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# Analysis and Design of a New COA-Based Current-Mode Instrumentation Amplifier with Robust Performance against Mismatches

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**Abstract:** In this paper, analysis and design of a new current-mode instrumentation amplifier (CMIA) circuit is presented. The proposed circuit employs two Current Operational Amplifiers (COA) as active building blocks, one resistor and two transistors operating as variable resistors to electronically control the differential-mode gain. The main feature of the proposed CMIA is that unlike most previously reported CMIAs, its CMRR has negligible sensitivity to mismatches. In addition, in the proposed circuit both active building blocks operate in negative feedback loop which results in an overall enhanced performance. SPICE simulation results using 0.18 μm TSMC CMOS parameters and supply voltage of ±0.9 V show a constant CMRR of about 51 dB regardless of mismatches and wide bandwidth ranging from 14.8 MHz to about 3 MHz for differential-mode gains between 3 and 18 dB, respectively.

Keywords: Current Mode, Instrumentation Amplifier, COA,

## 1. Introduction

Instrumentation amplifiers (IAs) are widely used in data acquisition systems and signal processing applications. The most important performance parameter of an IA is the common mode rejection ratio (CMRR) which indicates how well it is possible to measure the desired differential signal in presence of large unwanted common mode ones. The CMRR of an IA not only depends on matching between the used active elements but also on the external resistor tolerances. Higher tolerance degrades CMRR and lower tolerance resistors calls for the increased cost. In the traditional voltage mode IA, which is based on three operational amplifiers (op-amps) and seven resistors, high CMRR is achievable only by laser trimming of resistors.