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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 *synchronmodal* 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
INTERMODAL ROUTE PLANNING
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)
INPUT – OUR APPROACH

• origin
• destination
• departure/arrival time
• possible modes of transportation
• (transhipment points)
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
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
THANK YOU!
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