Selected issues - Providing better maps and information for Location Based Services (LBS) on mobile devices

Fast mobile broadband - Many countries have increasing access to the internet, mobile & fixed. With mobile broadband users can access maps on their mobile device. As many devices have in-build Global Navigation Satellite System (GNSS) receivers, it is possible to display the current position of the user. A mobile broadband connection enables the user to utilize Location-Based Services (LBS), for example for navigation or local information. Mobile broadband enables public to access (spatial) information anywhere and anytime. This trend together with the development of information and communications technology (ICT) foster many innovative applications.

Tailored maps for Location Based Services (the role of cartography in Location Based Services) - Many location Based Services use maps as background maps or to provide a particular services, for example routing or wayfinding services. In many cases these maps are implemented using common map interface application protocol interfaces (APIs). One of the most popular one is provided by GoogleMaps. Google maps provides a very particular map layout. Given the popularity of this map service, this layout has become a “quasi” standard for displaying maps on smartphones and pads.

As it seems some providers of for example apps for mobile gaming (e.g. “PokemonGO” or the “Ingress” mobile game) or routing services are mainly concerned with the functionalities of their application. Less attention is given to maps and its design. Therefore there is a need of improving Location Based Services by providing a tailored map design for a particular application and context of use. Principally, we suggest utilizing guidelines of designing maps for mobile devices, especially considering their small screen sizes, restricted interaction modalities, technical constraints, and their context of use.

Best practices (selected do and don’ts…, how to…) - A number of researchers have investigated issues concerning the cartographic communication when small display sizes are involved. These issues need to be considered when dealing with the display of maps on small screens or displays. Examples includes avoiding an information overflow as it causes overlapping information. Overlapping symbols and labeling makes the map unreadable. This seems to be trivial, but still for example rather recent maps used in navigation systems display overlapping information, as shown in figure 1.

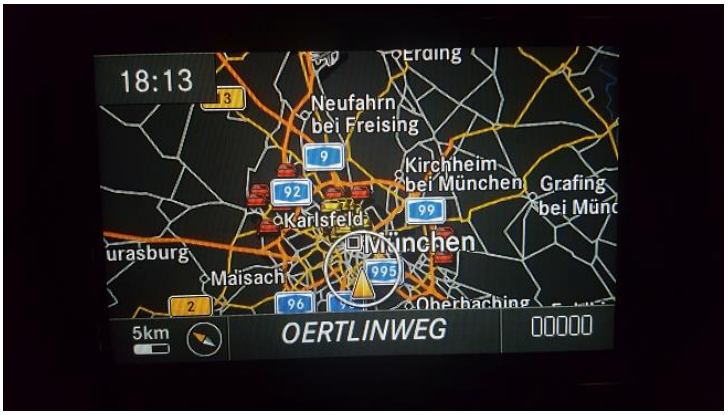
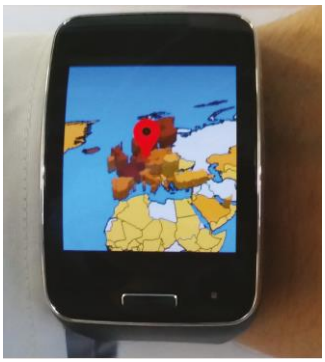


Figure 1 Car Navigation Display showing overlapping information, Mercedes car navigation system from 2011/12

Do we need a “tailored” cartography for varying devices? - Upcoming devices, for example “SmartWatches”, shown in figure 2a, are increasingly considered for visualizing maps. We expect to have an increasing diversity of technical systems (including data formats)

and an increasing diversity of devices (e.g. "wearables" like smartwatches, glasses, etc.). Concerning the cartographic presentation of content, we may see different “specialized platform specific systems” vs “more universal or web-based systems”, as the different media can handle content and interactivity in various ways. For example, the map has to scale according to the size of the display in a smart watch.



a. SmartWatch showing a thematic map on a small screen

b. User navigating with a Microsoft HoloLens

Figure 2. a. Smartwatch showing a thematic map b. a young user navigating in an augmented reality environment

Additionally devices provide possibilities of an augmented reality, for example the Microsoft HoloLens shown in Figure 2b. At this point, it remains unclear how cartographic presentations can be designed and used in these kind of augmented reality environments.

Communication of correct location-based service information – In many cases services are based on data-streams. A prominent example are weather information services on smart-phones and smart watches. Still the location of the user and the data acquired or processed from a data stream may not match. That might lead to wrong information displayed on the “smart” device. Figure 3 shows an example of weather information indicating “unhealthy air quality”. This information is completely arbitrary, as the index showing (an odd) “42” is not explained. There is no information on the spatial extent of this information. This picture is taken on a normal day in the city of Düsseldorf with no unusual official reading on particularly bad air quality.

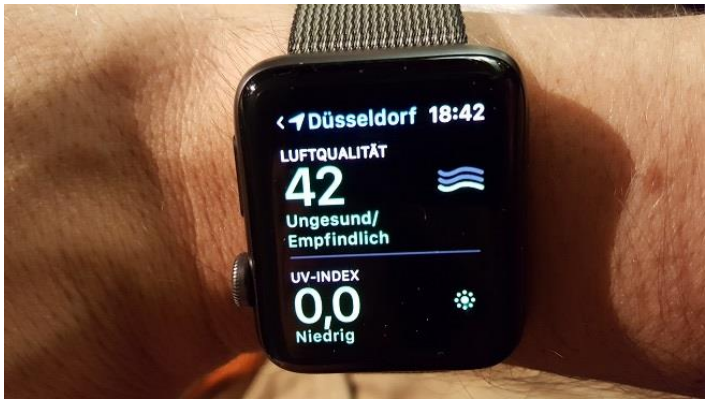


Figure 3. Smartwatch indicating "unhealthy" air quality in Düsseldorf, Germany