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Unlocking the Potential of Crowd-Sourced Data for Smart Mobility Hubs

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This work addresses the following topic(s) from the Call for Contributions:
(Please check at least one box)

- Placemaking to integrate urban spaces and mobility
- Promoting sustainable mobility choices in metropolitan regions
- Governing responsible mobility innovations
- Shaping the transition towards mobility justice
- System analysis, design, and evaluation
- other: _____

Extended Abstract

From here 700-1000 words, grouped by the following sections:

Problem statement

Mobility hubs are emerging as a key component of urban transportation systems, offering a centralized location where various modes of transportation and other services intersect to provide efficient and sustainable mobility options – especially in urban areas (Miramontes et al. 2017, Amoroso et al. 2012). Cities and regions have been actively developing and implementing mobility hubs as part of their efforts to create more sustainable and efficient transportation systems (Arnold et al. 2023). However, data on the hub's locations, services and transportation provided are rare and lacking consistency. A systematic collection of hubs in an open, crowd-based manner is crucial to plan and develop innovative and smart hubs in (peri-)urban areas.

Research objectives

Within the research project SmartHubs an accessible and interactive open data platform (ODP) was developed. This platform allows an easy “expert crowd” mapping of the operational and planned mobility hubs. This ODP is based on the semantic media wiki framework (technical setup realized by the contractor mobyome) that makes a collection of datasets on mobility hubs (among other features) available for users and allows the visualisation of its components. The most important purpose of the ODP is to get a single point of access and overview of the datasets to users, which have been and will be collected under common rules. These datasets allow to directly calculate the SmartHubs Integration Levels (see Geurs et al. 2023). Within the last two years 155 Hubs and 26 Mobility Hub Networks were collected and specified.

The collected data can be used for further analysis. In this contribution, we focus on the current geographic distribution of hubs. It involves examining the physical, digital and demographic integration level of the hubs concerning spatial typology factors, such as the degree of urbanization (DEGURBA), which classifies Local Administrative Units based on the share of population living in it (EUROSTAT 2023). The accessibility tool (a

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key output of the SmartHubs project) should be applied for all hub locations to create a typology. The second research question is whether a hub network influences the average integration level of the hubs themselves. The assumption is that hubs as part of a network reach a higher integration level and this is pivotal for its understanding of the dynamics and potential further developments.

Beyond geography, the creation of a service typology is essential, distinguishing between mobility and non-mobility services. This contribution also aims to identify which services are often bundled together and which ones tend to remain independent in an exploratory approach. This insight can guide the development and enhancement of hub networks to better meet the evolving needs of (potential) users.

Through this comprehensive approach, the evaluation of the data, can shed light on the specifications of the hubs within the open data platform. Understanding the current status of hubs are relevant for future decision-making and planning of smart mobility hubs.

Methodological approach

Our methodical approach involves a comprehensive analysis of the ODP (Open Data Platform) data, which encompasses several key steps:

- **Data Extraction:** We begin by extracting data from the open data platform and converting it into a usable format, such as CSV. During this process, the data is cleaned and scrutinized for any inconsistencies or errors.
- **Data Analysis:** With the cleaned dataset in hand, we employ various statistical techniques to analyze the information, all in alignment with our defined research objectives. This analysis is geared towards uncovering patterns, trends, and correlations within the data. In this process, we may also incorporate supplementary datasets, including spatial and demographic information, to enhance the depth of our analysis.
- **Evaluation of accessibility:** An essential aspect of our approach is the evaluation of accessibility for the listed hubs. We employ the accessibility tool that help us determine the accessibility levels of each hub across different user groups and transport modes. This step is integral to understanding the real-world implications of the data and its relevance to various transportation scenarios.
- **Data Visualization:** This step includes the creation of visual aids like charts and maps, which provide a clear and accessible representation of the data's insights.
- **Reflection with experts:** As a last step, ideas for an automated integration of analysis steps into the ODP will be discussed and evaluated regarding their feasibility with mobility and other relevant stakeholders

(Expected) results

The results will show the potential of crowd sourced data and its significance for research and planning of hubs. We also expect important insights beyond the ODP and the collected data. Additionally, the detailed records of the analysis process, varying data sources, methods, and findings as documentation will be essential for reproducibility and future references. Further on, ideas for integrated analysis directly in the ODP will be discussed.

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