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РАЗРАБОТКА СИСТЕМЫ ПОДДЕРЖКИ ПРИНЯТИЯ РЕШЕНИЙ
(DSS) ДЛЯ ТРАНСПОРТНОЙ КОМПАНИИ
DSS DEVELOPMENT FOR A SHIPPING COMPANY

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A shipping company has N orders for cargo transportation between M different points. It has a fleet of trucks, each of which is characterized by: capacity M_{max} , maximum volume of cargo V_{max} , fuel consumption r . The cargo is characterized by volume v , mass m , transportation distance l , possibility of division into smaller batches.

In order to solve this problem it is necessary to make a preliminary analysis of the original data. First, we should decide whether the cargo can be transported at one time. If it is not possible (no trucks), then the cargo is divided into several batches, m_i of each batch should be less than M_{max} , and v_i should be less than V_{max} .

We need to decide whether it is possible to combine the cargoes. If there are cargoes with similar points of departure and destination, they can be consolidated.

We form an objective function, taking into account the characteristics of cargoes and trucks:

$$F = \sum (l \cdot r \cdot \frac{M_{max}}{m} \cdot \frac{V_{max}}{v}) \rightarrow \min.$$

As it can be seen from the formula, the objective function is determined by the amount of fuel l multiplied by r and truck load volume M_{max}/m and V_{max}/v .

For convenience, the cargo characteristics are represented as follows:

$$a = \frac{l}{m \cdot v},$$

and the truck features are represented in the following way:

$$q = M_{max} \cdot V_{max} \cdot r.$$

Then, the objective function becomes:

$$F = \sum (a \cdot q) \rightarrow \min.$$

Since each cargo should be placed on an appropriate truck, we have an assignment problem. The solution of this problem can be found by using the Hungarian method. Taking into account the amount of goods and a number of vehicles in the fleet, a square matrix of dimension k is made up.

By solving the assignment problem we obtain a set of combinations of cargoes and trucks, which leads to the lower cost of transportation.