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The Meaning and Importance of True Intermodal Route Planning in the Context of the Physical Internet

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INTERMODAL ROUTE PLANNING

Why is intermodal route planning important for the Physical Internet?

WHY INTERMODAL ROUTE PLANNING?

- aim to achieve synchromodal routing

- based on multimodal network
- real-time switching between modes
  - -> intermodal routes “might happen”

- complexity of decision too high for humans
  - -> need for decision support tools

DRAWBACKS OF STATE-OF-THE-ART INTERMODAL ROUTE PLANNERS

input

- place of departure A
- place of arrival B
- time of departure or arrival
- modes of transportation to utilize
- transhipment points (in case of intermodal route planning)

output

- the best route from A to B utilizing the selected modes of transportation (with the specified transhipment points)

- -> this is not, what we need!

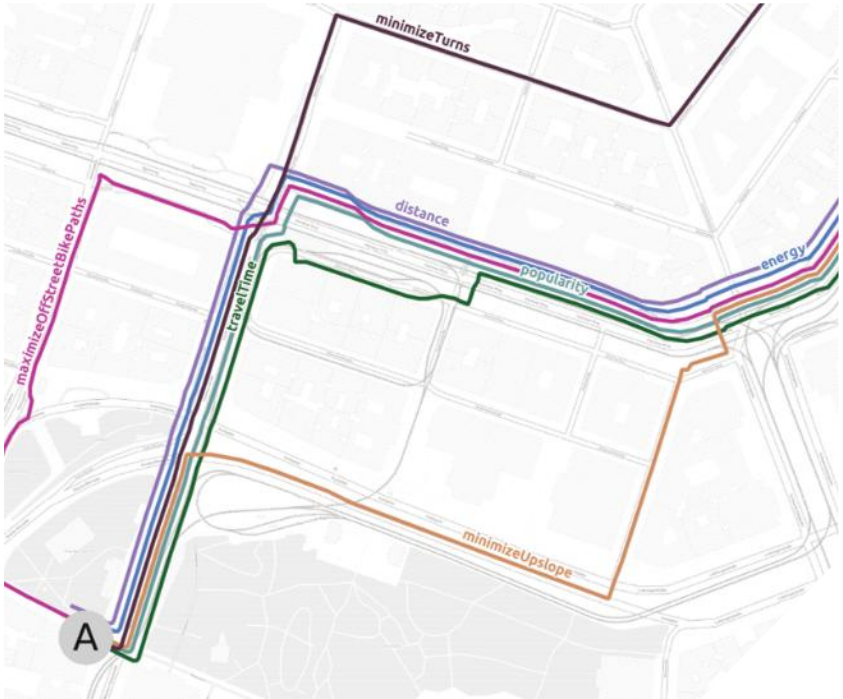
WHAT WE ARE REALLY NEEDING

input

- place of departure A
- place of arrival B
- time of departure or arrival
- possible modes of transportation to utilize

output

- a set of good fitting routes from A to B utilizing one or more of the specified modes of transportation



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INTERMODAL ROUTE PLANNING

the meaning of true intermodality

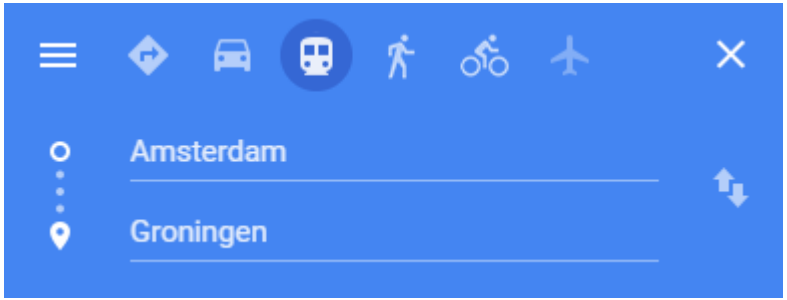
THE MEANING OF TRUE INTERMODALITY

we have to distinguish the following three steps

- input for route planning
- the process of route planning (incl. the planned route)
- the actual trip
- -> the meaning of intermodality is not the same for these three steps

INPUT – STATE-OF-THE-ART

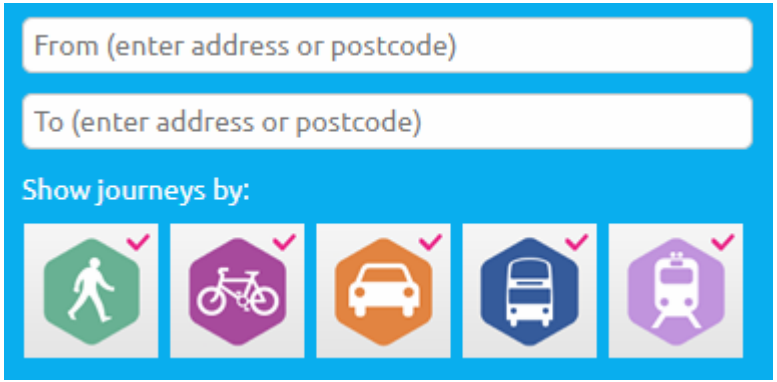
- origin
- destination
- departure/arrival time
- modes of transportation
- (transhipment points)



state-of-the-art UI © Google

INPUT – OUR APPROACH

- origin
- destination
- departure/arrival time
- possible modes of transportation
- ~~(transhipment points)~~



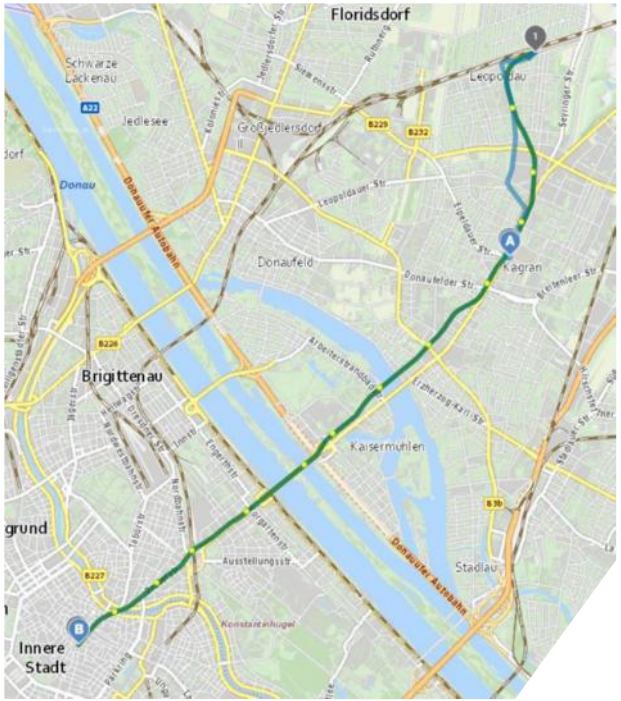
next generation UI © i-Travel York

ROUTE PLANNING – STATE-OF-THE-ART

- find a route that
  - starts at given point (and time)
  - ends at given point (and time)
  - utilizes all selected modes of transportation

or

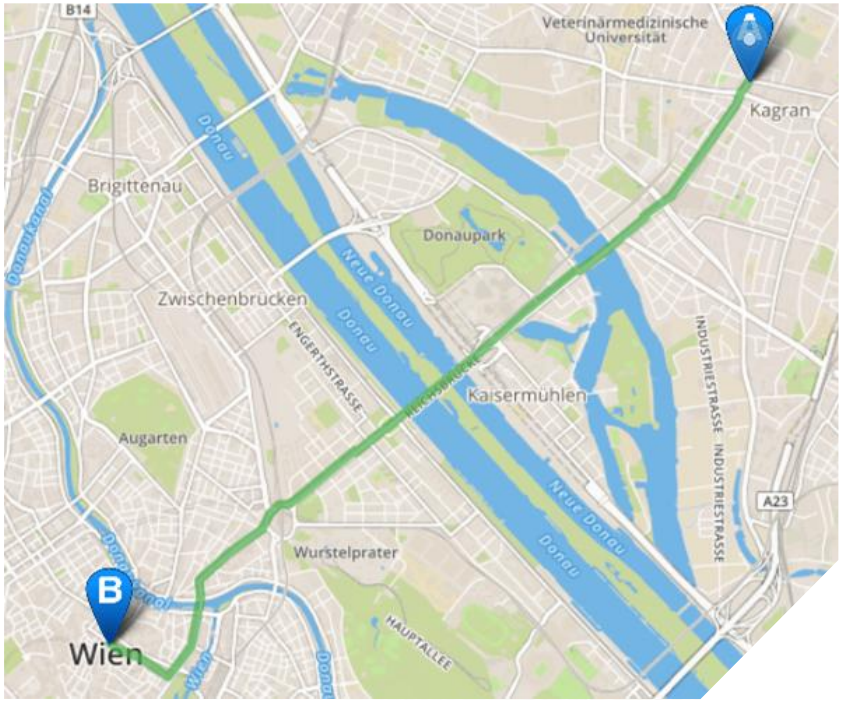
- find a route that
  - start at a given point (and time)
  - ends at a given point (and time)
  - utilizes one mode of transportation



a forced intermodal route from A to B

ROUTE PLANNING – OUR APPROACH

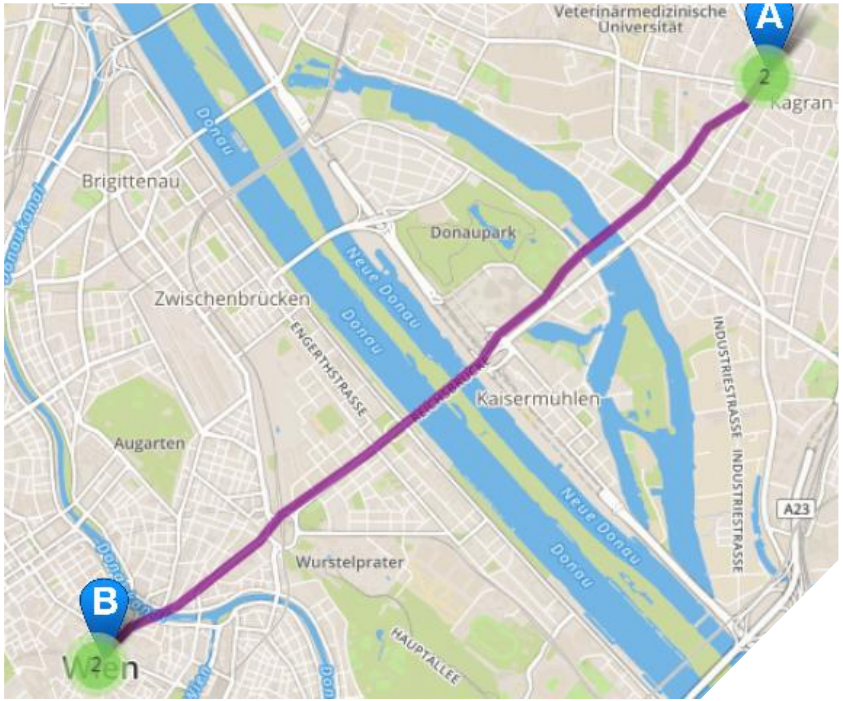
- find a set of routes that
  - start at given point (and time)
  - end at given point (and time)
  - utilize one, some or all of the specified modes of transportation



route 1: bike

ROUTE PLANNING – OUR APPROACH

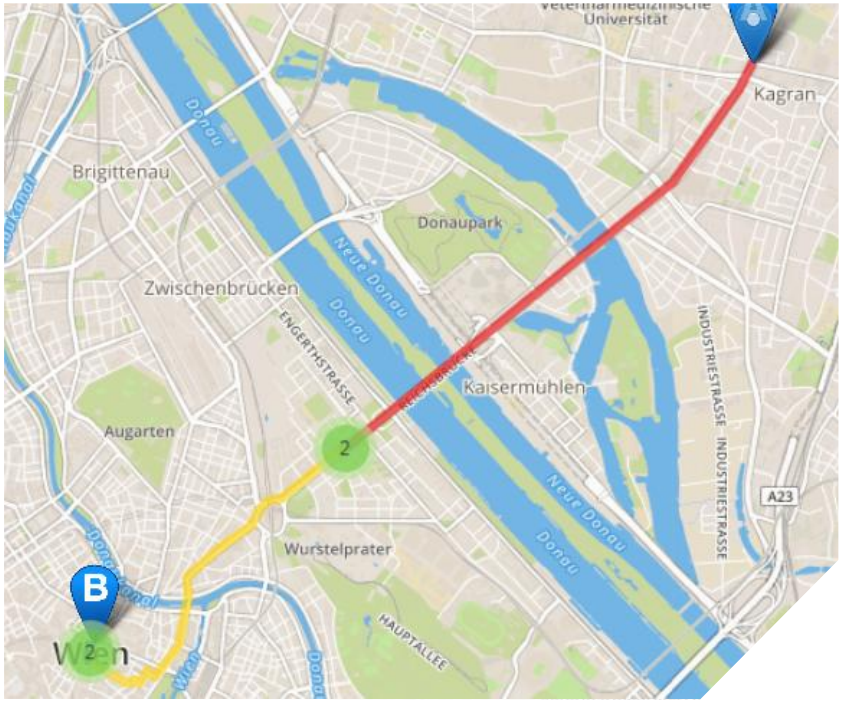
- find a set of routes that
  - start at given point (and time)
  - end at given point (and time)
  - utilize one, some or all of the specified modes of transportation



route 2: public transport

ROUTE PLANNING – OUR APPROACH

- find a set of routes that
  - start at given point (and time)
  - end at given point (and time)
  - utilize one, some or all of the specified modes of transportation



route 3: first car, then public bike-sharing

INTERMODAL TRIPS

state-of-the-art

- the trips are performed as planned

our approach / the PI approach

- trips are adapted in real-time
  - -> it is possible that even an intermodal trip turns out to be unimodal at the end
  - e.g. due to
    - incidents
    - changes in orders
    - changes in transportation network

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INTERMODALITY IN LOGISTICS

examples for application

PROMOTION OF SUSTAINABLE MODES OF TRANSPORTATION

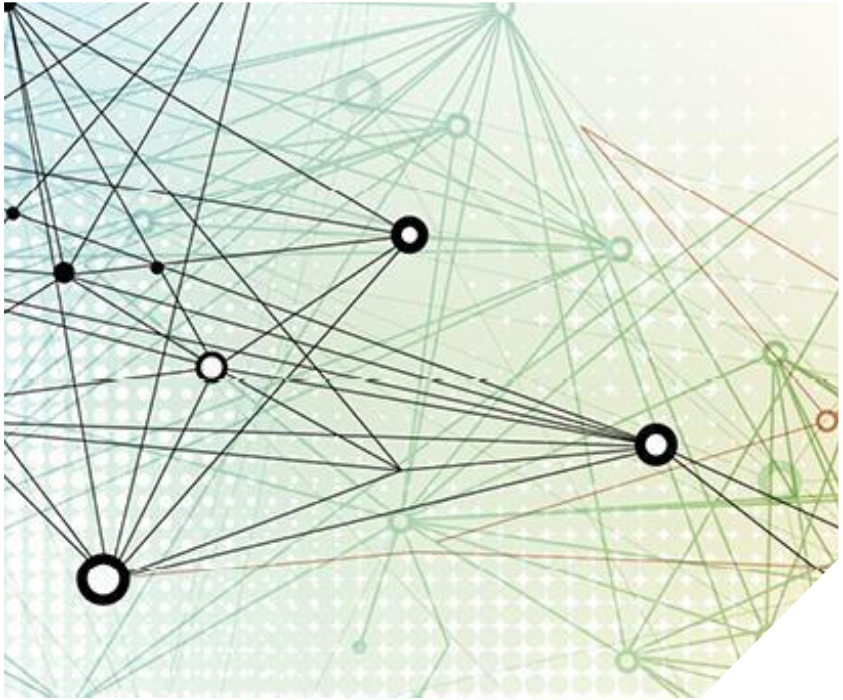
- no more standard decisions like
  - “we did it always like this”
  - “the truck is the most flexible one”
- information about possible alternatives
- reducing the complexity of planning
  - especially in case of full integration into decision support tools

AUTOMATION OF RE-PLANNING

- integration into real-time planning tools
- reducing complexity for decision makers
- step towards self-organizing system

TRANSPORT NETWORK DESIGN AND NETWORK SERVICE DESIGN

- integrated operations research methods
- complex simulations of future scenarios in transport networks possible
  - where to build new transportation infrastructure
  - which type of infrastructure to build (e.g. drones, hyperloops,…)
- optimizing network services (PI services)
  - planning of regular services (e.g. along the Danube)
  - (ad-hoc) planning of fallback solutions in case of incidents



SYSTEM-AWARE ROUTE PLANNING

- focus on transportation system as a whole, including
  - other traffic participants (freight and passengers)
  - residents
  - communities/municipalities
  - schools, hospitals, etc.

- no low-hanging fruits but optimization of the system
  - e.g. improving air quality vs. real-time deliveries in e-commerce

- try it for your private and business trips – download the App

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THANK YOU!

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