Real-time disruption management in a three-dimensional loading vehicle routing problem with split pickup and time windows

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In recent years, the growth of e-commerce has led to an increase in the number of product returns, leaving logistics service providers (LSPs) with an ever-increasing number of boxes to collect from different locations in an urban area. This gives rise to a three-dimensional loading vehicle routing problem with split pickup and time windows.

Throughout the day, real-time changes, called disruptions, occur. Disruptions that we consider here are the arrival of a new customer, the cancellation of a planned customer, the removal or addition of boxes from a planned customer request, the referenced box type being larger (by volume) than expected and a planned customer who is not ready on time.

The LSP must respond to these disruptions by adjusting his ongoing routes, schedules, and the box loading arrangements in the vehicles. His goals are to collect all the boxes from as many customers as possible and to minimize the total travel distance. We present specific recourse actions that the LSP can take to deal with these disruptions. These actions differ from those for delivery operations since the vehicle is initially empty and is progressively loaded in pickup operations.