

ABSTRACT

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This work presents an evolutionary model to enable the evolution of analog electronic circuits. It is based on a genetic algorithm and employs a fuzzy system in the evaluation process of multiple objectives. The traditional evaluation method of genetic algorithms is replaced by a fuzzy system is executed during the evaluation process, aggregating the many objectives of the electronic design and generating a fitness for each individual. The proposed model presents a simpler and more interpretable way to insert preferences specifications. These specifications are introduced before the circuit evolution process, ensuring that the evolution is guided in the desired direction and thus avoiding the need of a designer intervention to choose the most appropriate circuit. A simulation based on models of the circuits allows a flexible environment for case studies and future applications. Case studies in different application areas are analyzed: a voltage divider design, membership functions for fuzzy systems and evolutions of analog PID controllers. The work developed for evolution, evaluation and implementation presented good performance in the case studies and can be used as a basis for new applications and for other electronic circuit designs.

Keywords: Fuzzy systems; Genetic algorithms; Multiobjective optimization; Hybrid systems.