

Using Genetic Algorithm in Functional Verification to reach high level functional coverage

- Escola de Engenharia Elétrica, Mecânica e de Computação

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Organization

- Introduction
- Objective
- Functional verification and Functional coverage
- Genetic algorithm
- Genetic algorithm applied to the functional verification
- Example: DPCM
- Conclusion
- Acknowledgments

Introduction

- Evolution of computing (hardware and software)
- Hardware verification

Objective

- Implement a Genetic Algorithm to create the coverage data in functional verification

Functional verification and coverage criteria

- Functional verification
 - Consumes approximately 70% of project resources and 50% of the project time
 - Specification plan
 - Prove that there are no errors
 - Stimulate the functionalities
 - Simulation

Functional verification and coverage criteria



- Functional Coverage
 - Coverage model
 - Measuring progress of the simulation
 - Reach the coverage



Genetic algorithm

- Optimization problems
- Random-guided search technique
- Based on the theory of evolution by Charles Darwin

Genetic algorithm applied to the functional verification



- Model the problem
 - Representation of individual
 - Fitness function
 - Stopping criteria
- Coverage reached?
 - No...
 - Yes...



Example: DPCM

- Differential pulse-code modulation (DPCM)
- Representation
 - Genes
 - Individuals
 - Population

Example: DPCM

- Representation (cont...):
 - Reference Model – transaction level
 - Genetic operators
 - Recombination – 75%
 - Mutation – 10%
- Stopping criteria

Conclusion

- Satisfactory results
 - Implementation of a Genetic Algorithm
 - Data generation
 - Reach coverage
 - Optimization done

Conclusion

- Future works aims to:
 - Integrate the implementation of the genetic algorithm in the DUV
 - Improve the genetic algorithm to perform functional verification with various modules
 - Analyze the optimization of genetic operators

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