

Laboratory 5

Design of a bio-instrumentation amplifier for EOG; Design a bio-instrumentation amplifier for a Human – Computer Interface that uses EOG signals

Alexandru Patriciu, modified by H. de Bruin

Scope of the lab

1. Design a multistage bioinstrumentation amplifier/filter system for EOG.
2. Acquire EOG data.
3. Perform simple analysis of EOG data.

Before the lab

1. (2.5pts) Design a multistage bioinstrumentation amplifier/filter system for EOG signals.
2. (2.5pts) Suppose that you want to use this amplifier to control the mouse on a computer. The mouse should move right when you are looking to the right, left when you are looking left, and is STATIONARY when you are looking straight ahead. Provide the system design for a system that will implement such a Human Computer Interface. Use the information given in the lecture on EOG. Remember there are Three sources of D.C. noise in the recorded signal: The offset of the signal itself when you are looking straight ahead; the difference in h.c. potentials of the electrode; and the offset voltage of the difference amplifier. Use the offset adjust circuit in the notes and split your gain stage in two.
3. (2.5pts) Sketch the expected frequency gain plot of the analog signal conditioning system.
4. (2.5pts) Propose a method to assess the performance of your design. What performance measures are relevant for this application? What data would you collect for testing and validation? Think of a calibration curve for direction of eye gaze vs. output voltage, frequency response and noise.

During the lab

1. Build and test the proposed system using the MacECE Biomed lab. Once you are satisfied it has the req'd bandwidth response, prepare the skin and place Ag-AgCl electrodes at the left and right temple, and the forehead as ground. Connect to your system. Testing requires 3 people in the group: subject, one who holds a finger 1.5 m in front of the subject, and one who controls the computer for data collection. Collect 3 sec of EOG for each position(10) of the finger . Subject keeps head still.
2. (10pts)Show to the TA how/if the system is working.

After the lab

1. (10pts)Provide the test and validation results. Discuss any differences between the desired and the actual performance measures. Plot the selected gaze angles against the EOG amplitude in microvolts.