Track-based OSM Print Maps

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Abstract Mobile devices have become more and more powerful in the last years and it is possible to use them for locating and navigation. But are they always the better choice than using a paper map? In many situations – e.g. on a long hike – a paper map is still useful. This project aims at providing map booklets based on OpenStreetMap data. In comparison to similar projects creating print maps for an area of interest this projects creates a map booklet along a given GPS track with customizable rendering options and overlapping map sections.

Keywords. OpenStreetMap, print map, GPS track, tiling, rendering

1. Introduction

GPS devices or smartphones with specific applications can help you to easily locate yourself in and navigate through unknown surroundings. But traditional paper maps still offer advantages over mobile devices. For example on long hiking trips it might be unforeseeable when it will be possible to recharge your electronic device. In such a situation a printed map is a valuable alternative. Also, it is much easier to get an overview of the area on a high resolution A4 paper map than on a 3-inch display.

Searching the web, there are many solutions to export and print map views. However there is no service that allows to create customized OpenStreetMap paper maps with integration of tracks or user-defined visualization styles. Creating such a map with GIS software is much to difficult for a user who is not familiar with this kind of software.

This paper presents an architecture to create customized OpenStreetMap booklets on the basis of a GPS track that might be downloaded from hiking websites like `www.gpsies.com`. This track can represent the mentioned hiking trail, or any other intended route, e.g. the navigation instruction from OpenRouteService. The booklet supports multi-page mode, at which the map sections overlap each other. A step-by-step interface offers everyone the possibility to create map booklets that fit their individual needs.

2. Related Work

There are some similar projects that offer functionalities to export and print OpenStreetMap data. The *Walking Papers* project by Michal Migurski encourages users to print OpenStreetMaps, annotate and add information, scan the map and then digitize additions and changes. The main advantage of this method is, that no mobile device is nec-

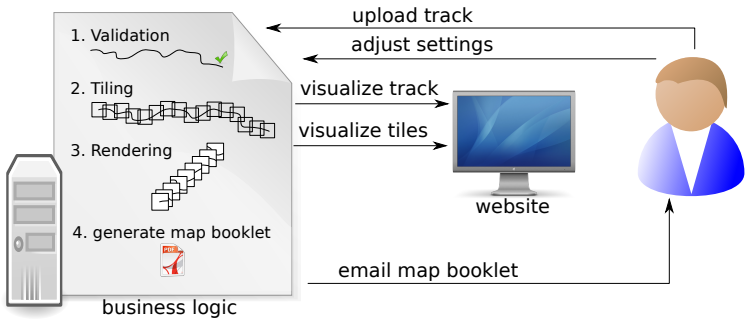

Figure 1. The service architecture. On the left side is the server with the four steps of the business logic. The right side denotes the interaction with the user and via the web interface.

essary for the mapping part. The most famous application was after the earthquake in Haiti [5]. *MapOSMatic* is a free webservice that allows to create printable city plans. It contains the map and a street index, ready to print as PNG, PDF or SVG file [1]. The *TownGuide* is a python program that, like MapOSMatic, renders a map to a PDF file including a street index, but also adds an index of user-selectable POIs. It can run either as a web service or as a stand-alone program if the source code is installed [3]. There are also application-based projects that assist to create a printable map from OpenStreetMap data: The *Osmbook* turns OpenStreetMap data into a printed book. It generates a high-level gridded overview page and multiple other pages with cross referencing and additional information [2].

All these project have in common that they create paper maps based on OpenStreetMap data for a given area of interest defined by a bounding box. But none of these projects is capable to use a track as an input and render maps along this track.

3. Architecture

The architecture is based on a simple client-server interaction. As depicted in Figure 1 the business logic splits the data processing on server side into four single tasks: validation, tiling, rendering and generating the booklet. The user interaction is realized through a web interface.

The user uploads a GPS track, which is validated against a XML-schema and modified if necessary. In the tiling step the track is splitted into parts and calculates map tiles for each part. Each tile is represented by a rectangle centered around a certain point of the track with a predefined overlap. The tile size is defined by the format of the paper and the scale of the map. Afterwards the renderer creates a graphical representation for each tile. This project uses the Kogutowicz renderer [4], which is implemented in Java and offers many setting adjustments. The renderer fetches the raw OpenStreetMap data for each tile using the OSM API. Apart from the map in the background the renderer also visualizes the extent of the neighboring, overlapping tiles and the track itself. Figure 2 shows an example of a rendered map section. In the final step the map sections are linked with additional information, the resulting map booklet is generated and sent to the user via email.

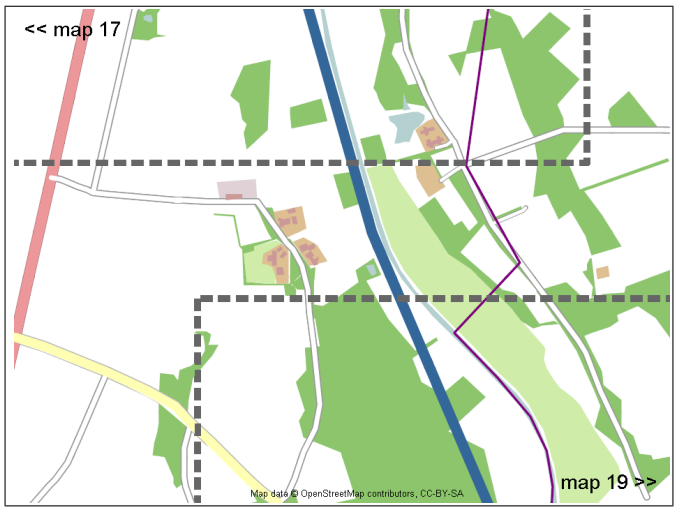

Figure 2. An example of a tile along a track. The track is in blue, the extent of the neighbouring tiles is in black.

The user gets feedback for each step through the web interface that can be accessed at `giv-osm.uni-muenster.de`. The validated track is visualized on a map as well as the preview of the tiles. The user can adjust the page settings if necessary and specify the rendering options.

The whole architecture is implemented in Java. Using OpenStreetMap has several advantages, especially for copyright and licensing. OpenStreetMap data is licensed under the *Creative Commons Attribution-ShareAlike 2.0* License. That means that you are free to copy, distribute, transmit and adapt our maps and data, as long as you credit OpenStreetMap and its contributors.

4. Conclusion

The project demonstrates an architecture to create individual map booklets based on the integration of GPS tracks. Similar projects offering printing functionality of OpenStreetMap data have already been reported. But none of them offers a web-based tool to print maps along a path. This projects enables a user to create a map booklet for a specific purpose. The map booklet shows the local environment around a track and provides only the areas the user is interested in.

For this purpose an algorithm has been developed to calculate overlapping map tiles along a track. Existing path splitting algorithms are not capable to perform this tiling. Furthermore this project integrated a renderer to fetch raw OpenStreetMap data, which enables the user to adapt the map individually to the personal needs.

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