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**Title:** « Restoring Accessibility during Urban Rail Disruptions via Bus Network Redesign »

**Short Abstract:**

In broad terms, accessibility measures opportunities (e.g., shops, residents) reachable within a given time frame. Urban rail transit (URT) plays a crucial role in providing accessibility, but it is susceptible to disruptions. In city centers with dense public transport (PT) networks, travelers can often find alternative lines. However, in suburbs where PT is sparse, disruptions have a more significant impact on accessibility. The traditional approach consists in deploying bridge and replacement buses to mitigate URT disruptions without specific care to accessibility. Yet, the question arises: is this approach the most effective way to restore accessibility? To the best of our knowledge, our paper is the first to propose a bus re-routing method with the objective of restoring accessibility during URT disruptions. We formulate an integer program and develop a two-stage heuristic algorithm to maximize restored accessibility. The efficacy of our method is always the present assessed in Évry-Courcouronnes and Choisy-le-Roi, France. The results show that, compared with conventional replacement methods, our strategy improves accessibility, in particular in the areas most affected by the disruption. Such results are observed even when no additional vehicles are deployed and, at the same time, achieve a reduction in the kilometers traveled. Despite it being well understood that accessibility is the most relevant benefit a transportation system can produce, this aspect is reflected by the traditional approaches in remediation to disruption. With this work, we show instead how to make accessibility the main guiding principle in remediation.