How to Obtain Good and Diverse Solutions
(in Game AI Optimization and Other Real World Problems)

Abstract:

Black-box optimization problems that cannot be treated with classic optimization methods occur in many application areas, and delivering one single (near-)optimal solution is often not enough. Especially in mixed-initiative systems where humans are integrated into a stepwise optimization or design process, providing multiple comparable but high-quality solutions is crucial. Game AI related optimization problems and especially game design support systems are good examples for easily scalable but relevant real-world problems. We will review several approaches that have been suggested to tackle these problems, and especially deal with Evolutionary Algorithms for multimodal problems which have improved considerably in the last years, providing sets of good and diverse solutions. Using a freely available Python codebase, we will put together simple example algorithms that already provide good performance for many problems.

Outline:

- Introduction: Multimodal Optimization
- Introdution II: Game AI related optimization
- Diversity and sampling: where is elsewhere?
- Measures and Goals
- Toolbox: useful algorithmic approaches
- Hands-on: constructing some simple algorithms
- Scaling up: more complex problems
- Hands-on: comparing and adapting our algorithms
- Outlook

Intended audience (include level of expertise):

Basic knowledge concerning (evolutionary) optimization is expected, basic programming skills (Python) would be good in order to follow the hands-on part.

Main Take-aways:

- Basic understanding of the trade-offs involved when looking for several good solutions at once

- Overview over the available algorithmic approaches

- Experience of having performed multimodal optimization on some simple and game AI related optimization problems

Biographies of presenters:

Mike Preuss, WWU Muenster, Germany
Mike Preuss is Research Associate at ERCIS, University of Muenster, Germany. Previously, he was with the Chair of Algorithm Engineering at TU Dortmund, Germany, where he received his PhD in 2013. His research interests focus on the field of evolutionary algorithms for real-valued problems, namely on multimodal and multi- objective optimization, and on computational intelligence methods for computer games, especially in procedural content generation (PGC) and realtime strategy games (RTS).

He is associate editor of the IEEE TCIAIG (Transactions on Computational Intelligence and AI in Games) and Springer's SWEVO journal and has been member of the organizational team of several conferences in the last years, in various functions, as general co-chair, proceedings chair, competition chair, workshops chair.