INDUSTRIAL ENGINEERING AND INNOVATION SCIENCES

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

A path selection algorithm that incorporates conflicting city logistics stakeholders' objectives

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RESEARCH QUESTION

Which solution minimizes the negative impact of city logistics on the **liveability** of a city while satisfying private stakeholders' preferences?

Liveability *is defined as the degree to which a city is suitable and attractive for living. A liveable city supports quality of life, safety, accessibility, and environmental sustainability*

(Tennakoon & Kulatunga, 2019)

CONCLUSION

- Answer research question: create new paths between origins and destinations while incorporating travel time constraints
- A public stakeholder should not impose rules
- Shift to new approach to incorporate **liveability** in city logistics
- Start a public-private partnership. The private stakeholder should use the **multi-criteria optimal path algorithm** while the public stakeholder creates incentives to encourage its use

LIVEABLE CITY

CHALLENGES

INCREASING NUMBER OF INHABITANTS

INCREASING CITY LOGISTICS VEHICLES

INCREASING CUSTOMER NEEDS

LOWER NEGATIVE EXTERNALITIES > LOWER LIVEABILITY

Too little focus on social and environmental issues

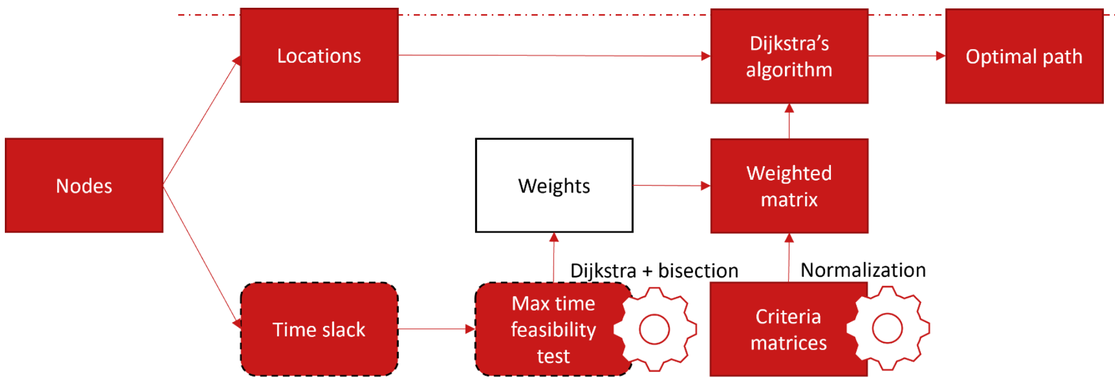
Research novelty: new method and new criteria

Private stakeholders want to maximize liveability for its residents

Public stakeholders prioritize travel time

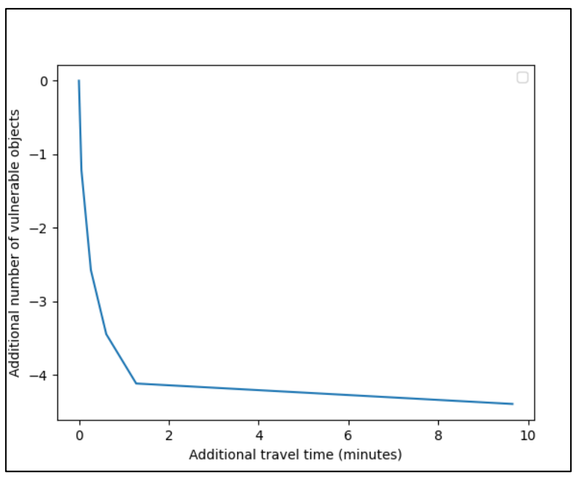
DESIGN

- **Multi-criteria optimal path algorithm**
- Weighted sum method is applied to assign weights to criteria



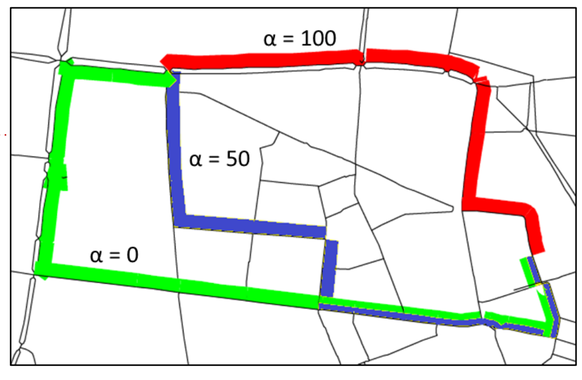
CASE STUDY RESULTS I

- Trade-off analysis
- Left top is preference of retailer: fastest path. (Current situation)
- Right bottom is preference of public stakeholder: highest **liveability** (avoid as many vulnerable objects as possible)
- Only small increase in travel time required for improvement in **liveability**

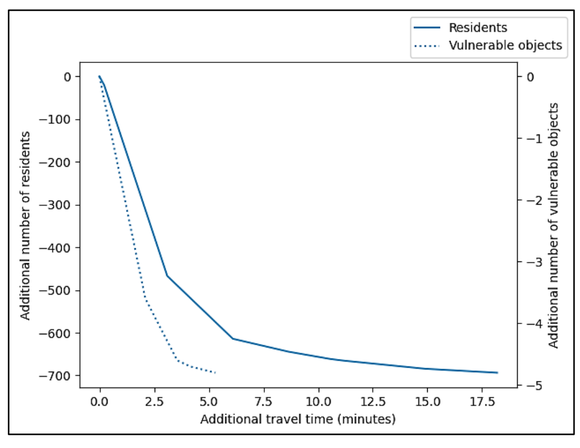


CASE STUDY RESULTS II

- Geographical visualisation
- α: weight assigned to travel time
- Red (α=100): fastest path
- Blue (α=50): intermediate option
- Green (α=0): least vulnerable objects
- Small detour is required to avoid vulnerable objects



- Detour time and highway exit
- For fixed routes to supermarkets, additional travel time prepared to drive can be decided with the help of this picture →
- The amount of additional travel time prepared to drive can be used to determine which highway exit to take



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- Tennakoon, T. & Kulatunga, U. (2019). Understanding liveability: related concepts and definitions.