Concluding remarks

Fitness landscape analysis for understanding and designing local search heuristics

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Basic Methodology of fitness landscapes analysis

- Density of States : pure random search, initialization ?
- Length of adaptive walks : multimodality?
- Autocorrelation of fitness : ruggedness?
- Neutral Degree Distribution : neutrality?
- Fitness Cloud : Quality of the operator, evolvability?
- Neutral walks and evolvability : neutral information ?
- Features of the local optima network : structure at LO level ?

Recent review : Katherine M. Malan, Information Sciences, (2013)

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- ... be creative from your algorithm and problem point of view
- ... be careful on the computed measures : one measure is not enough, and must be very well understand

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Sofware to perform fitness landscape analysis

Framework ParadisEO

http://paradiseo.gforge.inria.fr

Software Framework written in C++ for Metaheuristics (local search, EA, continuous, discrete, parallel, fitness landscape, etc.)

sampling();

sampling.fileExport(str_out);

Summary on fitness landscapes

Fitness landscape is a representation of

- search space
- notion of neighborhood
- fitness of solutions

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Goal :

- local description : fitness between neighbor solutions Ruggedness, local optima, fitness cloud, neutral networks, local optima networks...
- and to deduce global features :
 - Difficulty !
 - To decide (and control) a good choice of the representation, operator and fitness function

Open issues

- How to control the **parameters** of the algorithm with the local description of fitness landscape?
- Links between **neutrality** and time complexity (difficulty)?
- Can fitness landscape describe the dynamics of a **population** of solutions ?
- Fitness landscape for parallel algorithm (island model)?
- What about crossover?
- Multi-objective or continuous optimization problems, etc.
- Links with theoretical approaches
- ...

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Thank you for your attention !