Towards a city congestion index: methodological explorations using Google's Distance Matrix API

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Abstract. All articles *must* contain an abstract. This document describes the preparation of a conference paper to be published in *Journal of Physics: Conference Series* using LaTeX 2_ε and the `jpconf.cls` class file. The abstract text should be formatted using 10 point font and indented 25 mm from the left margin. Leave 10 mm space after the abstract before you begin the main text of your article. The text of your article should start on the same page as the abstract. The abstract follows the addresses and should give readers concise information about the content of the article and indicate the main results obtained and conclusions drawn. As the abstract is not part of the text it should be complete in itself; no table numbers, figure numbers, references or displayed mathematical expressions should be included. It should be suitable for direct inclusion in abstracting services and should not normally exceed 200 words. The abstract should generally be restricted to a single paragraph. Since contemporary information-retrieval systems rely heavily on the content of titles and abstracts to identify relevant articles in literature searches, great care should be taken in constructing both.

1. Introduction

What are the problems with congestion? Is it mentioned in UN Habitat NUA, or SDGs e.g.11?

What are the clients of this index? Who needs such an index, and to do what?

2. Background

What congestion indices exist out there?

Practice/literature

How are others mapping congestion (or real travel time) with geodata? (edited)

3. Research Aim

As mentioned above, traffic congestion is an urban problem that deteriorate the positive benefits of urban life, therefore is imperative to understand the problem in depth and look at it from different angles as possible. Traditional congestion measurements are found to be costly and through practice or research different methods have been explored to overcome this issue.

One avenue of research understands congestion as a time and location specific problem, which occurs in a road segment and that its consequences are suffered from those in the immediate surroundings. A second understanding of the problem deals with the individuals who are affected by traffic. Focusing on this second interpretation of the problem, the aim of this research

is to provide a methodology to spatialize congestion and expose how congestion is distributed across an urban area. The map of congestion will provide local authorities and planners with spatial information about the city and consequently provide and measure how the problem has been evolving over time and space.

4. Methodology

At its core the methodology described in this section details a process of collecting and processing data from an internet service for traffic estimation and routing. The results presented here correspond to data extracted from the Distance Matrix API form Google Inc., but the exact same exercise can be done with other services such as HERE or TOMTOM. In order to understand how congestion is distributed across an urban area and potentially identify who is suffering from it, this method starts by selecting the study area and identifying the boundaries of the analysis.

5. Data

The methodolgy detailed above The information requirements for this study are relatively low. As explained above, as the method genereates the data there

Table 1. Descriptive Statistics

	Time Difference (mins)	Routes	N	Mean	S.D.	Min	Max
1	Amsterdam	30,564	15,282	8.22	4.54	-1.37	39.62
2	Glasgow	33,512	16,756	10.99	5.39	-0.25	34.08
3	Goteborg	29,248	14,624	4.89	2.35	-1.25	14.78
4	Lisbon	25,870	12,935	15.21	7.26	-0.33	40.67
	TTI	Routes	N	Mean	S.D.	Min	Max
1	Amsterdam	30,564	15,282	1.84	5.08	0.79	397.17
2	Glasgow	33,512	16,756	1.93	0.33	0.93	3.73
3	Goteborg	29,248	14,624	1.38	0.17	0.86	2.42
4	Lisbon	25,870	12,935	2.23	0.50	0.92	5.26

6. Results and discusison

Table 2. Descriptive Statistics

	Time Difference (mins)	Cells	Mean	S.D.	Min	Max
1	Amsterdam	131	8.57	2.39	5.38	19.03
2	Glasgow	136	11.15	1.88	7.66	15.64
3	Goteborg	123	4.92	0.99	3.22	8.06
4	Lisbon	119	15.34	2.67	9.74	21.57
	TTI	Cells	Mean	S.D.	Min	Max
1	Amsterdam	131	1.74	0.23	1.36	2.61
2	Glasgow	136	1.94	0.14	1.60	2.31
3	Goteborg	123	1.38	0.09	1.21	1.69
4	Lisbon	119	2.21	0.16	1.70	2.57

7. Conclusion