The Automated Modeling and Optimization of Part DNA Substructures Employing Evolutionary Computation

Daniel Tauritz, Bailey Eversmeyer

Missouri University of Science and Technology

tauritzd@mst.edu, rbe62d@mst.edu

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Overview

Part-DNA Overview

Goals:

- Model and map the flow of goods and components through a system
- Track the changes to components over time
- Help identify relationships between components
- Makes analyzing the system easier

How We Fit into the Part-DNA Model

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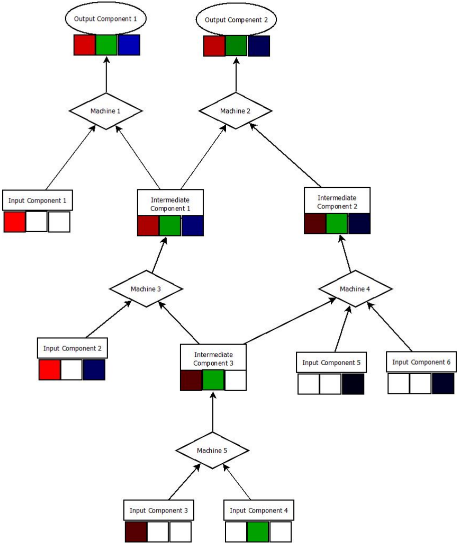
3. Model the transformations of components through the section
4. Gather data on possible input components
5. Test new input combinations to map Pareto Trade-Off surface

Our Model Concept

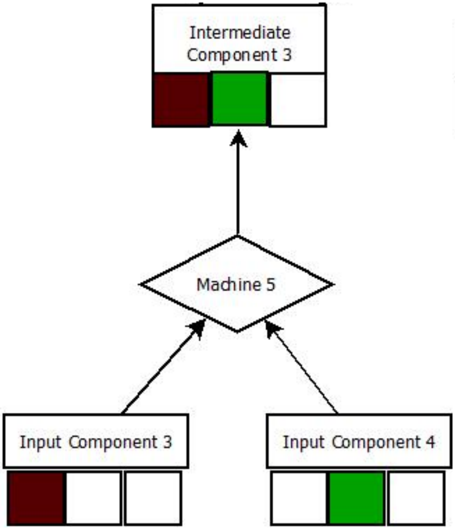


Genetic Programming (GP)

Evolutionary Algorithms (EAs)

Multi-Objective EAs (MOEAs)

GP Section


Intermediate Component 3
Machine 5
Input Component 3
Input Component 4

GP Process

Given a dataset of input-output combinations
For each output attribute:

- Generate population of randomized functions from the input domain

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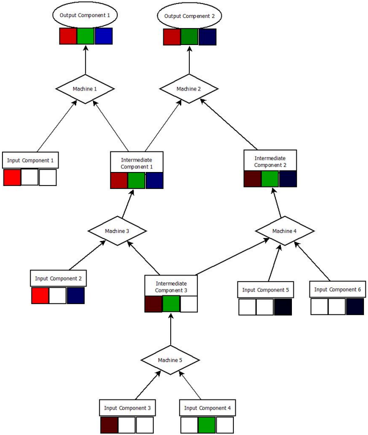
- Explore the function domain through recombination and mutation of functions

Repeat for each transformation object

MOEA Section

With the modeled functions in hand, we apply our MOEA to the whole process to optimize for the output parameters



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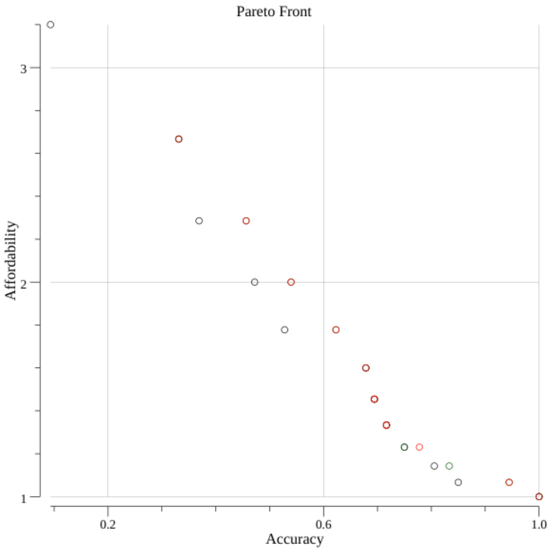
- Assign fitness values for Accuracy and Affordability
- Rate solutions based on their Pareto score
- Explore the input combination domain through recombination and mutation of solutions

End with a selection of Pareto Optimal solutions, and associated trade-off information.

Example Pareto Front over Time



Questions?