Beyond the Blandscape: Utilizing Aesthetics in Digital Cartography

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Abstract

Despite the rich design history within the field of cartography, the majority of digital maps exhibit a dominant aesthetic that is primarily designed to serve the usability and utility requirements of turn-by-turn urban navigation producing a so-called 'blandscape' of map design. In this research we consider not only how to produce more visually appealing digital maps, but also how the cartographic decisions made in the production of maps can influence behavior, particularly with regard to the encouragement of explorative experiences. Novel cartographic and technological solutions are therefore presented, which address exploration using digital maps in the context of location based gaming and tourism. These examples demonstrate the potential of digital cartography to influence behavior and the importance of aesthetics in the cartographic process.

Author Keywords

Cartography, Digital maps, aesthetics, navigation, exploration.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Digital Cartography

Modern digital cartography is an activity that requires an appreciation of art, science and technology in order to be effective [4].

Whilst a lot of science goes into map-making (digital tools, algorithms, projections, colour spaces etc.), it is design that remains, "the most fundamental, challenging, and creative aspect of the cartographic process" [8].

Introduction

Digital maps take advantage of the fact that the technology for obtaining accurate spatial information, such as GPS receivers and magnetometers (digital compasses) are now so widespread that they are considered as 'standard' sensors on our now ubiquitous mobile phones. Whilst tools such as Google Maps make it simple to create digital maps that are integrated with these sensors, they provide very little scope for aesthetic customization beyond the simple re-coloring of map features. The production of bespoke digital maps therefore still typically requires a great deal of expertise and financial investment.

Cartography has developed an understanding that radically different maps are needed to perform different tasks [1]. It is not surprising, therefore, that many cartographers have lamented the rise of these commercial mapping tools, which come with predefined projection, scale, typography, color and symbology [3]. It is argued that predefined digital maps are creating a global "blandscape" and a sense of "unauthoredness" thorough the lack of detail and apparent "homogenization" of the landscape [6]. Further, its is not only different tasks that require different maps but it may also be argued that in some cases different people may require different maps to perform the same task, as the cognitive models of our environment can vary significantly between individuals [7]. This has led for calls for greater personalization within cartography which digital maps should readily be able to afford.

The personalization of digital maps has predominantly been explored in HCI with respect to increasing their usability, efficiency, and clarity relative to the task being performed [1]. This type of personalization can be achieved either directly by the user through preference selection, or algorithmically through the device to either increase efficiency, by removing information unnecessary to the users current task, or to provide recommendations of possible points of interest (POI) based on users previous behaviors [1].

Whilst this aspect of map personalization produces useful results, it largely ignores the role of the aesthetic and its potential to affect user behavior. The aesthetic qualities of a map must be considered to be of equal, if not greater importance to the cartographer. This is supported by Wright [9], who suggests that: whilst a beautiful map based upon miscalculated, poorly measured or otherwise incorrect data may be considered to be of little utility; an ugly or unclear map, however accurate, is unlikely to inspire the confidence of the map-reader, and as such is also limited in its utility. We would also argue that the focus upon efficiency and utility of maps promotes user dependence on the map itself [2] and does not facilitate exploration or serendipitous discovery with the actual physical landscape. In this research, we therefore explore both how digital map aesthetics can be optimized for given purposes and how these aesthetic decisions can alter the experience and even behavior of users.

Map Aesthetics: Feature Abstraction

Map design revolves around the need to satisfy a particular communication goal [3] relative to a given task. For commercial mapping services such as Google Maps, this goal is primarily to act as a road atlas. It is arguably inappropriate, therefore, that these maps are often used for a wide range of purposes without due attention being paid to the suitability of the map for the

task at hand. For example, many traditional paper tourist maps represent selected POI around a city but frequently sacrifice scale and completeness in favor of adopting a visual style that matches the image of the city they are trying to portray (e.g. an historic city), and focus upon the features of the city which would be of interest to tourists (e.g. museums).
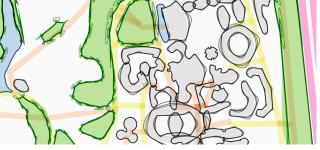

Figure 1. Sketchy Style Map.

Figure 2. PAC-MAN Style Map.

In order to examine the potential of cartography in influencing behavior, a series of maps were produced

Figure 3. Basic Anti Glare Map

for use in a PAC-MAN inspired location-based game, with the primary design-goal being to use the map aesthetics to encourage players to navigate 'head-up' rather than 'head-down' during gameplay. The game simply required players to navigate between physical objects (NFC tags attached to lamp-posts) and 'tag' them with their mobile handset using a bespoke Android application. A series of 4 maps were designed to achieve the previously mentioned design goal, with players being required to tag 5 objects using each map, allowing them the evaluate each of the maps against the specified design goal [2,5].

Two of the maps used are shown in Figures 1 and 2. They were created using data derived from OpenStreetMap[1] using PostGIS[2] and are rendered on-demand into 256x256 pixel 'tiles' using Mapnik[3] [5]. Both maps use different approaches to represent the features (buildings, roads etc.) on the map in a more abstract manner, in order to discourage over-reliance upon the map by users, and so promote 'head-up' navigation, whereby users will look up from the screen, and engage more with their surroundings. The results of trialing the maps concluded that Figure 2 was universally preferred by the participants and was also the most suitable of the maps for the promotion of 'head-up' navigation in the game. The combination of the PAC-MAN gaming aesthetic and moderate feature abstraction promoted the game play whilst encouraging the player to validate what they saw on the map against the physical landscape. This result is interesting

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[1] //www.openstreetmap.org/

[2] //postgis.net/

[3] //mapnik.org/

if viewed from a purely utility and efficiency perspective which would clearly favour the map in Figure 3, which was designed for clarity and to minimize screen-glare during gameplay.

Map Aesthetics: Visual Hierarchy

Previous research has demonstrated that map design can have a significant effect on route selection, and that the visual hierarchy of roads and footpaths is one of the primary influencers [4].
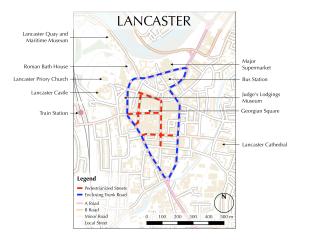

Figure 4. A map of the city centre of Lancaster UK[4].

In this part of the research we present a novel Android application called 'Paths of Desire', which unlike traditional digital maps has a cartography that can be dynamically adjusted in real-time, modifying the visual hierarchies of paths (including roads, footpaths etc.)

and POI in order to try to encourage visitors explore the city. It is intended that the varying visual hierarchies will encourage users away from main routes and motivate exploration of areas that would otherwise be ignored.

Experimentation using this design aim has focused upon the city of Lancaster in the United Kingdom, which is a small historic city in the North West of England. Lancaster is dominated by a main pedestrianised street that runs through the town center and a circular trunk road that encloses the town center. Both of these features significantly influence the flow of traffic and pedestrians as they move through the city. These are shown in Figure 4, along with the major points of interest and other often overlooked tourist attractions.

Lancaster City Council has been actively engaged in attempts to attract both residents and visitors to these places through outdoor art exhibitions, music festivals, and new street furniture. Whilst these efforts have had some effect, they have not addressed the use of digital maps, which is the dominant way in which new visitors are likely to explore the city. This research seeks to address this omission, and determine the extent to which novel digital map design can be used to promote tourism in these under-visited areas of the city.

The map design used in the application is defined by an XML style-sheet that is downloaded from a server at launch. This allows for dynamic updates of the style-sheet without the need to push updates of the application to users devices.
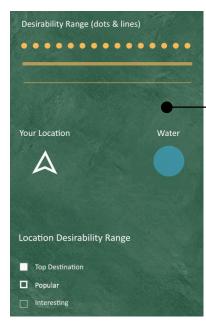

Figure 5. Paths of Desire Style Sheet.

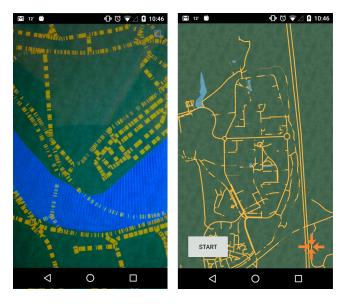**Figure 6.** Paths of Desire Style Screenshots

The initial map style guide was designed by the Manchester-based digital design agency Magnetic North[5], and is shown in Figure 5.

The paths and POI are both supported by a 3-level visual hierarchy based upon definitions under the control of the map designers. For example this could be based on predefined values to promote particular routes and POI, or done in real-time by monitoring how many users of the application had opted for a particular route i.e. with features classified as 1 (least visitors) could be given hierarchical prominence).The screenshot on the left of Figure 6 is an early attempt to recreate the dots of style sheet which were not possible using the current software. It was decided these squares did not readily indicate the hierarchy so in the current version of the application three different line weights were used as shown on the right of figure 6.

Conclusions

There is little doubt that widespread availability of digital maps through mobile phones has significantly increased our use of maps over time. However, these maps are provided by a small number of commercial providers and exhibit limited opportunities for customization. This has resulted in the creation of a perceived 'blandscape', in which the traditional purpose-driven cartographic design process has taken a back seat to the application of recognizable commercial color-schemes. This comes at a time when modern digital mapping technologies and the ubiquity of digital maps on personal devices have created an unprecedented potential for cartographic and approaches to affecting human behavior.

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[5] //thisismn.com/

Whilst there have been calls for greater personalization of digital maps the resulting solutions have been directed at usability, efficiency, and clarity relative to the task being performed. In this research we have considered an alternative view whereby the aesthetics of maps are can be used to affect the user experience in relation to exploration and serendipity. Firstly, we have presented research that uses abstraction of features on the digital map in order to encourage 'head-up' rather than 'head-down' use of digital maps on mobile phones, thus promoting users' engagement with their physical surroundings. Secondly we have presented a system capable of producing digital maps in which the hierarchy of POI and roads and paths can be adjusted in real-time, with the aim of exploiting the known impact of map design upon behavior in order to encourage users to explore their environment.

The next stage of the research is to trial the Paths of Desire application with visitors to Lancaster using different hierarchies to more fully ascertain the affect on user exploration of the city. Ultimately the intention is to explore dynamic hierarchy modification in real-time to see how users react to a map that hierarchy changes during operation.

Overall we believe that rich history of cartographic design has yet to be adequately addressed in relation to the aesthetics of digital maps and this research highlights the exciting prospect of changing users perception and behavior within physical space through the choice of the aesthetics within the overall design.

Acknowledgements

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