SYSC 3203
Project Title: EMG-Controlled Mouse
Laboratory: Deliverable #1B: Amplifier / gain stage

Introduction

The magnitude of surface electromyographic (sEMG) signals is typically only a few millivolts (mV). In Milestone #2 you will be constructing an instrumentation amplifier to take the raw signal from the forearm muscles (Figure 1), however its designed voltage gain will only be approximately x10. In order to "see" the signal from your muscles on an oscilloscope, you will almost certainly need an additional gain stage. This stage will be used later in the project to amplify the signal between the band-pass filter and integrator.

If time permits, you can optionally modify the gain stage to improve the noise rejection by rolling off the gain at high frequency.
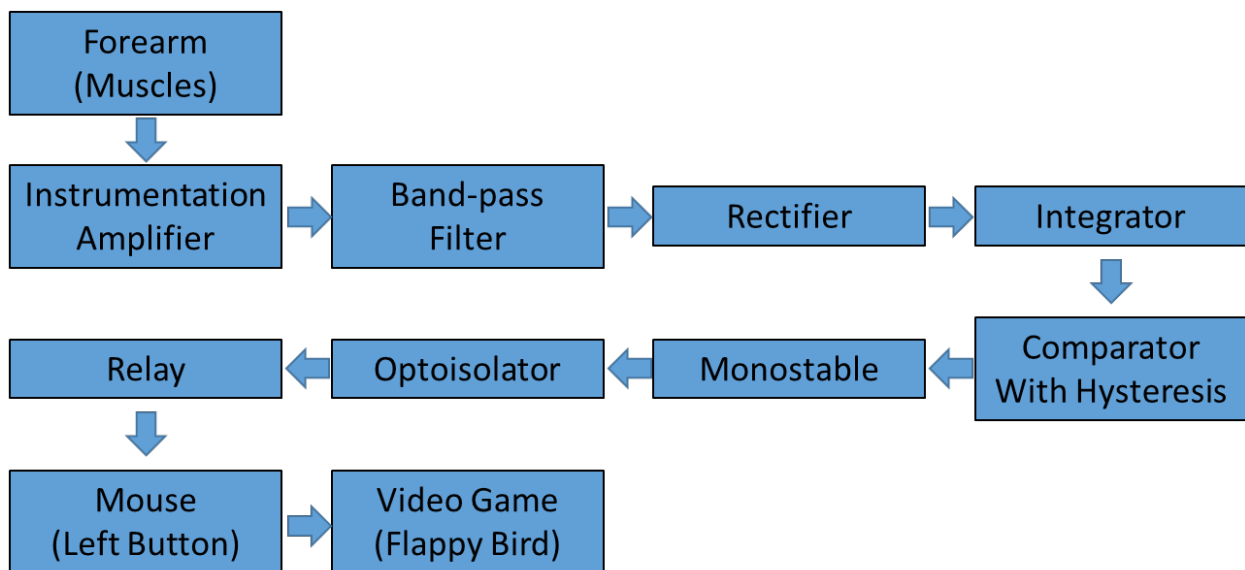

Figure 1: Block diagram for the whole EMG-controlled mouse project.

1. Gain stage design

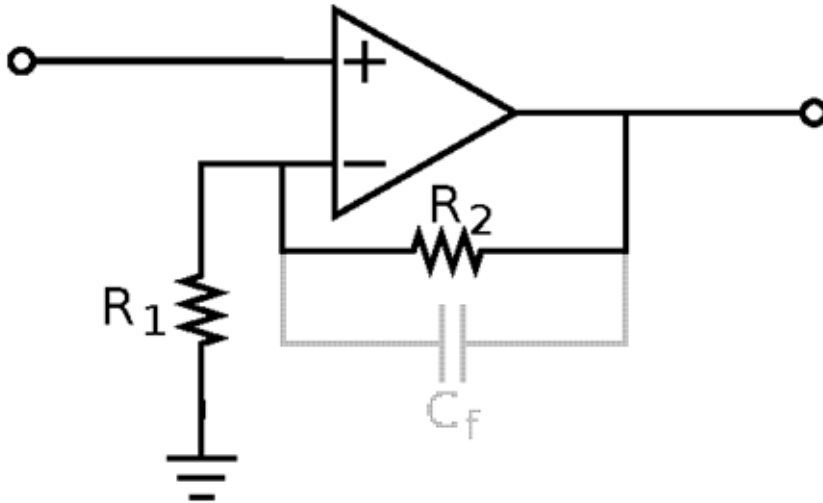The gain stage should be a simple non-inverting op-amp design as shown in Figure 2.

Figure 2: gain stage with optional low pass filtering

    1.1. Choose resistors R_1 **and** R_2 **to give a voltage gain of x40. Show the calculations in your lab notebook.**

Optional:

    1.2. Choose C_f **to make the gain of your circuit start to roll off above approximately 1 kHz. Show the calculations in your lab notebook.**

2. Gain stage assembly and test

Implement your gain stage using an OP97 op-amp from your kit. Using the function generator and oscilloscope:

    2.1. Verify that your circuit achieves the designed gain value

    2.2. Show your testing results and assembled circuit to the instructor and have him/her sign your lab notebook.

If you included C_f in your design, also

    2.3. Estimate the 3dB rolloff frequency of your circuit i.e. the frequency at which the output voltage reaches $\dfrac{1}{\sqrt{2}}$ **of its value at DC**

    2.4. Show your testing results and assembled circuit to the instructor and have him/her sign your lab notebook.