

citizens. However, in order to maximise the benefits, it is necessary to work on the shortcomings and limitations associated with the use of these technologies.

In general, GIS plays an important role in achieving sustainable development goals and implementing the concept of smart cities. They provide tools for monitoring environmental indicators, optimising traffic flows, managing energy consumption and improving the quality of life of residents.

Trends in the development of geoinformation technologies in spatial planning for 2025 demonstrate a continued gradual increase in their integration with other digital technologies, the introduction of artificial intelligence, the use of open data and cloud services. These changes contribute to more efficient and sustainable development of territories, improving the quality of decision-making and optimising of management processes.

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DEVELOPMENT OF A THEORETICAL MODEL FOR PLANNING INTERMODAL FREIGHT TRANSPORTATION USING THE DIFFERENTIAL EVOLUTION ALGORITHM

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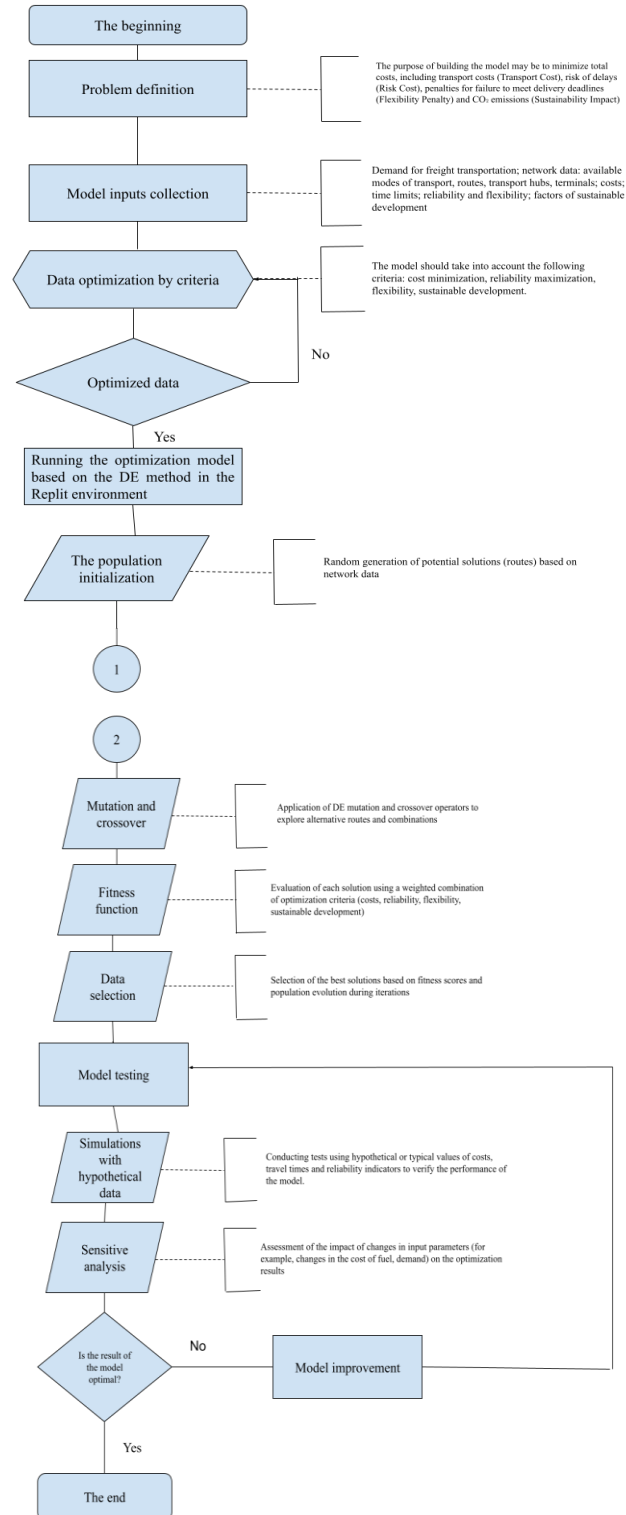
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The differential evolution (DE) [1] method is an effective tool for optimizing processes in transport logistics, particularly in solving problems related to route and schedule optimization. Applying DE to intermodal transportation significantly enhances efficiency and reduces costs, which is crucial for the development of modern transportation systems. Our research in this area [2] focuses on adapting the proposed model to the specific conditions and requirements of transport logistics, particularly in the intermodal transport branch of "Lisky," as well as evaluating the effectiveness of the proposed model.

In this thesis, we have implemented our approach in the form of a flow chart diagram in the Replit environment [3], which outlines the key steps involved in the optimization process. This visual representation provides a clear overview of the methodology, from data collection and optimization to model testing and evaluation. By following this approach, we aim to achieve optimal solutions for

intermodal freight transport planning, addressing the challenges of cost minimization, reliability, flexibility, and sustainability.

The process begins by defining the model's purpose, which is to minimize transportation costs, including transport costs, delays, penalties, and CO₂ emissions, while also considering reliability, flexibility, and sustainability.



Pic. 1. Planning intermodal freight transportation using DE algorithm

Each solution is evaluated using a fitness function that combines the optimization criteria. The best solutions are selected and refined through successive iterations, improving the population over time. The model is tested using hypothetical data to verify its performance, and a sensitivity analysis assesses how changes in input parameters, such as fuel prices or demand, affect the results.

Finally, the model is evaluated for optimality. If the results are not satisfactory, further refinement is done until an optimal solution is found.

By breaking down the process into distinct stages, the flow chart approach facilitates the identification and resolution of potential issues in the model's development. It also provides an organized way to evaluate different optimization criteria — such as cost, reliability, flexibility, and sustainability — in an integrated manner. The clear, step-by-step approach enhances the transparency and reproducibility of the research, allowing for more effective adaptation of the model to specific conditions and requirements within the transport logistics sector, such as those in the "Lisky" intermodal transport branch.

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METHODS OF MONITORING LANDS OF HISTORICAL AND CULTURAL SIGNIFICANCE

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Monitoring lands of historical and cultural significance is a key element in preserving cultural heritage. It includes a set of measures aimed at assessing the condition of objects, identifying potential threats, and developing strategies for their protection.

Main Monitoring Methods:

1. *Engineering and Geodetic Methods:*