Biomedical instrumentation amplifiers.

Abstract:

Because of the extremely low amplitude of the input signals, the design of modern integrated biomedical amplifiers involves a special care for noise reduction, but also offset and CMRR are important. The task becomes challenging in the case of portable and implantable electronics, because power consumption is restricted from few μW to a few hundred μW. This tutorial analyzes different issues and circuit techniques aimed at reducing noise and power consumption in precision amplifiers for medical devices.

The tutorial will start with very basic aspects of biomedical signals and medical devices, as well as transistor noise fundamentals. The design of a classic low noise - low power biomedical amplifier will be illustrated, showing the relations and trade-offs between power consumption, noise, offset, size, or common mode rejection, among other characteristics. Usual circuit techniques like autozero and offset will be presented from the perspective of medical devices, as well as a few examples covering the state of the art in low power biomedical amplifiers. Finally some advanced topics like safety and reliability of biomedical amplifiers, or the limits to noise and power consumption of integrated amplifiers are discussed.