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MAPPING PLACES FOR DIGITAL NATIVES AND OTHER GENERATIONS

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INTRODUCTION

Digital technologies impact our tasks and concerns related to the earth we inhabit, to places. They have also modified, across several generations, our capacities related to information management. In this context, a working seminar was organized by EuroSDR to explore what can be said, from national mapping agencies practices and from some literature, about the expectations of the new generations, the digital natives and the next ones, regarding maps of places: what maps do they need at all and how can these maps be produced.

For centuries, national mapping bodies have been missioned to define, produce and maintain, at the best cost, a precious common good for societies: shared abstractions of physical geography. Several abstractions are needed depending on users (human, machine) and on usages (communication, inventory, analysis). These are typically topographic maps, topographic databases, height models, gazetteers, land use land cover data, 3D models. Maps are used for visual reasoning to have an awareness of a territory beyond their mere perception, whereas databases are used to feed programs. This information support individual tasks, e.g. discovering what does a neighbor look like, but also collective tasks, – e.g. : to convince peers that there is no correlation between a urban tissue evolution and a regulation, to make commitments to funders and electors about the improvement of green space in a region, to participate to e-democracy debates related to a new building-. National map makers do not simply measure and draw what they see, they make different choices throughout a complex abstraction process to provide a representation homogeneous enough to be tractable –to be used by machines or to feed visual reasoning- and expressive enough to be faithful to the specificities of surveyed landscape. These languages differ across nations, even within Europe, dure to difference in physical space but also in cultures (Kent 2008)(Kent 2009)(Robinson et al. 1995)(Bucher et al. 2010).

Users have to learn these languages, to read without too much effort a topographic map. For a long time in many countries, most citizens got to learn to decode a national topographic map from their national mapping agency during their outdoor leisure or during military duty and hence to learn the national topographic language. This has changed for many reasons: the usage of new technologies to fulfil tasks that required map reading some years ago, but also what (Edsall 2007) refers to as "globalization and cartographic design".

This working seminar gathered 9 participants coming from France, Switzerland, Greece and Germany and with different backgrounds: practitioners at national mapping agencies or scientists with different backgrounds (geomatics, digital humanities, information science). The first part of this report exposes practical experiences of the French and Swiss national mapping agencies with digital natives. The second part presents perspectives brought by academics. The last part is a summary of discussions and a set of suggestions for future work.

1 Experiences of NMA

In France, two phenomena have urged the national mapping agency, IGN, to adopt a proactive approach towards new generations: the end of compulsory military service in France (since 1997) and the advent of GAFA and Apps. Lately, IGN ordered a survey about people usage of geographical information following their age and gender in France, between 2008 and 2017. It revealed that the most distinct trend in the younger generation was to use mobile device for mobility -instead of paper map, and instead of desktop based consultation

of web site-. Current strategy adopted by IGN to get visible from these generations is to propose smart apps.

A proactive approach to teach new generations to read maps was a partnership with the French ministry of education to provide geographical digital material for teachers. This partnership has led to the design of Edugéo, https://www.edugeo.fr/, a geoplatform integrated in the generic digital work environment of teachers, Eduthèque, http://www.edutheque.fr/accueil.html. It is free for classroom usage. Edugéo provides enhanced access to IGN data and maps as well as teaching material. Specific ressources are 'Zones pédagogiques' (pedagogic areas) which are areas of particular interest for teaching map reading.

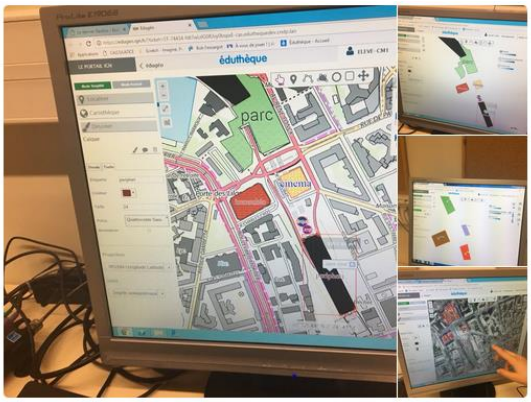

Figure 1: A pedagogic session using Edugeo platform from IGN: 'discover the place where I live', ©IGN

Besides, in order to be more visible from the new generations, IGN develops specific tools - Minecraft data sets, https://minecraft.ign.fr/-, and organizes specific events for young people -Escape game- and last has inaugurated more generally a new physical place, called Georoom.

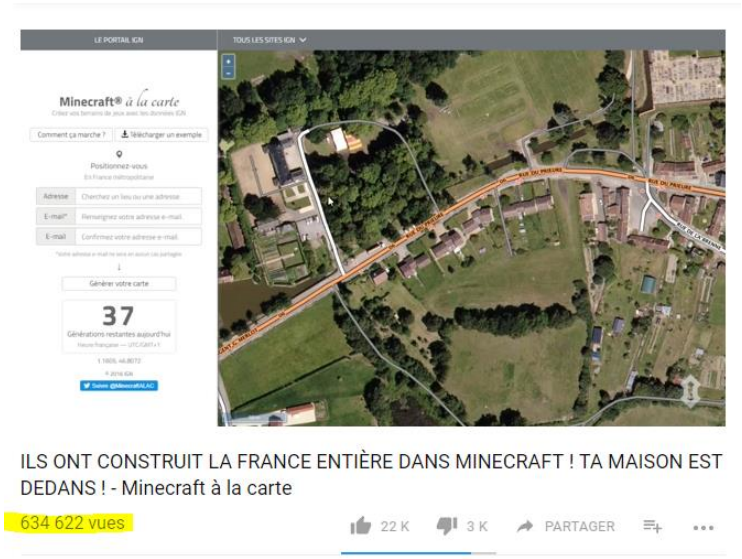

Figure 2: Minecraft 'à la carte' is a successful service to download French territory for Minecraft, © Cantat

In Switzerland, a specific signal of change was witnessed by the association of Swiss Alpine Club (SAC) with a decrease of participants using SwissTopo paper maps. This is not interpreted by SwissTopo as a lack of need for "maps" but rather as a need to reinvent maps and to embrace the other interface for the generation of knowledge based on geographical data, for example, augmented reality.

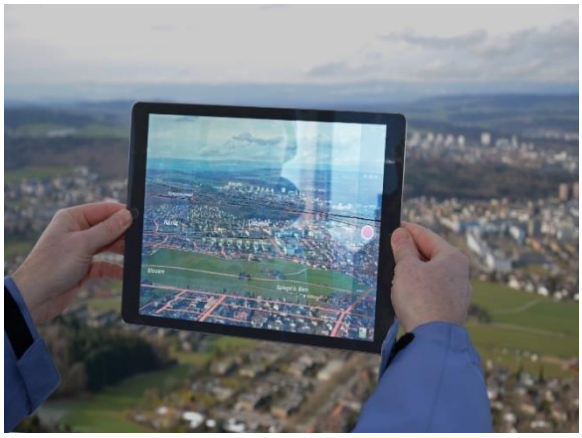

Figure 3: Augmented reality is a successful paradigm to browse map information, © Streilein

SwissTopo analyses current years as a golden age of geo-information; geo-information is accepted as a vital national infrastructure. The many changes with the new generations -and years- are : the technology change, the relation to time, the funding challenge. In this context, the need for a national body shifts towards the need for a national centre of expertise for geoinfo and georesources rather than a centre of production. Swisstopo has missioned external experts: to examine trends regarding usage and suitability of space-related information for observation and analysis; to identify the opportunities (and associated risks) that these trends will have in the use of this information; to make strategic recommendations

regarding the impact of the above on the data, production methodologies, services and resource capabilities on the organisation over the next 5-10 years.

The large amounts of digital data as well as the raise of machine learning are game changers in surveying and map making. Next generations will more and more need ‘maps’ useful to detect meaningful patterns in these data. Meaningfulness can only be estimated based on a predefine knowledge and theory. Future maps could support the connection to these theories.

2 Perspectives brought from science

2.1 Christoph Schlieder: Place models beyond territoriality

Research on place-based GIS studies geodata services, which present and represent the environment in forms that are close to the user's cognitive conceptualization of places. The talk contrasted space-based with place-based information processing tasks and discussed lessons learned from two application scenarios: geographic recommender systems for tourists and educational location-based games. In both scenarios, the spatial conceptualizations are epistemic in the sense that it matters not just, whether some place A is part of some other place B, but also that the social actors believe this to be the case. Such epistemic place models may help to get a better understanding of shared (or: non-territorial) uses of place-based resources.

Results and applications of place research

While traditional GIS represent space mainly by reference to physical properties, research on place-based or “palatial” GIS focuses on capturing the social construction of places. It emphasizes, for instance, geo-referencing by toponyms over spatial reference systems (Goodchild, 2011). Palatial GIS aims at supporting the qualitative methods of human geography more than the type of quantitative analysis offered by current GIS technology (Roche, 2015). The difference between the two perspectives is also one of data sources. Researchers on palatial GIS often study data extracted from social media that may give more weight to subjectivity and new clues for relevance. An example illustrating the contrast between the spatial and palatial perspective is the buffering operation. While a spatial buffer simply consists of a circular region around a reference point, a palatial buffer takes the geographic conceptualization of the reference point and its surroundings into account to determine, for instance, which cities are considered neighbours in texts published on web sites from Santa Barbara, CA (Gao, Janowicz, McKenzie, Li, 2013).

The study of place has been approached by considering specific spatial activities, which involve social interaction such as playing location-based games or recommending touristic places. Research on location-based games shows that knowledge about the places where players can play the game constitute a critical resource (Ahlqvist, Schlieder, 2018). Places of game play are not abundant since they have to satisfy a number of constraints such as being easy to reach by public transportation, permitting the access of players, and being sufficiently spacious to accommodate players without disrupting the daily routines of non-players. Part of the success of games such as Ingress or Pokémon GO is due to their effective place design by crowdsourcing.

Research on recommender systems for touristic places finds that the popularity of places varies considerably according to a power law (Schlieder, Matyas, 2009). A primary objective of recommendation consists in providing information, which helps tourists to find places that

although being less popular, are nevertheless of specific interest to them. Recommender systems base their results on different methods for determining the similarity of spatial choices (Bao et al., 2015). Data about spatial choices such as the personal preferences for places are crucial for any recommendation system and constitute a valuable economic resource.

Discussion on possible recommendations for NMA

In both application scenarios presented before, location-based games and tourist recommender systems, information about places constitute a valuable resource.

As far as location-based games are concerned, it would be interesting to identify potential places of game play from base data features. This does not necessarily mean to introduce a new feature type "playable place". However, it would definitively help game designers to have information about whether or not an open space is accessible to the public. Obviously, terrain models are important to location-based games as to other types of leisure activity. The same holds for features, which help players to identify landmarks such as the height and the colour of buildings.

Geographic recommender systems depend on data about individual spatial behaviour, which is gathered mainly by the companies that offer mobile operating systems (Google, Apple) or location-based services (e.g. Uber, Airbnb). It is difficult to see how NMA could become providers of that kind of data. However, there are data of interest to recommender services, which relate more closely to the expertise of NMA. An example are historical maps, another example are gazetteers of colloquial place names.

Gamification and recommending may also be considered under a NMA user perspective. Educational games, especially location-based ones that are played in the geographic environment, can help to learn how to use maps. Likewise, recommended services could guide non-expert users towards data matching their interest.

2.2 Marinos Kavouras: The new generation of spatial thinking citizens

What is common in tasks such as reading a map, finding your way in a shopping mall, interpreting a diagram, and understanding the spatial distribution of a phenomenon or the association of places and events? They are all tasks that rely on a mental skill called spatial or geospatial thinking. Spatial thinking has lately been acknowledged as an important ability both for sciences and everyday life. A 2006 report from the US National Research Council "Learning to Think Spatially: GIS as a Support System in the K-12 Curriculum" underlined that "without explicit attention to [spatial literacy], we cannot meet our responsibility for equipping the next generation of students for life and work in the 21st century". Spatial thinking is considered as a key ability for the STEM disciplines (Science, Technology, Engineering, and Mathematics). Research results stress the rewarding effects of developing geospatial skills in increasing the participation in STEM disciplines, lacking of which acts as a barrier for students leading them to dropout. This presentation outlines the major aspects and latest developments of spatial thinking in the digital era.

Results and applications of research on spatial thinking education

Inclusive education embraces the diversity of the world and recognizes that all children, regardless of ability, deserve equal educational opportunities. It is also proving to be an effective educational model which benefits all children. Spatial reasoning is well-suited to the needs of inclusive education. It provides a good basis for open-ended problem-solving

tasks and science inquiry activities. Thus, it can help maintain the interest of all students and foster collaboration in a diverse class, with multiple benefits.

Spatial thinking is defined as the cognitive ability to visualize and interpret location, position, distance, direction, relationships, movement, and change over space, in different situations and at different scales (Sinton et al, 2013). It is essential in science. (Geo)spatial thinking is related to, but wider in scope than spatial ability, the second being limited to the table-top scale.

The competence of spatial thinking, usage and interpretation of maps or other spatial tools is not self-evident for all. It is a dexterity which must be cultivated. Geospatial literacy can vary according to age, background knowledge, education, cultural and ethnic background, distinct living conditions and other factors. Special target groups may need appropriate knowledge components to enhance their geospatial skills, which will help them overcome susceptibility to poverty, social exclusion and dropout. Spatial skills can be improved through training and the improvements in cognitive spatial ability are durable. Training can bridge gender differences in geospatial literacy. It can also affect the choice of careers (e.g. STEM disciplines), which has been linked to performance on spatial skills tests.

Project GEOTHNK-"Semantic Pathways for Building a Spatially-Thinking Society" has aimed at developing an innovative, socially enabled learning platform for enhancing geospatial thinking skills. The project addresses a variety of target groups (students, teachers, science centre educators, adult learners), using an ICT-based approach and an open, collaborative educational environment which allows for the interdisciplinary organization and semantic linkage of knowledge. Users are supported in an inquiry-based learning experience, in which geospatial concepts and ideas are taught in a way that emphasizes their correlation and relevance. The project has been supported by the European Union through the Lifelong Learning Programme (2013-2015).

Project VISTE (2016-2019), builds upon the experience of GEOTHNK, with the aim of empowering the spatial thinking of primary and secondary school children with visual impairment (VI). For students with disabilities, such as VI, spatial thinking is an imperative skill for perceiving the world. The visually impaired face important challenges related to orientation and mobility, with implications for their personal and professional life and for their inclusion in society overall. ICT technologies and interactive maps have the potential to provide a broad spectrum of the population with spatial knowledge, irrespective of age, impairment, skill level and other factors. They can overcome the limitations of raised-line paper maps with Braille text, which had traditionally been proposed for the visually impaired.

VISTE project partners, representing different areas of expertise, are working together to develop strategies, educational components and an ICT toolkit toward effective spatial thinking of students with VI, facilitating inclusion. The project is co-funded by the European Union through the Erasmus+ programme.

Discussion

The discussion on mapping places for digital natives should not be based on the assumption that generations are discriminated as being digitally able or not. There are a variety of issues and differentiations to consider, apart from age.

Some issues of interest with regard to cartography and spatial thinking for digital natives, could be the following:

- Digital natives need dynamic maps, whereas in the past, maps had traditionally been static.
- Multimodal interfaces are the norm among digital natives. They are also highly useful in inclusive education.
- With digital media, the God's eye view traditionally used in cartography is being replaced by the ego-cantered views of individuals communicating in space; the new tools should be developed/ adjusted accordingly.
- Digital natives have a tendency to multitask; the design of application environments may need to take this tendency into account.
- They tend to use space based on common sense rather than rigorous scientific research – expert knowledge.
- Through gaming etc, they have been accustomed to cooperation – networking. This may be of use in designing spatial applications which support co-operation.
- With the advent of crowd sourcing, what the majority think to be the case becomes the dominant view: Così è (se vi pare) [It is so, (If you think so)].
- People, especially, children and teenagers, will do what it is "fun" to do. Gaming is of particular interest in spatial thinking education.
- Following the trend, contests, recognition, "likes" may be considered in order to enhance learners' motivation.
- Personalization has been a growing trend in several aspects of life, including mapping.

2.3 Marta Severo: Social media for mapping places: from VGI to the check-in

New technologies, and notably social media, have profoundly changed the relationship of young people to maps. On the one hand, through applications such as Google Maps and Waze, but also through recommendation platforms such as TripAdvisor or Foursquare, maps become everyday tools that facilitate the orientation in the geographical space and the identification of good addresses. On the other hand, Digital Natives are more conscious of their location and of the link to places thanks to the success of the "check-in", that is to say the public declaration of the position on Facebook, Instagram or Twitter. New communication platforms are proposing to young people new approaches to mapping. In this digital era, social networks can be seen as 'cool' digital places. Social network relate to physical geography in the sense that an important aspect of space is the affordances of social network.

3 Wrap up and perspectives

As a summary, the raise of digital technologies in our societies leads to new challenges and opportunities in the domain of mapping places for and with our society.

In education for instance, digital technologies are opportunities to design new pedagogic material, to integrate game patterns to motivate the students -or the learner more generally-. This opens important perspectives in inclusive education that is a challenge of our societies. Video games like Minecraft are technologies that can be considered to design new pedagogic materials. Digital technologies also present challenges for education: to teach the required

skills to interpret correctly an abstract representation, to learn how to select the best data or map for a given task.

Places are social constructions somehow related to physical features. There exist today more and more data about the social aspects of places; these place-related data are not provided by national mapping agencies but rather by social network of communication operators. As places become an important asset, for example to design some games (like Pokemon go) or to make recommendations based on place similarities, national mapping agencies could investigate what data they hold are much relevant to mapping places as social constructions, especially among their gazetteer data and historical data.

Last, maps are a strong metaphor to handle the complexity and support serendipity; national mapping agencies could study the design of maps to support the detection of meaningful signals among the big data. This can only be done by collaborating with scientists working on theories of space, starting with geographers.

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