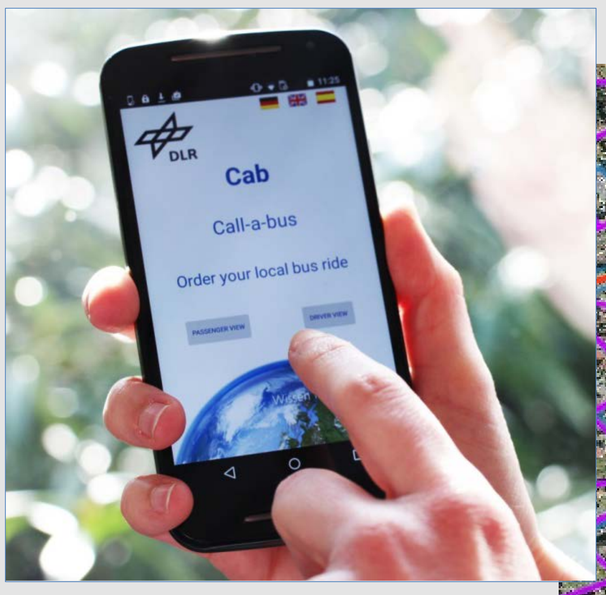
Challenges in static data acquisition for a bus-on-demand line



Left: Mobile App | Right (Fig. 1) : Tiled orthoimages of Schorndorf's historical core area with sidewalk network layer. Blue: no public traffic; Pink: curb; Black: railing; Green: grass strip; Orange: none.

Challenge

An existing rigid bus line in the German city of Schorndorf (metropolitan region of Stuttgart) will be switched to an on-demand minibus regime without fixed *stop points*. This shall enable boarding and alighting literally at the travelers' door steps. But not every inch of the public road network is suitable - for, i.a., legal, technical and structural reasons. Different static data needs to be merged into an enhanced network database to finally define and enumerate all allowed *stop areas*. Necessary data include the ones in Fig. 2, with some being a proxy if the detailed info is not at hand. While in theory all such data is available in the municipal electronic registries, in reality it is a big challenge to gather them or even newly create information. Open Street Map (OSM) is surprisingly sparse in such medium cities, yielding only vehicle type restrictions. Google's and Mapillary's street views are not available.

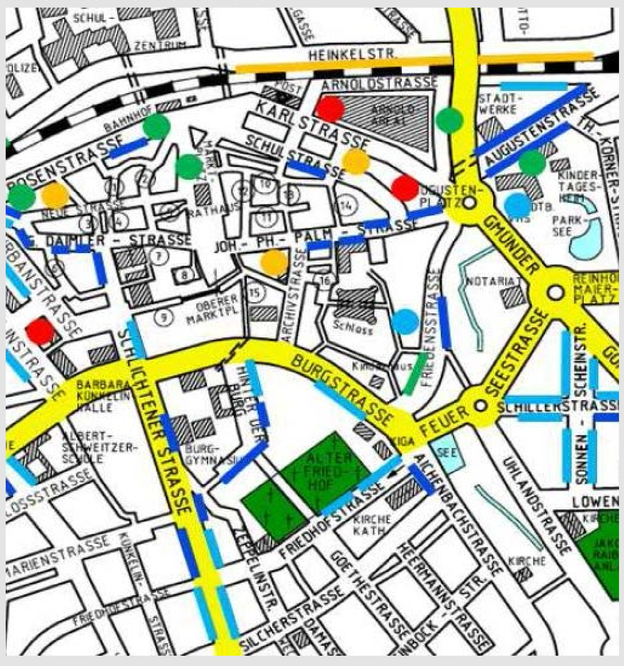


Fig. 3: On-street parking info from a previous study

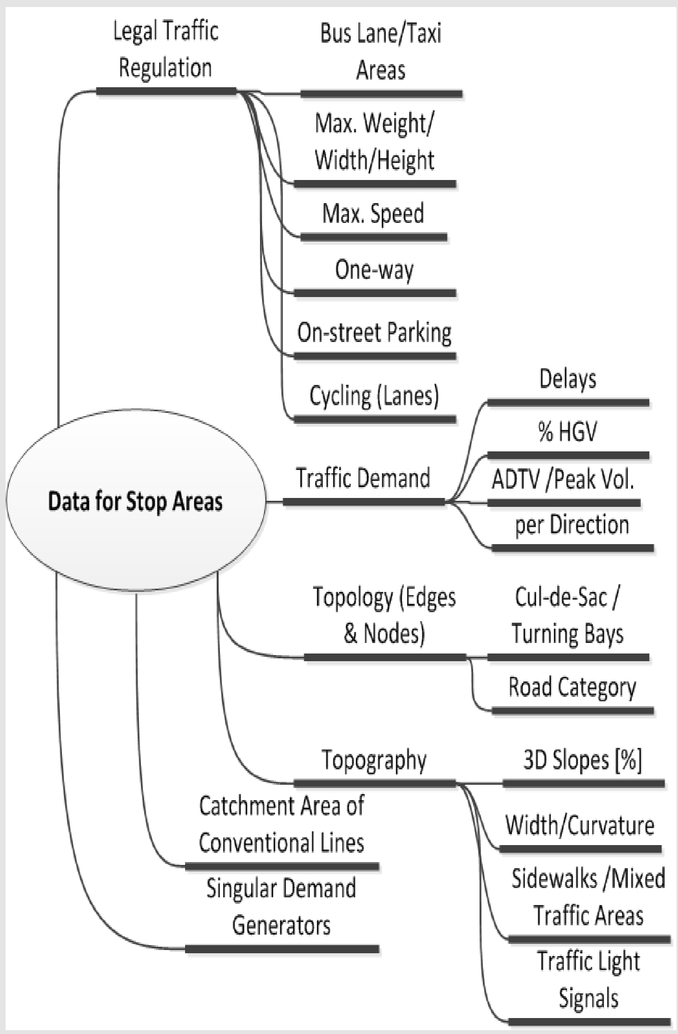


Fig. 2: Considered data for stop area definition

Approach

We tapped different sources including aerial images, the regional traffic model, and the cadaster.

Sidewalks - Orthoimages

As a safe boarding and alighting requires an accessible sidewalk next to the road, we guessed (sic!) from HiRes orthoimages and attributed them according to Fig. 1.

Parking – Cadaster

As on-street parking cars between the road and the sidewalk are an obstacle, we detected (only) few such areas in a shapefile (Fig. 4). The center was mapped in 2015 (Fig. 3).

Signs - Municipal Road Inspection

Parking information and other legal regulations are stored in >100 paper folders, making it impossible to efficiently retrieve information. The municipal road inspection images from 2011 are a further source, e.g. for semi-automatic sign recognition. Licensing issues of the proprietray file viewer stand against it so far.

Fig. 4: An on-street parking area in the shapefile

Winter Services

Snow falls might lead to impassability of road sections for buses. But sweeping might clog up the sidewalk-road transfer zone. Special arrangements and a reduced stopping regime need to be considered. The given shapefiles (Fig. 5) were transferred into a node-edge format.

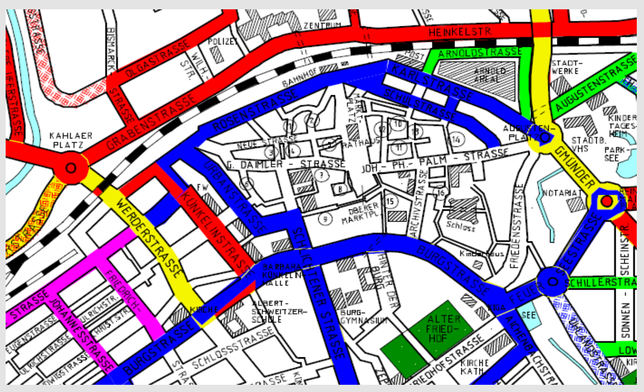


Fig. 5: Winter services in the shapefile

Results

The enriched network database is the input for multi-criteria heuristics where (and when) to allow for stops. This is displayed as passenger information and base for the routing algorithm.

One thing became obvious:

There is no smart mobility without digitisation.

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