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The Design of New Railway Line Connecting Al-Majmaa City with Al-Madina City

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Abstract

Rails transport infrastructure is one of the most important factors for a country's progress. It provides the most important mode of public transport. This is the most commonly used and cost effective long distance transport system of the country. one cannot overemphasize the importance of transportation than call it the 'lifeline' of a nation. It has been proven by so many instances how Rails transport infrastructure has added speed and efficiency to a country's progress. Good physical connectivity in the urban and rural areas is essential for economic growth. So it is proposed to construct a new railway line to connect Al-Majmaa City with Al-Madina City.

Objective

- Constructing a rapid line Connecting the two cities that distanced apart.
- Providing the accessibility of the cities.
- Boosting AL-Majmaa socio-economic potential.
- Reducing the number of highway accidents and fatalities in the roads connecting them.

The Design Model

$$\text{minimize} \quad C_1 \sum_{i \in N} \sum_{j \in N} d_{i\text{-}j} \times t_{i-j} + C_2 \sum_{r \in R} f_r \times T^r$$

s.t.

$$D_o(R) \geq D_o^{min}$$

$$D_{o1}(R) \leq D_{o1}^{max}$$

$$D_{tot}(R) = D_o + D_{o1} \geq D_{tot}^{min}$$

$$d(R) = \sum_i \sum_j d_{i\text{-}j} \times \frac{t^r_{i-j}}{t^s_{i-j}} \Big/ \sum_i \sum_j d_{i\text{-}j} \leq d(R)_{max}$$

$$T^r = \sum_i^{m-1} \sum_{j=i+1}^{m} t^r_{i-j} \leq T^r_{max}$$

$$\sum_{r \in R} f_r \times T^r \leq TBF$$

$$\frac{Q^r_{max}}{f_r \times V_s} \leq L.F$$

The Methodology

1. Initial number of skeleton routes M

HRGA queries the user for the number of initial skeletons M. The number of M should generate set of routes satisfying minimum percentage of the total demand that has to be satisfied directly by initial expanded skeletons. It is desirable to select M less than the eventual number of routes needed

2. Routes expansion:

The algorithm takes advantage of previously existing route to cover the demand between vertices which are close to it and vertices which are already included into route. It doesn't already belong to route Kth under expansion. It still has a high percentage of its total originating demand left; uncovered after pervious insertions in other routes. The resulting route (after insertion v in r) doesn't become circuitous. The ratio of the contributed incremental demand value exceeds a minimum value. The required frequency of service on the resulting route doesn't exceed a maximum operational value.

3. Designer's knowledge:

The designer is queried for the value of M and one identifies the M node pairs according to his knowledge of the dominant trip generator and attractors. The designer also implements his knowledge in determining the seeds nodes to each route expansion and the order of route expansion.

The Planning Layout