

Multiple-criteria optimization for mobile agents in a network

H2020 SOCIETAL CHALLENGES: Smart, green and integrated transport

PRODUCTIVE SECTOR: Logistics and Transport

PROBLEM DESCRIPTION

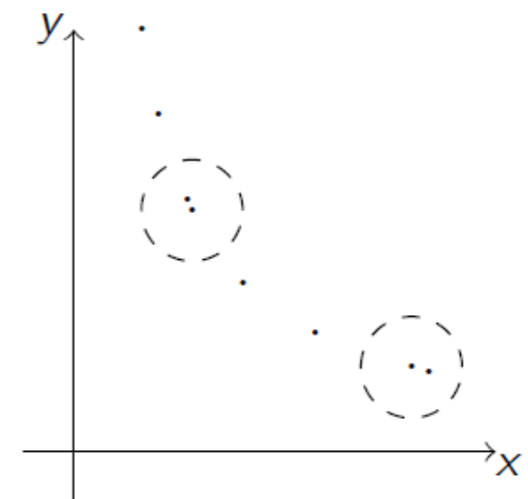
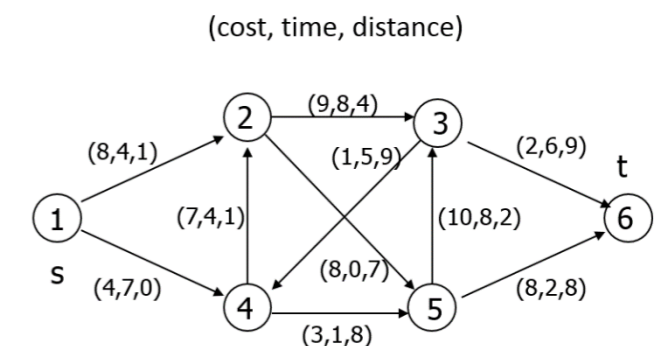
The company Smartgeo Solutions was interested in developing an application, which operates on a Web platform, to optimize routes of mobile agents considering multiple criteria in the decision process.

CHALLENGES AND GOALS

- Compute efficient routes of mobile agents.
- Considering multiple criteria in the decision process.
- Control the number of efficient solutions determined and the time spent to get them.

MATHEMATICAL AND COMPUTATIONAL METHODS

The problem was modeled using a multicriteria version of the multiple traveling salesman problem with multiple depots. Labeling algorithm and new heuristics were proposed to find solutions of this problem. Additionally, a new dominance criterion was introduced to speed up the methods used.



A Hamiltonian cycle (left).

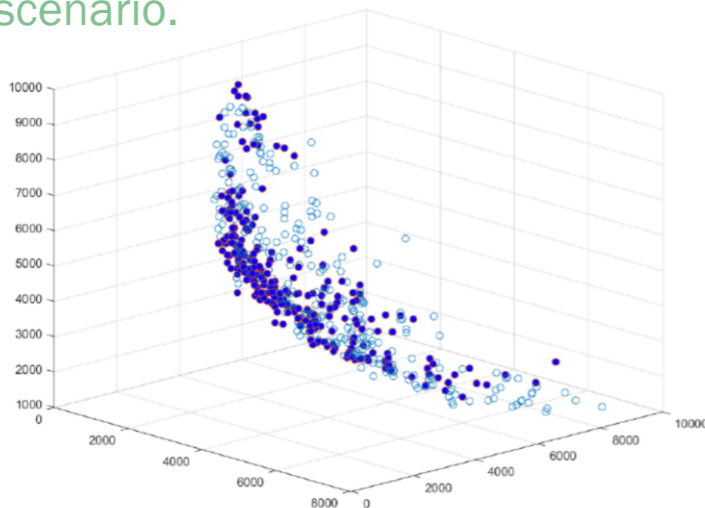
A network example with 3 criteria (right upper corner).

New dominance criteria (right bottom corner).

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Results and Benefits

The straight result is the development of new algorithms to obtain solutions for the multiple traveling salesman problem with multiple depots. These algorithms constitute the basis of the prototype to optimize the route of the mobile agents in the network and allow to explore solutions that had not been found with classic approaches. Since several criteria are considered simultaneously, the decision maker is able to choose the best solution in each scenario.



Pareto optimal solutions on 3 criteria network with 15 nodes



Routes for each one of the mobile elements.

The company has a **prototype** to include on its platform to **optimize the routes** of mobile agents in a network considering **several criteria** simultaneously.