Interface Adaptation Design for Extracellular Recordings from Excitable Tissue

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Abstract. For a clear perspective and almost exhaustive regarding physiology life organism, it is important to have the best method to gather this kind of signal and to processing them correctly and do not affect information content. Thus, the method must ensure a good sensibility and a better selectivity. Along this papers it is develop an application how to get physiological signals and how can-do processing of it. On circuit design the main component will be instrumentation amplifier, which fulfill these requests. It was presented an amplifier which is fit for high quality recording of extracellular signals from muscular tissue and nerve. In particular case, it has a gain and bandwidth for a proper action potential, a common mode rejection rate, filtering and internal noise. Input impedance is high and a low consumption are the main key feature of this device. Additional, component costs are very low and have a very compact design. Because of high input impedance of amplifier, is not necessary a specified input impedance. Final experimental results show the viability of the solution chosen by design.

Design. To design this kind of device, must looking to basic three function of any biopotential amplifier: amplifier gain, signal filtering, and, which is important when is used to live organisms, protection regarding dangerous potentials. This method can be used as an invasive or non-invasive method. An example of biopotential measurement systems is presented in Fig. 1. Main components are electrodes, amplifier, oscilloscope, interface and conversion to connect to a computer. As seen on Fig 1 the performance of this measurement system depends by amplifier.

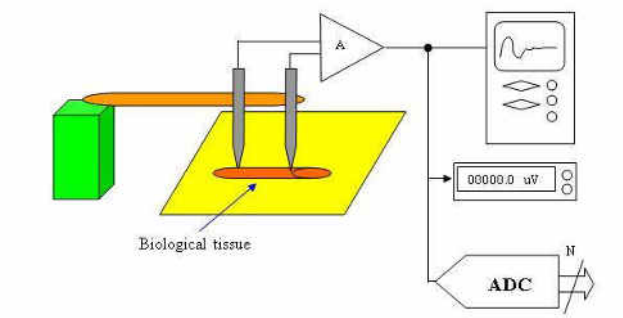

Fig. 1. Measurement system for physiological pulses

Signals can be different types starting with extracellular signals, neuro-physiological signals and brain signals or from muscular activities.

Proposed device is a combination of amplifiers-filters, that main purpose is to adapt physiological signal to easy follow by classical measurement methods. This is important when want to connect this device to a data acquisition system for post processing and memorize them. Only condition of conversion stage is to work at a frequency (which compliant sampling theorem) correlated with cut frequency of low pass frequency, to avoid spectrum aliasing.

For experimental purposes, were design two different schematics, but with the same structure: first use bipolar power supply and inverted amplifier stage and the second use unipolar power supply and non-inverted amplifier stage. Experiments are done using rat sciatic nerve.

References

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