

Towards Integrating VGI and National Mapping Agency Operations - A Canadian Case Study

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Introduction

Many National Mapping Agencies (NMAs) around the world have seen their operations downsized in the past 10-15 years as many other government production and service based agencies [6]. In some cases, downsizing got to a point that some agencies cannot maintain anymore what would be considered a reasonable updating cycle. There is then a risk to offer obsolete information through their Spatial Data Infrastructure (SDI) while, paradoxically, up-to-date Volunteered Geographic Information (VGI) has never been so ubiquitous. This paper discusses the Canadian NMA approach for integrating VGI in its operations.

Discussion

If Britain's Ordnance Survey business model has triggered the Openstreetmap project 8 years ago, NMA downsizing is now seen in many countries as an opportunity to integrate VGI in NMAs operations [1, 3, 4, 6, 10]. It is the case of the Canadian NMA, the Center for Topographic Information (CTI), that has decided to explore, 3 years ago, how VGI data could be integrated in their operations.

Coleman [3] suggests that, under certain circumstances, VGI data offer NMAs the opportunity to produce richer and more up-to-date databases. Questions that need to be asked in this context are: *Why using VGI? How to use it? Who contributes? Who decides on validity? For how long?* We explore each question in the context of the potential use of VGI by CTI.

Why using VGI? Downsizing operations has created a situation where the Canadian NMA cannot update much of its map content anymore, despite the Canadian GeoBase initiative[5], where provincial and federal agencies had decided to share and give free access to some of their data. For instance, excluding the road network, metadata indicate that objects in the database are on average 30 years old in the most densely populated half of the country. In this case, VGI could help the organisation to get a faster updating cycle in urban areas.

How to use it? Considering the NMA geographical data asset value, soliciting and incorporating all VGI updates directly into the database was not considered as an option, as there is still too much to learn about VGI data and volunteers behaviour. Instead, using VGI contributions as a user-driven change detection mechanism appeared to be safer, as the organisation decides what changes are applied to SDI data and what metadata are provided [7]. CTI already uses VGI change detection as a planning tool for conventional field work. Questions remain about how to best integrate some detected changes into the database.

Who contributes? Cooper [4] has proposed an extension to a formal SDI model that can include the contribution from VGI. Using this model, Openstreetmap (OSM) can be seen as a formal SDI with contributors having the role of data provider and the NMA having the role of data aggregator/integrator. Dealing with OSM as a SDI has two advantages: it already exists and has a well-developed community. If CTI was to develop its own VGI web mapping site, it would have no guaranty that the site would be used and that a user community would develop [9]. However, it is still not possible to distinguish between a credible VGI contributor and an incompetent, mischief-makers, or outright vandals [3].

Who decides on validity? As VGI updates will not be incorporated directly into the database, the NMA can filter among available information before using it. Statistics on contributors could be maintained, selecting/rejecting contribution, before using an information without a ground-truth validation. It also implicitly meant that a contributor will require a significant and continuous contribution before being considered, which is only the case of a small proportion of OSM contributors [2, 3].

For how long? We believed that an NMA cannot rely on "one-time-only" VGI contributors to develop a reliable assessment mechanism and to automate VGI data integration process. A long-term relationship shall

be proactively cultivated to maintain a large community of volunteers [2] by considering contributor motivations [9, 11].

Current progress

The Canadian NMA, the Centre for Topographic Information, has invested in his relationship with the OSM community by providing them with a fully compatible OSM version of its map product. As hoped, the OSM community has largely integrated CTI maps into the OSM database for densely populated regions of Canada. Automated processes are being developed to detect potential updates using the OSM data. These processes use a statistical characterisation of the compared datasets to evaluate what should be considered as significant changes. Changes are classified as “omission”, “commission”, and “attribute changes”. The current focus is placed on omission, while commission and attribute changes will be dealt with later. These change detection might eventually be provided to the OSM community. Asked by the community, it should help them synchronizing the OSM database with the latest CTI content or correcting less accurate OSM data. A statistical contributor’s assessment procedure should be put in place before any automated integration procedure be developed.

VGI Data integration uncertainties

The research and operational mapping communities faces a number of challenges. We identify some of VGI/NMAs data integration aspects where results from ongoing and future works are needed:

- VGI data characterization in regard of the nature of detected changes. Do omission, commission and attribute classes should be considered having the same weight when it is time to add, delete or modify an object in the database?
- Understanding VGI contributor's work evolution over time. Does the accuracy of a contributor's work increase or remains the same over time? If it evolves, how long does it takes before its accuracy stabilized, if it does?
- Understanding how local knowledge impacts VGI contributors’ work accuracy. Does the accuracy of a contributor stay the same when mapping specific features local to the contributor’s neighbourhood, compared to updating features located in an area far from it?
- Defining an interaction model for data exchange between the VGI community and the NMA of a country, as discussed in this paper.

References

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