Adaptable Protection for Embedded Systems Resilience

ARFL Presentation - Fall 2020

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Outline

1. Work Completed

2. Conclusions

Differences Between GA and HereBoy for Genetic Programming

- Population Function
  - GA initializes a population of randomly generated ASTs
  - HereBOY uses only a single ASTs
- Fitness Function
  - Each circuit is scored off of their logical functionality
  - Each node in the AST is scored individually, by seeing which modification to that node would give the highest overall fitness
- Selection Function
  - The best preforming individuals of the population are selected for re-population
  - The modification that offers the highest overall fitness is selected
- Mutation Function
  - The highest preforming individuals are then mutated to generate a new population
  - The new AST is formed by implementing the modification selected in the past stage

Current Issues

- Fix structural fitness
- Mutations currently only work for 2-terminal logical feature (AND OR)
- Implement other logical gates (MIN, MAX, XOR, etc)
  - hdlConvertor seems to have 27 different functions
- Get each function working together properly
- hdlConvertor seems to be going through a fundamental rework, I'm having to manually input each AST to run tests

Plan for the Rest of the Semester

- Start testing out scalability larger circuits
  - Will the system need to be modified to work for larger circuits?
- Get code onto FPGA
- Looking for HOST 2021 submission deadline in March 21

References

1 Zhang K. and Shasha D., "Simple fast algorithms for the editing distance between trees and related problems" SIMA J. Comput., 18(6):1245– 1262, 1989

2 Xu H., "An Algorithm for Comparing Similarity Between Two Trees". ArXiv:1508.03381v1, 2014