

Route Optimization Model
Pathfinder
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Version 1.0

Pathfinder models route optimization as a linear programming problem. The function to be optimized and the constraints will be specific to a specific cluster for an application.

Parameters

- $c_{i,j}$ - The capacity of vehicle i with respect to parameter j .
- $v_{k,j}$ - The value of parameter j for commodity k .
- $vp_{i,m}$ - The value of routing parameter m for vehicle i . These are properties of the vehicle that might affect the optimization function, such as gas mileage.
- $cp_{k,m}$ - The value of routing parameter m for commodity k . These are properties of the commodity that might affect the optimization function, such as “passenger priority”.
- d_{k_1,k_2} - The driving distance from commodity k_1 to commodity k_2 .
- t_{k_1,k_2} - The driving time from commodity k_1 to commodity k_2 .
- $d_{i,k}$ - The driving distance from vehicle i to commodity k .
- $t_{i,k}$ - The driving time from vehicle i to commodity k .

Variables

- $x_{k,i}$ - 1 if vehicle i transports commodity k

Problem

$$\begin{aligned} \min f(d_{k_a,k_b}, t_{k_a,k_b}, d_{i,k}, t_{i,k}, vp_{i,m}, cp_{k,m}), s. t. \\ \sum_k v_{k,j} x_{k,i} \leq c_{i,j}, \forall i, j \\ \sum_i x_{k,i} = 1, \forall k \\ x_{k,i} \geq 0, \forall i, k \\ x_{k,i} \leq 1, \forall i, k \end{aligned}$$

The difficult part of the problem is determining a suitable function f .

Solution

A Julia service solves the optimization problem using the GNU Linear Programming Kit (GLPK, <https://gplkjl.readthedocs.org/en/latest/glpk.html>). We will use the HttpServer.jl package to expose the routing engine as a web service (<https://github.com/JuliaWeb/HttpServer.jl>).

An example of a Julia web service that solves a linear programming problem can be seen at <https://github.com/aj-michael/sudoku.jl>.