

SYSC 3203

Project Title: EMG-Controlled Mouse

Lab Milestone #4: Comparator and Monostable

In the previous lab, we obtained at the output of the integrator a signal indicating the intensity of the muscle contraction. The next step is to have a circuit that triggers for a given time whenever the intensity reaches a certain threshold. The goal for milestone #4 is to implement such a circuit by combining a comparator followed by a monostable circuit.

1. Comparator

For designing the comparator, the senior electronics engineer recommends an LT1011. Design a comparator using the LT1011 that will compare the output of the integrator from the previous lab to an adjustable threshold (via a 10 k Ω potentiometer). The output of the comparator should be -3V or +3V. Show your design to the instructor and have him/her sign the instructor verification sheet. Test your comparator using a function generator and an oscilloscope. You can use for instance a sawtooth or triangular wave to show the comparator is working properly. Show your comparator is working to the instructor and have him/her sign the instructor verification sheet.

2. Monostable

For designing the monostable circuit, the senior electronics engineer recommends you use a 555 timer which is a widely used classic integrated circuit. Read the 555 datasheet to figure how to use it as a monostable circuit. From experience using the 555, the senior electronics engineer thinks a trigger circuit as represented in Figure 1 might be useful to use the 555 as a monostable for the current application.

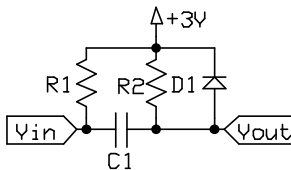


Figure 1. Trigger circuit

Analyze the trigger circuit to figure what it does and draw the V_{out} signal if a square wave was present at the V_{in} input. Explain to the instructor what the trigger circuit does and how it works and show him/her your drawing of the V_{out} signal. Have the instructor sign the instructor verification sheet. Explain to the instructor what the benefit of using a trigger circuit with the 555 circuit is and have him/her sign the instructor verification sheet.

Design a monostable circuit using the 555 circuit, the trigger circuit and as many resistors and capacitors as required. Set the monostable pulse width at 100 ms. To be compatible with the optoisolator circuit design during the first milestone, the 555 circuit should be powered with -3V and +3V. Show your design and component values to the instructor and have him/her sign the instructor verification sheet.

3. Comparator and Monostable

Connect the comparator and the monostable together. Make sure that the output of the comparator is compatible with the input of the monostable circuit. Using a function generator and an oscilloscope test that the whole circuit is behaving as designed. You can use for instance a sawtooth or triangular wave form. Test that you can easily adjust the threshold with the potentiometer. Show the instructor that the whole circuit is behaving properly and that you can adjust the threshold. Have him/her sign the instructor verification sheet. Using the function generator, test what happens when you send two pulses separated by less than 100 ms. Is your monostable retriggerable or not? Tell your answer to the instructor and explain how the fact that your monostable is retriggerable or not will impact the current project. Have him/her sign the instructor verification sheet. Explain to the instructor what will happen, for the current application, if the monostable pulse width is set too high or too low. Have him/her sign the instructor verification sheet.

Milestone 4
SYSC 3203
Fall 2016
Instructor Verification Sheet

Submit this page to the lab instructor.

Name: _____ Student ID: _____

Name: _____ Student ID: _____

1.1: Show and explain your design for the comparator.

Verified: _____ Date/Time: _____

1.2: Show your comparator is working.

Verified: _____ Date/Time: _____

2.1: Explain what the trigger circuit does and how it works and show your drawing of the Vout signal.

Verified: _____ Date/Time: _____

2.2: Explain what the benefit of using a trigger circuit with the 555 circuit is.

Verified: _____ Date/Time: _____

2.3: Show your design and component values.

Verified: _____ Date/Time: _____

3.1: Show that the whole circuit is behaving properly and that you can adjust the threshold.

Verified: _____ Date/Time: _____

3.2: Tell your answer and explain how the fact that your monostable is retriggerable or not will impact the current project.

Verified: _____ Date/Time: _____

3.3: Explain what will happen, for the current application, if the monostable pulse width is set too high or too low.

Verified: _____ Date/Time: _____