your check off.

Follow this order:

1. Code - DO
2. Potentiometer - AI
3. Dimming LED - AO
4. Interrupts - DI
5. Servo

4 Questions

1. Give examples where interrupts should and shouldn't be used in a code.
2. Explain how a microcontroller can reproduce analog signals.
3. Why is C++ a preferred way to program microcontrollers instead of other languages?

5 Appendix

Make sure to include and additional information in your report as specified in the lab documents.