Barrier-Free Micro-Mapping for Development and Poverty Reduction

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1 Role of VGI in Development and Poverty Reduction

Mapping of infrastructure and resources is an important backbone of poverty reduction work and environmental protection projects in developing countries. For many projects it is of highest priority to know how to reach places, to know where resources are, or to know about the dimensions of spatial entities, or to learn about change. Acquiring such information is important to document progress, to measure success, and to generate data for new projects. Participatory and VGI approaches are the natural choice in such a context: the required data can be collected by local stakeholders and contributed to VGI systems like OpenStreetMap, thus making it available for everybody (Elwood et al., 2012; Georgiadou et al., 2011, e.g.). The resulting data can be used in manifold ways, such as putting assets on the map, improving and monitoring agricultural activities, improving and creating maps in higher resolution, or furthering fine-grained spatio-temporal analysis.

2 Educational, Social, and Technological Requirements on VGI Tools

Current tools and workflows to collect, classify, and modify VGI data are usually optimized for being used by educated contributors with good technological knowledge and powerful equipment. The users have to be literate, aware of the complex spatial classification systems, and they need computers as only few and limited tools for small mobile platforms are available. Especially in developing countries, these requirements are often impossible to fulfill. However, in many cases, the inclusion of people at a grassroots level is the only possibility to gather and map expert data from agriculture, seasonal phenomena, land use, soil quality, etc.. Only if we develop barrier-free systems designed to meet the requirements of the users and the data to be collected, it will be possible to acquire valuable data in new topical dimensions.

3 Barrier-Free Mapping of Smallish Geographic Objects

We base our research on experience from poverty reduction work in rural Laos where potential contributors do neither have sufficient education nor technology to collect the required data. They are usually unaware of classification of geo data, not used to handling expert software, and sometimes even illiterate. When working in the field, possible contributors only have access to mobile phones as computing platforms. As a result of this educational and technological mismatch, the great potential of collecting useful data by local topical experts in developing countries remains inutilized.

Figure 1: Backyard fish pond in a village in Laos.

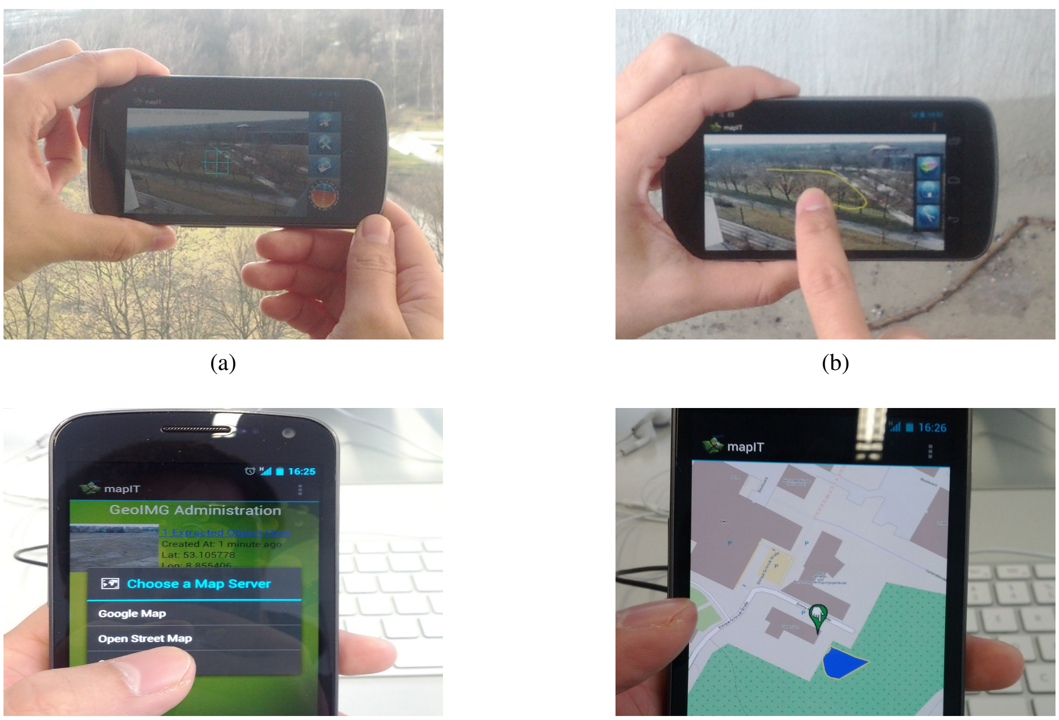
A particular focus of our work is the mapping of smallish geographic entities, e.g., small fishponds installed in the backyards of villagers to overcome protein supply problems (Figure1). These pools are too small to be recognized on satellite imagery. Thus, a VGI approach is very suitable to map locations and extent of these pools. Smallish entities like this are often hard to record but worth to be put on maps. Other examples are small archeological sites, places on campus environments, facilities for sports, contaminated soil, etc.

To foster the mapping of smallish geographic entities and to enable a broader variety of people to participate, we develop barrier-free micro-mapping tools for low-cost smartphones (Schmid et al., 2012a,b). We set three requirements for our method: 1) the mapping process should not require any geographical expert knowledge (for example, about geo entities), 2) it should not be required to type in names or numbers, and 3) it has to run on low-cost smartphones with usual sensory capabilities (that is, GPS, compass, camera, tilt sensors). Thus, we develop a camera and speech-recognition based mapping application for Android phones (see Figure 3): The user only has to take a picture of the entity to map (3a), trace its outline on the touchscreen (3b), and finally speak the type of the object into the phone (3c). After these intuitive and barrier-free steps, the entity can immediately be uploaded to an OpenStreetMap server or any other server and is ready for further processing (3d). Accurate geometry and location of the entity are derived from GPS signal, geometric projection of the finger-trace on the touchscreen, camera lens properties, and information of the tilt sensors.

4 Conclusion

Participatory GIS and VGI play a central role in mapping resources in developmental projects. To explore the full potential of these approaches we need to develop barrier-free applications to collect valuable geodata. In our work we want to enable the mapping of smallish geographic features for development measure evaluation and improving the accuracy of map data. We presented a method that poses little requirements on the knowledge of the users and thus makes if applicable for grassroots data acquisition in developing countries.

Figure 2: Our approach resembles shape and size of the object (blue), while GPS trace based approaches fail (red and green).



(a) (b)

(c) (d)

Figure 3: Mapping requires little effort: The user just has to take a photo (a), outlining the object (b), annotate it via speech, and upload it to a geo-server with one click(c) to, for example, put the object on a map (d).

References

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