Discovering the preference hypervolume: an interactive model for real world computational co-creativity

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Propositions

accompanying the thesis

Discovering the Preference Hypervolume, an Interactive Model for Real World Computational Co-creativity

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1. Solutions for problems in engineering are best compared using their phenotype/behavior, not their genome/parameters, due to the effects of neutrality and sensitivity observed in evolutionary encodings (*Chapter 3*).

2. It is the phenotype, specifically morphology and behavior, that hold the key to a concept of diversity that is easily understood by humans (*Chapter 3*).

3. Quality diversity algorithms produce the highest phenotypic diversity compared to multiobjective and multimodal optimization (*Chapter 3*).

4. Data-driven learning of phenotypic features can provide a more diverse artifact set than manually defined features (*Chapter 3*).

5. Generative models are better used as similarity models, providing niching spaces for multi-solution algorithms, rather than be used to provide the search space itself (*Chapter 3*).

6. Phenotypic and behavioral features of new artifacts can be predicted by Gaussian process models by on-line sampling based on optimality alone (*Chapter 4*).

7. Artifact sets generated by quality diversity algorithms can be compressed into smaller sets of representative phenotypic prototypes due to the appearance of genetic clusters (*Chapter 5*).

8. By selecting prototypical artifacts, a user can take influence on the evolutionary process through a Gaussian process model that predicts, whether a solution is similar to the user's expressed preferences. This prevents quality diversity algorithms from drifting away from the user's preferences, especially when the model makes its predictions based on the prototypes' phenotypic expression (*Chapter 5*).

9. Only using data-driven solution generators might in the end hinder, not advance engineering solutions.
10. Machines can help challenge and counteract negative cognitive psychological traits in creative processes.
11. An informed and challenged engineer can make better design decisions and more emphasis should be laid on developing optimization algorithms towards this goal.
12. Cooperative research between the scientific communities of optimization and computational creativity can be mutually beneficial.