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Patrolling Routes for the Amazonas River Navigation System

The Amazon River and its tributaries form an extensive and complex network exceeding 10,000 km, comprising several significant tributaries. These rivers are crucial for connectivity, facilitating trade and commerce, and providing access to services for local communities. Patrolling these waterways is essential to curb illegal activities, protect biodiversity, and safeguard local communities. The aim of this research is to develop patrolling routes for the Amazon River navigation system, conceptualized as a variation of the periodic arc routing problem. This study considers factors such as the navigation time span, which can make some routes exceptionally long, seasonal variations (floods and droughts) that restrict route availability, and varying visitation frequencies for each river stretch. This issue is also approached as a profit-collection problem, with benefits derived from the arcs monitored and secured. Different Mixed Integer Programming (MIP) formulations are proposed and evaluated, taking into account decisions regarding fleet size and base positioning. Results are obtained using real data.

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