

An Open Platform for Inferring Power Grids with Crowdsourced Data

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Outline

- Need
- Approach
- Benefit

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Need

• Commitment



Gedankenexperiment

To simulate the power system of any country, what do we need?



Models/met	hods	Comp	uting power	Data	
 O O Need 	○ ○ ○ ○ ○ Approach	0	O Benefit	O Commitment	3

The status quo with power grid data





Source: Esr



How academia assumes it is

How utilities want it to be

What many utilities still use

How it sometimes is

Improving data quality is a massive task







Why is data an issue?

- Real grid data sets are **not** openly available
- If available, data incomplete or inaccurate
- Gathering and maintaining this data is expensive











We are not the only ones interested

Power grid inference based on geodata

• H. K. Çakmak et al. "An attempt for fully automated generation of large-scale and complex simulation models for electrical transmission networks derived from OpenStreetMap data." at-Automatisierungstechnik, Smart Grids. In Press.

Models/methods Computing power Data

• dena-Verteilnetzstudie, 2012.

Models/methods Computing power Data

• Soltan, Saleh, and Gil Zussman. "Generation of Synthetic Spatially Embedded Power Grid Networks." arXiv preprint arXiv:1508.04447 (2015).

Models/methods Computing power Data

Our goal: Platform for power grid mapping

Models/methods Computing power Data





0 Benefit



OpenGridMap Analysis Collection Verification Inference Transformer? Generator? **OpenStreetMap GridLAB-D** Expert in the loop $\bullet \circ \circ \circ \circ \circ$ Ο

Need

Approach

Benefit

Ο Commitment

Data collection

Collection Verification Inference Analysis









Available data OpenStreetMap

Own mapping App (currently on Android) Add url to new app!!! Aerial mapping and modelling (Hobby drone)



O Benefit O Commitment

Data verification

Collection Verification Inference Analysis

Not easy to automate

Currently manual classification by experts-in-the-loop

Give it a try: What are these power grid devices?













Data inference

Collection Verification Inference Analysis

Example Garching: An inference approach of (underground) distribution lines



Unconnected power devices on the map

Need

Approach





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Commitment

Data inference

Collection Verification Analysis Inference

Example Garching: An inference approach of (underground) distribution lines



Benefit

Voronoi partition for transformers

Approach

Need

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Commitment

Data inference

Collection Verification Inference Analysis

Example Garching: An inference approach of (underground) distribution lines

Connecting houses and transformers (minimum spanning tree)

Approach

Dall Much to improve! 00 \bigcirc Ο

Benefit

Need

Sharing data

Collection Verification Inference Analysis





And now











Benefit

- Improve your research
 - Reproducible research on realistic datasets (without NDAs)
 - Bring your research faster to application
 - Boots on the ground research
- Be part of a community
 - Become an OpenGridMap evangelist
 - Organize mapping events
 - Rise awareness of the power infrastructure

Approach



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Commitment

Benefit

Source: innovation-on-purpose.com



Commitment

Commitment 1: We will publish our datasets and inferred models

Commitment 2: We will keep OpenGridMap free of charge

We need you Let's make it happen









Please send me an email

www.opengridmap.com j.rivera@tum.de

Extra slides: Security

- Utilities don't offer their network data Argument: protection against attacks on critical infrastructure Security through obscurity - a bad idea
- OpenGridMap is a knowlege tool The responsibility of use is on the user



Extra slide: Competitors

- Traditional GIS set up approaches
 - Requires experts and specialized tools in the field
 - Can only be performed by utilities
 - High costs



- Sensor-based approaches
 - Intrusive data collection
 - Challenging to collect the required amount of data
 - No geographical information



Competitive advantage: Non-intrusive data collection