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Elevator Scheduling for Emergency Evacuation

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Traditionally, elevators are prohibited during many emergency cases, e.g., fire. With the recent development on fire prevention and reliable power supply system, some manufacturers consider elevator system for emergency evacuation because of its high speed. The goal of emergency evacuation by elevator is to disperse crowded population to safe places as quickly as possible, which naturally involves an elevator scheduling problem, called Elevator Scheduling for Emergency Evacuation (ESEE). ESEE is a special scheduling problem with a definitive destination. In this paper it is formulated as a mixed integer linear programming and proved to be equal to a split delivery vehicle routing problem (SDVRP). The equivalence means that ESEE is NP-hard and methods designed for SDVRP are applicable. Drawing lessons from SDVRP, this paper develops two algorithms for ESEE. Their performance in numerical experiments implies the potential use in emergency evacuation system.