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Abstract
Evolutionary programming (EP) was evolved and developed from the idea of genetic algorithms (GAs) and is a parallel optimization technique. As compared to GA, which employs symbolic strings to describe the in-hand problems, EP utilizes functional forms so is more flexible and more suitable for solving complex engineering problems. However, the slow convergence speed of optimal search with the conventional EP may restrict its development and flexibility.
To improve the speed of optimization and efficiency of EP, a chaos-based EP (CEP) optimization algorithm and associated hardware implementation are proposed in this thesis. Due to the nature of chaotic variable, i.e. pseudo-randomness, ergodicity and irregularity, the evolutional process of CEP makes the individuals of sub-generations distributed ergodically in the defined space and circumvents late maturing of the individuals of sub-generations.
On the other hand, the use of EP/CEP in solving the demanding complex problems will overwhelm the CPU using software effort. Therefore, to improve the performance of EP/CEP in terms of optimization speed, a FPGA hardware EP/CEP processor is implemented to further speed up the function. In addition, the efficiency of the proposed methodology has been verified via Altera APEX EP20K600EBC652 FPGA platform.
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