Towards Knowledge-guided Genetic Improvement
Abstract

-- Grammar-guided Genetic Programming
-- Tree-based Genetic Programming
-- combined into Knowledge-guided Genetic Improvement
Introduction

Grammar-Guided Genetic Programming GGGP\[2\]

-- Utilizes grammar to create syntactically correct individuals
-- Originally crossover operator

Tree Genetic Programming (TGP)

-- Utilizing tree structure, often Abstract Syntax Tree (AST)
-- Enable operators, ex. homologous crossover\[3\]

-- Previously Combined into Tree-adjunct Grammar Guided Genetic Programming (T3GP)
Knowledge-guided Genetic Improvement

- AST based representation form
- Grammar that ASTs adhere to
- Grammar enriched with metadata
- Operators can access context
Syntax Graph

Figure: Syntax Graph for generating syntactically correct ASTs
Proposed Impact

Benefits

-- Increased amount of valid ASTs.
-- Not just syntactically correct but also semantically executable
-- Metadata enables complex operators and fitness function approximation
-- Syntax Graph can be pruned or redirected to reduce execution errors

Drawbacks

-- Mining metadata is complex and expensive.
-- Complex operators cost run-time performance
-- Mistakes in the syntax graph endanger validity of experiments
Conclusion and Outlook

-- Metadata in syntax graph especially useful for Genetic Improvement

-- Approach shows promise
  -- Amount of compileable ASTs is at 100%
  -- Amount of executable ASTs is "very high"

-- Upcoming empirical evaluation
  -- to put a number to "very high"
  -- Does the approach improves overall quality in individuals?
  -- Does it increase success rates in experiments?
Questions?

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Bibliography I

