

## DOES NEOGEOGRAPHY NEED DESIGNED MAPS?

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**ABSTRACT:** Web 2.0 technology enables virtually everyone to create, share and visualize (geographic) information online. Recently, these activities have resulted in a rapid growth of geographic information (GI). This GI is known as User-Generated Geo-Content (UGGC). The activities are collectively known as neogeography and the output can be termed as neogeography map. Neogeography maps involve techniques which fall outside the established mapping processes. They have some potential application areas but the question of credibility and quality remains. This question is valid partly due to lack of poor cartographic design. The study explores if cartographic design can improve the neogeography maps.

**KEYWORDS:** User-Generated Geo-Content (UGGC), Neogeography, Cartographic Design, Cartography, Credibility & Quality

### BACKGROUND AND OBJECTIVES

Over the last few years, the notion of web 2.0 has greatly influenced the way of making use of (geographic) information. Web 2.0 is re-conceptualization of the conventional web to new web services that facilitate interactivity and two-way communication. These dynamic features of the new web enable the creation of user-generated content (UGC). UGC refers to different kinds of contents (text, photo, video, etc.) that are generated and displayed by users. UGC which has ‘geo’ component can be termed as user-generated geo-content (UGGC) (Das 2010). The domain where users make use of geographic information (GI) using web 2.0 applications is known as neogeography and the associated products can be displayed as neogeography map. For instance, Wikimapia, OpenStreetMap (OSM) are few of the best-known examples where users contribute GI with varying scale and type. These applications allow users to create their own maps or contribute to GI by tagging any kind of information based on location (and time). It indicates a major development in the field of GIScience. Because neogeography is offering a new way of exploiting GI that is much cheaper and faster process when compare to established processes of handling GI. However effectiveness of using this GI for applications of real-world problem is merely unknown. As a consequence, opportunities of exploiting GI through neogeography maps have posed challenges for their use in professional applications.

Neogeography has sufficient potentiality to consider it as a valuable alternative and supplementary source of GI. UGGC is easy to create and can deliver huge amount of GI much faster compared with the formal way. UGGC is often displayed on top of a base layer that could be provided by Google, Microsoft, or Yahoo. These so called mashups can be considered as neogeography maps. However, neogeography maps involve a process that lacks established methods of cartographic design. This and the fact that UGGC is mostly collected by non-experts gives it the label – ‘informal data’. In case of ‘formal data’, experts are engaged in collecting and processing following established methods.

The informal aspect of data raises the question of credibility and quality of neogeography maps. Since there is no control and professional involvement, their credibility and quality are not assessed.



Fig.-1: Neogeography maps (Google Maps with tagged photos, Bing Maps with POI & Berkshire Flood Map with locations of flood reported areas, from L to R)

As can be seen in the examples in fig.-1, neogeography maps are mostly disorganized and cluttered making it difficult to interpret or to derive meaningful information from them. In this paper, the authors focus on poor cartographic design of most neogeography maps.

The objective is to apply cartographic design to neogeography maps. The work considers one neogeography map for the case study to provide an impression that neogeography maps need cartographic design for improvement.

After the emergence of web 2.0, the phenomenon of what is called neogeography in this paper led to a new and sometimes confusing terminology. Different terms are used for the same activities or phenomena and similar terms are used for different activities or phenomena. Although the paper does not attempt to formulate a lexicon for all those terms, an attempt is made to explain them.

According to Maguire (2007), the term 'neogeography' was coined (in 2006) by Di-Ann Eisner to describe the so called 'new' geography. Later, Turner (2006) defined it as: "Essentially, neogeography is about people using and creating their own maps, on their own terms and by combining elements of an existing toolset.". Researchers (Haden 2008; Jobst and Döllner 2008) have raised the issue whether to use the term 'neocartography' instead of 'neogeography'. Some researchers have described neogeography following the Turner's definition. Others have used alternative terms to describe neogeography activities, as for example, web mapping 2.0 (Haklay, Singleton et al. 2008), GeoWeb 2.0 (Maguire 2008) and Volunteered Geographic Information (VGI) (Goodchild 2007a). Goodchild argues that humans, acting as sensors, are motivated to contribute GI voluntarily. He also compares VGI with citizen science by which citizen provides information voluntarily. However, (Hacklay 2010) considers a specific sub-type of citizen science - 'Geographical Citizen Science', where the location is attached to the collected information. Seeger (2008) has conceptualized a specific type of VGI (facilitated-VGI) in response to a predefined set of criteria such as an explicitly defined question or limited to a specific area.

For the paper, the authors use the term 'neogeography'. Any kind of content that is created by users within neogeography is termed as user-generated geo-content (UGGC). Those contents can be anything from textual attributes and media (audio, video, Photo etc.) with location information to geographic features. When UGGC is displayed on top of base layer(s) (satellite images/ maps from Google, Yahoo, OSM etc.) is termed as neogeography map. User who makes and uses neogeography maps are termed as neogeographer.

#### **APPLICATIONS OF NEOGEOGRAPHY**

UGGC will have great impacts on GI Science. This is illustrated by the following applications:

a) The collection of UGGC can be considered as a global patchwork of valuable data (Goodchild 2007a; Elwood 2008b) of any kind with space and time as glue. This patchwork can serve as an alternative option for GI. Some scientists (Goodchild 2007b; Maguire 2008; Goodchild 2008a) have proposed that the concept of spatial data infrastructure (SDI) can accommodate the model of UGGC. Budhathoki, Bruce et al. (2008) have proposed 'hybrid SDI' model that can tap neogeographers. This synergy between SDI and UGGC can strengthen each other.

b) UGGC has adequate scope of being used in processes such as environmental monitoring (Gouveia 2007; Elwood 2008b). Gouveia (2007) has illustrated the use of citizen's contribution using two case studies for environmental monitoring. One to detect chlorine flavours in tap water, and one to detect odours of paper pulp mill. Gouveia and Fonseca (2008) have illustrated two additional cases, first to quantify noise from city traffic and second to use photographs to communicate beach quality issues. The results from these case studies confirmed that citizen's contributed information has potentials for environmental monitoring. Despite the issues of quality and credibility, the application of UGGC in environmental monitoring can not be ignored (Gouveia and Fonseca 2008).

c) Citizen Science is another way of acquiring volunteered information. It facilitates common citizen to provide any type of observational information with prior training on the subjects to ensure quality of the output (Goodchild 2008a). An example is the vernal pools project, conducted by DEP and Rutgers University, where citizens were engaging to survey and map all the vernal pools in New Jersey, USA with prior specialized training (Tulloch 2008).

d) Recently, there has been growing importance of using GI to disseminate information for emergency or early warning purposes (Goodchild 2007a). GI from traditional mapping agencies is not always free and might have restrictions. In the aftermath of two events in 2005, Hurricane Katrina in USA and Pakistan Earthquake, Google Earth was used to supply images for support (Nourbakhsh, Sargent et al. 2006) by "online disaster response community" (Laituri and Kodrich 2008). Similarly, 'Disaster Mapping 2.0', a project conducted by ITC, The Netherlands, has proved that neogeography helps to post disaster mapping

(Köbben, Maiyo et al. 2009). Recently, in the post-disaster period of Haiti Earthquake (January 2010) and Pakistan Flood (July 2010), Google together with satellite image companies and other sources provided images and related information. In addition people contributed local information which all together helped for damage assessment and rescue operation.

In some of above examples, formal data from National Mapping Agencies (NMAs) was augmented with UGGC. However, it is important to note that different types of NMAs acquire formal data which can be broadly divided into two types- basic geo-referenced topographic data and additional thematic data. Topographic data is acquired with high geomatic accuracy by trained professionals. Thematic data is produced by geoscientist where topographic data is used for registration and as base data. It is second category where neogeography can potentially be successfully used as an additional source.

To support neogeography activities, several tools have been developed. However, it is difficult to say if those tools can be easily used by neogeographers without expertise. Most of them are still to be considered as semi-professional. As for example, GMap Creator and MapTube by CASA, UCL (Hudson-Smith, Crooks et al. 2009) are built to enable choropleth map to be integrated with Google map. GMap creator allows creating a layer from any shapefile which can be overlaid on top of Google map. Those layers can be visualized using MapTube geoportal. It allows user to manipulate multiple layers by few embedded tools. However, it is still questionable if those tools can be exploited for improvement of neogeography maps by non-experts.

A part of UGGC is personal geotagged data such as videos and photos. Other tools can deal with such geotagged data. They can be visualized as placegram for improvement (Jo and Ryu 2009). Kraak (2009) has suggested personal geotagged data can be visualized using Space-Time-Cube (STC) assuming that the data collected is linked to a trajectory followed by an individual. Similarly, Keim et al. (2008) and Andrienko et al. (2008) have suggested to implement a combination of visualization techniques (visual analytics tools) for large and complex movement data.

However, some tools might help users to create improved neogeography maps. As for example, GeoCommons enables everyone to create rich interactive visualizations to solve problems without any experience using traditional mapping tools (Batty, Hudson-Smith et al. 2010). Users can either use GeoCommons data or their own data for those purposes.

### Neogeography Map - Uses and Users

A neogeography map is based on Map mash-up technology. It combines online maps with UGGC data. Neogeography maps are constructed using two types of layers, a base layer and top layer. The base layer holds the raster base maps containing images, maps or both with toggling facility. Those base maps are provided by several organisations such as Google maps, Microsoft Bing. Also a web 2.0 mapping sites such as OpenStreetMap (OSM) can act as base layer. The top layers contain the UGGC. This can be data from different sources. However, both layers have their problems.

The base layer comprising base maps are not always of good quality. They are sometimes of low resolution or patchy images or maps with incomplete information. Some restricted areas might have black patches to hide the areas. Handling this problem is beyond of this research work. The top layer can contain useful thematic information but of a questionable credibility and quality.

How are neogeography maps used and who are these users? Some users collect positional data of objects and display them on top of base maps. For example, a user can create a map showing all fitness centers in Enschede. Here the user wants to 'present' the collected data on a map. Other users might use the same map to explore the nearest fitness center to their home. Both kinds of maps use – present and explore – might require different kinds of designs (see fig. - 2).

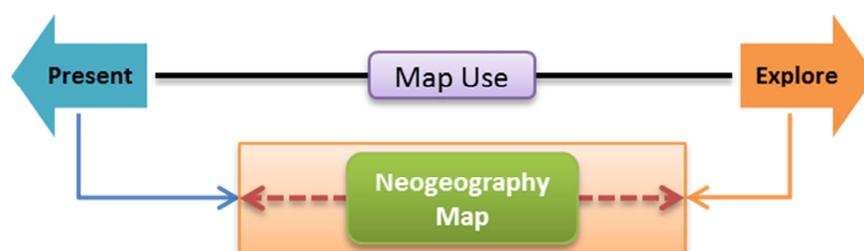


Fig. - 2: Relationship between types of map use and neogeography map

### CASE STUDY

To illustrate the above reasoning a case study of the Pakistan 2010 flood map is described (fig.-3). The map shows the locations of country-wide hospital facilities. Each location has detailed attributes (pops up

by clicking on symbols) regarding the available facilities such as number of available beds and total beds, type of facility, address. The map has 1136 records of hospitals having 30 attributes and displayed on top of Google maps. However, it is noticed that the attributes have no records in few cases. This map was created to assist both crisis responders and victims after the flood. In its presentation mode it only shows the hospital capacity in the country. The case study is used to check if the map needs design improvements when the users want to 'explore' the map.

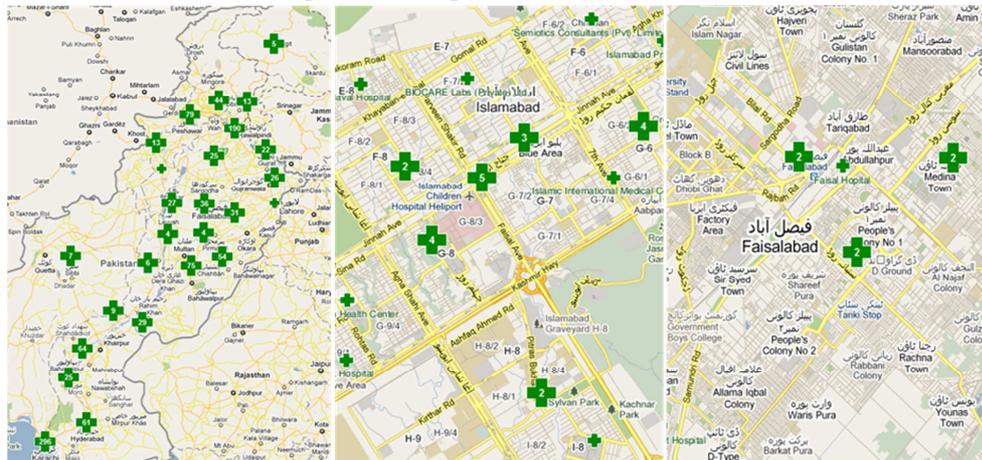


Fig.- 3: Pakistan flood map (Overview, Zoom into Islamabad, Zoom into Faisalabad, L to R)

The effectiveness of map mostly depends on their cartographic design. This is valid for neogeography maps as well. The cartographic design involves a process of analyzing the data to be mapped in order to be able to select the appropriate graphic variables, symbolization, typography etc. Most neogeography maps do not seem to 'worry' about cartographic design rules and use the symbols available via the mash-up software. Users don't care about the type of data, being qualitative or quantitative, they just want to map. This is typical for neogeography maps. It is not only because that users are unaware of the design rules, but because that they probably don't know what cartographic design can bring to these maps. Even though they might realize that the neogeography maps could be improved but they have no idea for what purposes and how to improve them.

Neogeography map of the Pakistan flood is considered for the use case 'exploration'. It is assumed that users want to analyze the map to get some meaningful information that would assist in crisis response.

Questions the map should be able to answer are:

- Which hospital has higher number of available beds?
- Which option should be used to show available beds?
- Which hospital has higher number of bed occupancy?

To introduce exploratory functionality the dataset has been converted to be used in GeoCommons (GC). The imported data has been displayed as maps. GC allows anyone to design the map in many different ways for different purposes such as reference map (simple point symbols), visual theme (classified point symbols based on attributes) and data analysis. These terms are used by GC and might not match with existing definitions of those terms in Cartography.

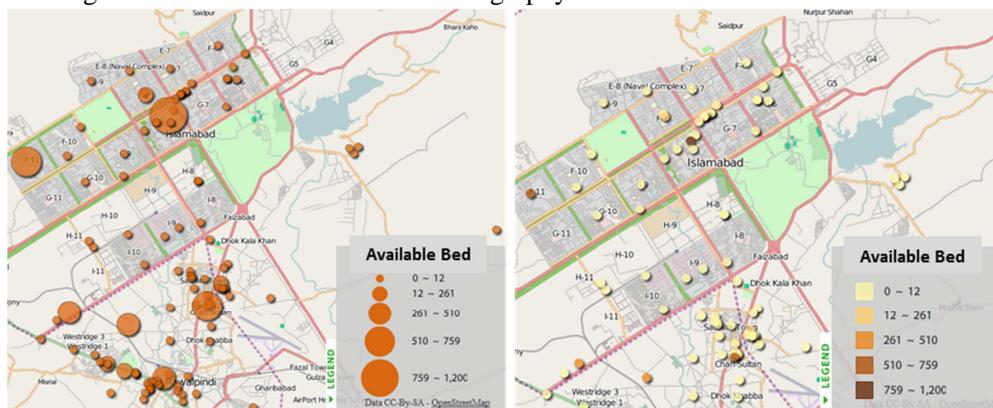


Fig. - 4: Map showing the available beds: Left with proportional point symbol and Right with value colour scale

Maps with proportionate point symbol (fig. - 4, left) and graduated colour point symbol (fig. - 4, right) were created using 'visual theme' option to show the available beds. Bed occupancy is displayed (fig. - 5) using the 'data analysis' option (after subtracting the available bed from total bed).

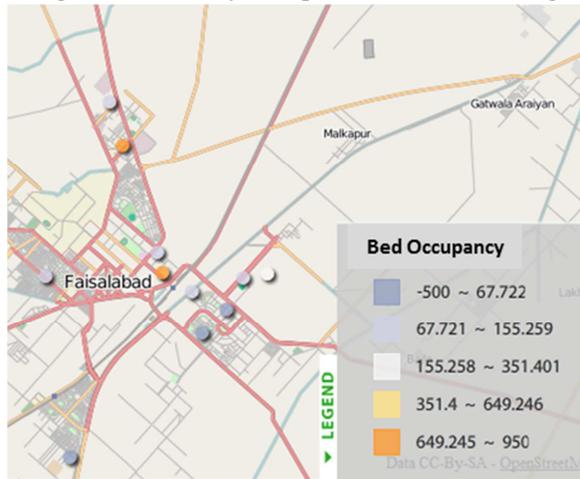


Fig. - 5: Map showing bed occupancy in hospitals

## RESULTS & DISCUSSION

Cartographic design using GC results in a set of maps. The dataset (hospitals in Pakistan) has been displayed following the 'visual theme' option. This option allows users to classify the map based on an attribute, for instance, available beds. This technique was used to create two maps portraying the location of hospitals categorized by available beds. These two maps consider both proportionate symbol (fig.-4, left) and graduated color (fig.-4, right). In map (fig.-4, left), number of available beds increase proportionately with increasing the size of point symbols. However, this map has overlapped symbols. If one want to avoid this, it is possible to use a graduated colour scale on symbols of equal size (fig. -4, right). Now if these two maps are compared against the source neogeography map (from where the dataset has been imported, fig.-3), it is now clear that the neogeography map after basic cartographic design has been improved for pre-defined purposes. However, by browsing the attribute table and clicking on the point symbols, users get the information about the available beds. But users don't get any impression about the spatial pattern showing how numbers of available beds are spatially distributed. Another design is used to display the number of bed occupancy (by subtracting number of available beds from that of total beds) (fig.- 5). This type of exploratory task was not possible on the source neogeography map (fig.-3).

## CONCLUSION & FUTURE PLANS

Neogeography offers geographic information that can alternatively be used in wide-range applications. Some potential applications are discussed. Due to its nature the neogeography applications seem to be chaotic and as a consequence, the use of neogeography in real-world problem scenario is taking of slowly, but promising, especially in the disaster oriented examples.

Neogeography maps have known design problems and an unknown level of credibility and quality. Several tools have been developed for the mapping, but they are built to meet specific tasks and often require knowledge in mapping processes. Thus they are mostly considered as semi-professional online mapping tools.

This work is a first attempt to prove that cartographic design can improve neogeography maps. This was illustrated with GC, software that is easy to use without little cartographic knowledge. However a good design does not solve the credibility and quality issue of neogeography data.

These issues are associated with the data collection process. If we know more about how neogeographers collect the data and what they require to display them on maps, it would be possible to include this aspect in the map design. In future, the authors plan to study the credibility and quality of collected data in order to include a kind of their metadata in design processes. Discussions are currently organized with neogeographers to come forward with user's requirements in neogeography maps with the objective to get better designed neogeography that met user needs.

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