

ABSTRACT

A High CMRR Instrumentation Amplifier for Biopotential

Signal Acquisition. (May 2011)

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Biopotential signals are important to physicians for diagnosing medical conditions in patients. Traditionally, biopotentials are acquired using contact electrodes together with instrumentation amplifiers (INAs). The biopotentials are generally weak and in the presence of stronger common mode signals. The INA thus needs to have very good Common Mode Rejection Ratio (CMRR) to amplify the weak biopotential while rejecting the stronger common mode interferers. Opamp based INAs with a resistor-capacitor feedback are suitable for acquiring biopotentials with low power and low noise performance. However, CMRR of such INA topologies is typically very poor.

In the presented research, a technique is proposed for improving the CMRR of opamp based INAs in RC feedback configurations by dynamically matching input and feedback capacitor pairs. Two instrumentation amplifiers (one fully differential and the other fully balanced fully symmetric) are designed with the proposed dynamic element matching scheme.

Post layout simulation results show that with 1% mismatch between the limiting capacitor pairs, CMRR is improved to above 150dB when the proposed dynamic element matching scheme is used. The INAs draw about 10uA of quiescent current from a 1.5 dual power supply source. The input referred noise of the INAs is less than $3\mu\text{V}/\sqrt{\text{Hz}}$.

