论文

长互连链延时功耗建模与基于混合粒子群算法的优化

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Analysis of Delay-power Model of Long Chain and Optimization Based on Hybrid Evolution Particle Swarm Algorithm

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摘要 延时和功耗已经成为VLSI两个关键因素，该文提出一种用于综合考虑功耗和延迟的片上寄存器长链设计方法，首先建立由基于Elmore延时模型和综合功耗模型的能量延时积模型。提出一种混合进化粒子群算法，通过引入新的惯性权值算子和混合变异操作，克服了传统算法收敛速度慢，早熟及局部收敛等缺陷，同时采用基准函数对该算法进行测试，验证了算法的有效性。最后，将该算法应用基于最小能量延时积的长链设计中，和最小延时模型相比，该方法所得到的功耗延时积减少26.34%，能量延时积减少18.74%，HSPICE仿真验证了设计方法的有效性。

关键词： 片上互连 缓冲器 延时 能耗 粒子群算法

Abstract： Interconnect delay and power consumption are two of the main issues in deep-submicron meter technology and nano-meter technology. This paper proposes a long chain design method which takes power consumption and delay into consideration. This paper proposes a hybrid evolution particle swamp algorithm which by introducing inertia weighted operator and hybrid mutant operation overcomes such drawbacks such as low convergent speed, prematurity and local convergence. Tests employing benchmark function prove that the proposed algorithm is valid and efficient. The algorithm is applied to long chain design based on minimum energy delay product, simulation results show that in minimum power delay model the PDP is 26.34% lower than in minimum delay model, while in minimum energy delay model the EDP is 18.74% lower than in minimum delay model, simulations indicate the efficacy of such design method with HSPICE.

Keywords： On-chip interconnect   Repeater   Delay   Power consumption   Particle swarm algorithm

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