Multi-Objective Path

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Objective functions

- Well studied for additive objective function : **sum**
  - distance, duration, cost …
- studied for min-max function : **bottleneck**
  - quality, accessibility
- complex (sometimes non monotonous) functions
  - arrival time, number of zones, energy consumption
- **In practice, How does a user express its preferences ?**

In Multi-Objective Combinatorial Optimization

- Building a weighted sum of the objectives and solving the single objective problem.
  - wrong approach in most general case
- Only evolutionary algorithms are efficient for solving a “difficult” combinatorial optimization problem
  - wrong for more and more structured problems
- from 1 to 2, objectives, from 2 to 3 objectives, etc.
  - wrong in general

Efficient Solutions In MOCO …

- Lexicographic optimality: There is a ranking among objectives.
- Efficiency and nondominance: No objective is more significant than any other one.
- Challenges:
  - Enumerate the efficient set
  - **Quickly find many various efficient solutions**

Multi-Objective Path in Multimodal Network

- Most MOSP algorithms are designed for road network (labeling algorithms)
- Less studied in public transportation network (timetable network - connection scan)
- Challenge : scalability
  - Network size
  - Number of efficient solutions

Alternative Path Problem

- Examples:
  - Repair broken paths : avoid recomputing *all* paths
  - Propose several interesting paths (PT + carshare)
- Challenges : handle real-time events of the network
- Edge-disjoint paths : too much similarities
- Model as a MOP ?