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Simple Open Data Measures of Public Transit Service Availability

Usecases for Closeness Centrality and Isochrones

Emily C. Wilke

35xxxxxxxx

emilycwilke@gmail.com

Ruprecht-Karls-Universität Heidelberg

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Contents

1	Introduction	3
1.1	Transit Accessibility Equity and Equality	3
1.1.1	Terminology	3
1.1.2	Motivation	3
1.1.3	Research Question	3
1.2	Related Work	3
1.3	Methodological Approach	3
1.4	Geographic Case Studies	3
2	Closeness or Reachability	4
2.1	Closeness Centrality	4
2.2	Isochrones as a Measure of Reach	4
2.3	Comparison Use Cases	4
2.4	Methods	4
2.5	Results	4
3	Comparisons with Non-Schedule-Based Modes	5
3.1	Cycling	5
3.1.1	Methods	5
3.1.2	Results	5
3.2	Cars	5
3.2.1	Methods	5
3.2.2	Results	5
3.3	Temporal Discrepancies with Scheduled Transit	5
3.4	Limitations	5
4	Distinguishing Transit Footprints	6
4.1	Historical Urban Blueprints	6
4.2	Radial and Tangential Services	6
4.3	Methods	6
4.3.1	Visual Differences	6
4.3.2	Inequality Measures	6
4.4	Results	6
4.5	Hub and Spoke Transit Planning	6
5	Recap of Results	7
6	Discussion	8
6.1	General Limitations	8
	Bibliography	9

1 Introduction

In recent years, but for decades by now, the demand for a paradigm shift in transportation infrastructure and service has become louder and louder. While calls for a shift away from car centric mobility are nothing new and were a well established part of German Academic discourse in the 1990s already [1], it has become part of a widespread political discourse around the so called *Verkehrswende* [2]. With increased awareness and concrete experiences of climate change this discourse has reached states of heated debate. Benefits of

1.1 Transit Accessibility Equity and Equality

1.1.1 Terminology

1.1.2 Motivation

- Traditional transport planning centering on men?
 - German Transport Planning post world war 2?
- Transit planning and identifying demand in public transit networks is a complicated process, that takes into account a plethora of data that's hard to access or acquire [3].

1.1.3 Research Question

- How can an easy closeness centrality measure help asses transit service availability and equality

1.2 Related Work

1.3 Methodological Approach

1.4 Geographic Case Studies

- Selected based on data availability, personal familiarity.

2 Closeness or Reachability

2.1 Closeness Centrality

2.2 Isochrones as a Measure of Reach

2.3 Comparison Use Cases

2.4 Methods

2.5 Results

3 Comparisons with Non-Schedule-Based Modes

3.1 Cycling

3.1.1 Methods

3.1.2 Results

3.2 Cars

3.2.1 Methods

- added parking times

3.2.2 Results

3.3 Temporal Discrepancies with Scheduled Transit

3.4 Limitations

- limitations to car traffic estimations
- limitations to parking times

4 Distinguishing Transit Footprints

4.1 Historical Urban Blueprints

4.2 Radial and Tangential Services

4.3 Methods

4.3.1 Visual Differences

4.3.2 Inequality Measures

- Lorenz Curves and Gini Coefficients being silly sometimes [4]

4.4 Results

4.5 Hub and Spoke Transit Planning

5 Recap of Results

6 Discussion

6.1 General Limitations

- Lack of real world measures as Comparisons
- Lack of reliability Data
- Lack of delay data
- *inequality* being silly at times [4].

Bibliography

- [1] H. Holzapfel, “Hat das Auto in der Stadt noch etwas zu suchen?“, *Strategien gegen den Verkehrsinfarkt*. in Deutsche-Bank-Research. Schäffer-Poeschel, Stuttgart, pp. 63–80, 1993.
- [2] H. Holzapfel, *Urbanismus und Verkehr: Beitrag zu einem Paradigmenwechsel in der Mobilitätsorganisation*. Wiesbaden: Springer Fachmedien Wiesbaden, 2020. doi: 10.1007/978-3-658-29587-5.
- [3] F. Pieper, “Der Kreislauf der Aufgaben – Leistungsplanung und Leistungserstellung im Betrieb”, *Grundwissen Personenverkehr und Mobilität*. GRT Global Rail Academy and Media GmbH, Leverkusen, pp. 234–283, 2021.
- [4] D. Graeber and D. Wengrow, *The Dawn of Everything. A New History of Humanity*. Dublin: Penguin Books, 2022.