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Stellingen

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Guiding Evolutionary Search towards Innovative Solutions

1. An *innovative solution* has the potential of leading to an *innovation*, that is, the resulting product getting adopted by the end users. To this end, an innovative solution is *novel* and of high-quality, both with respect to the state-of-the-art solutions in the application domain.
This thesis, Chapter 3.
2. *Novelty* of a solution can be expressed as the *minimum distance* to *reference solutions*. Alternatively, novelty of a solution is expressed as the *error* that an *approximation model* trained on reference solutions makes in its *prediction* for it. The latter is an estimator of the *learning progress* that the solution leads to in re-training the approximation model.
This thesis, Chapter 3 and Chapter 4.
3. *Interestingness* of a solution is a better estimator of learning progress than the solution's modeling error is. Interestingness accounts for regions in the search space in which the model does not improve. This is done based on the *earlier-observed* modeling errors in the region in which the solution lies.
This thesis, Chapter 4.
4. Novelty and interestingness express deviation from available knowledge, not the chance for high quality.
This thesis, Chapter 4.
5. An *exploration criterion* is best-integrated into quality-based search using separated *exploitation* and exploration phases. By exploitation, optimization on quality is meant. This is because exploitation and exploration have inherently conflicting dynamics.
This thesis, Chapter 5.
6. Quality optimization assisted by interestingness-based exploration is able to deliver more solutions, more diverse solutions, and solutions of greater quality than unassisted quality optimization.
This thesis, Chapter 6.
7. Local optimality of solutions does not imply high solution quality.
8. An approximation model has to be supplied with a sufficient amount of training data. Only then will it concisely reflect relationships that exists between points from the domain of its training data: It is no *panacea*.
9. A theory is easier derived from observations than supported with observations.
10. Some make their point by convincing, others by confusing their audience.