

Session 5: Adapting the RCPSP framework to Evacuation Problems

In the context of the H2020 GEOSAFE European project, we have been working on the late evacuation problem, that means the evacuation of people and eventually critical goods facing a natural disaster (flooding, wildfire..). We did it accordingly to the 2-step approach currently favored by practitioners: the first step (pre-process) computes the routes that evacuees will follow; the second step, to be performed in real time, schedules the evacuation of estimated late evacuees along those routes. In practice, performing this last step requires forecasting the evolution of the disaster, rather difficult in the case of wildfires, because of their dependence to topography and meteorology. But we consider here this issue as resolved and focus on the priority rules and evacuation rates which have to be imposed to evacuees. Our model non preemptive Tree evacuation planning problem (NPETP) is equivalent to the model proposed in evacuees have been clustered into groups with same original location and pre-computed route, and once a group starts moving, it keeps on at the same rate until reaching his target safe area (non preemption. This last hypothesis derives from practical concerns and aims at avoiding any panic effect during the evacuation process. The pre-computed evacuation routes are supposed to define a tree, with evacuee groups located at the leaves of the tree and the safe target place at its anti-root. We make then appear the resulting problem as a RCPSP: Resource Constrained Project Scheduling Problem variant, and use this RCPSP reformulation in order to get accurate optimistic bounds (lower bounds) and design an efficient network flow based heuristic.