# Heuristics for the bi-objective Unidirectional Road Network Design Problem with Disruptions

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**Abstract**

This study addresses a typical situation of disruptions happening on road networks. Predictable (e.g. planned maintenance, fair, sport, cultural event and demonstration) or unpredictable (e.g. accident, bad weather conditions and natural disaster) events can affect the network in urban areas. This requires the definition of alternate paths to avoid the blocked segments. The number of such disruptions typically depends on the city size. For instance, 8 000 interruptions are managed each year in Troyes conurbation, France. Due to the strong connectivity property, the alternate paths can require, in some cases, changing the segments' direction; these changes also have to take into account the disruptions time scale and the type of vehicles supposed to be rerouted. In this work, we investigate a version of this problem to manage disruptions on city centres or touristic areas. It is modelled as a bi-objective Unidirectional Road Network design problem with Disruptions and strong connecting requirements (bi-URND) and consists in defining alternate paths such that the number of arc reversals and distances are minimized, while ensuring that the final graph remains strongly connected. Metaheuristics based on Random Keys Genetic Algorithms (RKGA) to solve the bi-URND are proposed and tested over medium-size and large scale graphs.

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