Exploring Deep Mapping Concepts: Crosthwaite's Map and West's Picturesque Stations

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Abstract What are the requirements for building a historic deep map using literary data? This is the question we sought to address as part of an exploratory prototype in Lancaster Universitys *Geospatial Innovation in the Digital Humanities: A Deep Map of the English Lake District* project. We created a prototype deep map based on Thomas Wests *A guide to the Lakes*, and a historic map of Derwent Water Lake created by Peter Crosthwaite. Our prototype maps the locations of Wests picturesque viewing stations and creates connections between the literary work and visual representations of the places described. This article describes our approach to building this prototype and discusses what we learned and the issues we revealed about creating a historic deep map.

1 Introduction

This article looks to discuss our investigation into the requirements for and construction of historic deep mapping applications. As part of Lancaster University's *Geospatial Innovation in the Digital Humanities: A Deep Map of the English Lake District* project, we wanted to explore the concept of a Deep Map in a more limited scope, to allow for a discussion of the included elements and features, and evaluate their effectiveness. We chose to focus on a single historic map of Derwent Water Lake in the Lake District, created by Peter Crosthwaite in 1783. Crosthwaite's map depicts his representation of Thomas Wests Viewing Stations around Derwent Wa-

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ter. The West stations are picturesque locations in the environment that West visited during his travels.

The prototype our team developed focuses on two concepts that have been included in various definitions of deep mapping. The first is a common concept that appears frequently in the discussion of spatial humanities, space vs place, or a chorography [11]. A traditional map is generally a representation of space, while a deep map, under this definition, should be a representation of place [9]. The second deep mapping concept we chose to focus on is the 'open-ended exploration of a particular place' [10]. Each place represented in our prototype is intended to provide users with the ability to explore the available data pertaining to that place. Our prototype uses these concepts to explore the places identified in Crosthwaite and West's works. This exploration of, and focus on place, makes our prototype an exemplar application of deep mapping.

2 Crosthwaite's Map

The English Lake District is renowned for its literary and artistic history. It is famously a place of poetry and of painting. Crucially, though, it is also a place of maps. True, the region was among the last portions of England to be mapped in the first Ordnance Survey. But the belatedness of the Lakeland's inclusion in the OS is significantly counterbalanced by its rich cartographic history. By the time the first OS maps of Cumberland appeared (in the 1860s), the Lake District was doubtlessly one of the most frequently and widely represented regions in Britain. Admittedly, many of these representations took the form of scenic pictures and verbal descriptions. Many, however, also took the form of maps, plans, and topographical diagrams. Among these maps, plans, and diagrams, few stand out as prominently as Peter Crosthwaite's 'Accurate Maps' of the Lakeland's eponymous lakes.

A native of the parish of Crosthwaite, near Keswick, Peter Crosthwaite (1735-1808) had an exceptionally colourful career. As a master of a gunboat called the Otter, he spent his early adulthood protecting East India Company ships from pirates in the Bay of Bengal. Following his return to England in 1765, Crosthwaite opened a new chapter of his life working as a customs officer on the coast of Northumberland. Then in 1779 he returned to Keswick as a respectable man, married with two children [6]. The year after, he took a house in the Square and quickly set up shop as a purveyor of publications, amusements, and paraphernalia for tourists.

Of all Crosthwaite's business ventures, however, it is his pursuits as a cartographer that are of principal significance. In part, this is because of the peculiar mixed-media character of his maps (which we discuss below); in part, though, this is because his maps were the first designed specifically for Lakeland tourists. Whereas some of the early accounts of the Lakes region included cartographical plans, none of the early guide or tour books did. Even Thomas Wests widely cited and celebrated Guide to the Lakes (1778) did not include a map until the publication of its third edition in 1784 the year after Crosthwaite began publishing his own 'Accurate Maps' of several of the region's key lakes. In this way, Crosthwaite's maps can be

seen to complement other aspects of his entrepreneurial enterprises: they rushed to fill a gap in the region's developing tourist trade.

Crosthwaite's 'Accurate Maps' were produced between 1783 and 1794, and thereafter revised and reproduced until 1819. Crosthwaite completed his maps of Derwent Water, Windermere, Ullswater, and Pocklington's Island (in Derwent Water) in 1783. He enlarged this series in 1785 and 1788 with his maps of Bassenthwaite and Coniston Water. Finally, in 1794, he completed his series with a map of the western Lakes, which includes Buttermere, Crummock Water, and Loweswater. Meticulously surveyed and packed with detail, these maps are exquisite productions, and nearly all of them (save those of Windermere and Pocklington's Island) are drawn on the scale of 3 inches to the mile. All of them, moreover, are designed to be handheld; on average, they measure 18 inches by 8.5 inches.

These maps, after all, offered much more than information about the locations of places, roads, and routes. They were miniature compendia of topographical and picturesque detail. In addition to marking the principle landmarks, houses, and estates (as well as the names of their owners), Crosthwaite's maps featured vignettes of those landmarks, houses, and estates, as well as passages of descriptive poetry and prose. Beyond this, they also featured the locations of the viewing stations designated by Thomas Wests Guide as those places where the Lakes scenery could be seen to its best advantage. Crosthwaite's creations could therefore be considered as prototype deep maps of their day, and so we considered them to be an excellent first case study in our own exploration of this so far ill-defined concept.

Julia Carlson has recently remarked on this curious 'convergence of cartographic and poetic innovation' [4, p. 44]. Crosthwaite's maps, explains Carlson, 'were a new form of print text intended to facilitate a new form of experience [...]. They encouraged physical exploration and demanded the interpretation of intersecting modes of measur[ing]' geometrical, pictorial, and literary [4, p. 44]. These composite creations, in short, combined different illustrative media not only to guide the tourist to key locations, but also to inform the tourists feelings about those locations. These maps were tools for instructing not only the eye, but also the mind and the heart.

3 Deep Mapping in the Humanities

Many of the prototype deep map applications discussed in academic papers, including this one, have been primarily map based, focusing on the spatial distribution of data and providing some form of navigation for users to interact with the map and explore the data. A prototype, using Google maps to spatially place data and a content bar to allow users to view details about visible sites, is a good example of the basic implementation of a deep map, because it can provide information to a user that can transform a space into a place. The creators of this implementation of a deep map put the most 'emphasis on one particular user interaction: exploration' [10].

A study using data from Greek Orthodox churches in Indianapolis created a deep map that focused on the 'spatial navigation' of data, rather than the spatial distribu-

tion of data. Instead of placing all the data they had available into a map, this team create a Prezi project and placed their evidence into the canvas of the presentation. This structure allows the data to be spatially navigable be viewers of the presentation, but the data does not need to be associated with any geographic coordinate systems. The presentation was also given a storyline so users could be lead through the data in a more curated manor, but users still have the freedom to explore and deviate from the storyline if they want [9]. The Prezi project shows a more abstract view of what a deep map could be.
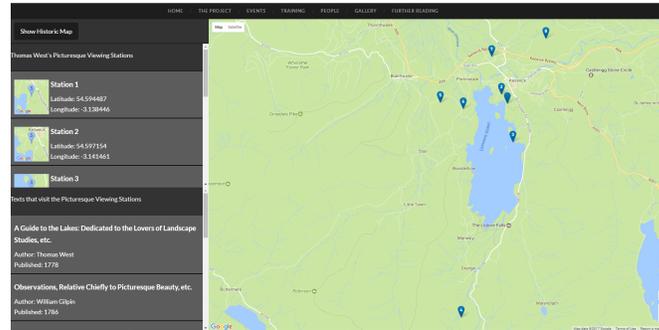

Fig. 1 Main page, with markers representing the West station locations on the map. Navigation: contains toggle to historic map, and lists of stations and texts.

4 Methodology

We wanted to bring the Crosthwaite Derwent Water map [2], the concept of Wests stations [12], and a selection of texts, by other authors, about the stations from the Lancaster Lake District Literary Corpus [3] into a single environment for users to be able to explore. In addition, we wanted users to have access to a representation of the environment that the text discusses at each station. The initial prototype is intended to provide a framework around which we can carry out interviews with academic colleagues interested in the deep mapping concept and with potential end users in order to gather feedback and requirements for future development. We are loosely exploiting the principles of participatory or co-design in this investigation.

The main page of this application is built around a Google map, centred on Derwent Water Lake, with markers denoting the location of the eight West stations as depicted in Crosthwaite's Map (Figure 1). A navigation panel on the left side of the map has a toggle for the historic Crosthwaite map (Figure 1), and list two sections, a list of the West stations, and a list of the texts included in the application (Figure 2). Clicking on a station from the list, or its marker on the map, will take the user to the page for that station, while clicking on a text from the text list will take the user to a text view.

Each station page is a Google Street View of the stations location (or the closest available to the corresponding point on the Crosthwaite Map). The Street View
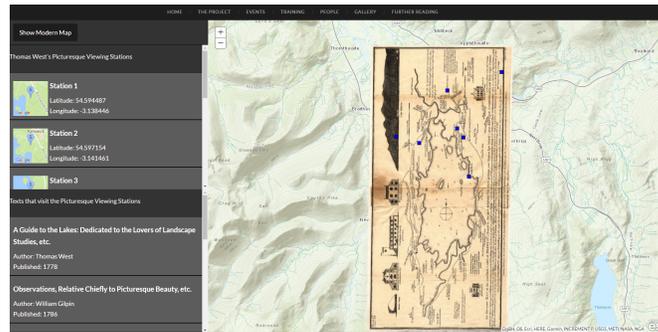
Fig. 2 Historic Crosthwaite Map overlaid on topographic map.

Panorama allows users to explore the site of the station with 360-degree imagery (Figure 3). Overlaid on the Panorama is another left navigation (Figure 4) which contains tabs, one for each text mentioning that station and another tab for a FoamTree [1]. Each tab of text shows the title of the text, a link to the full text, and the section of that text that specifically talks about the station. The FoamTree tab is a Voronoi treemap visualization of the top 50 most used words (excluding standard stop words) in the texts talking about the selected station [1].

Fig. 3 Station View, Panoramic Imagery from Google Street View of the selected Station.

The text view allows users to read the text alongside additional interactive information pulled from the text. The text view page has a simple navigation in the top right allowing users to flip through the pages of the text. Each page shows an image of the original historic page on the right side and a list of the locations mentioned on that page on the left. If the page of text being viewed mentions a station, a link to that station is shown on the far right. The list of locations for each page were found using the Edinburgh Geoparser, with some manual corrections of the data [7], [5]. Clicking on location from the list brings users to the main map view and focuses on the selected location.

Fig. 4 Station View Navigation, Tabs containing linked texts and a FoamTree summary of word frequency.

An underlying database to the application contains the metadata for the stations and text. The database also defines the sections of text, by sentence range or page range, which are associated with a station. Our Crosthwaite Deep Map prototype was constructed using a Java server to perform data management and database access. The data from the Java server is called via Ajax, by the HTML page and stored by JavaScript.

Fig. 5 Text View, Showing image of the page, a list of locations mentioned on the page, and link to any mentioned stations.

5 Discussion

The Crosthwaite Deep Map application that we created provides users with an interactive method of engaging with the Derwent Water map and a selection of the literary pieces related to it. The most significant question that must be answered is: is

this a Deep Map? A deep map has been described as needing 'quantitative and qualitative data, spatial data, images [...], and virtual representations of places[...]'[9]. Under this definition, our map would seem to qualify as a deep map with its inclusion of the texts, stations, and panoramic imagery. Our application provides the user with an array of data related to the Crosthwaite map in an undirected interface, which allows for 'open-ended exploration' of Derwent Water[10].

In the original iteration of this map, the text view showed a plain text rather than the image of the historic page. The decision to add the original page imagery was based on initial user feedback and was an attempt to make the feel of the site more closely linked with the historic source data. Without this imagery, the pages would have little to no visual tie to the original representation of the texts. As these texts are over 200 years old, we decided it was important to make that attribute more explicit, so that users might have a better understanding of the context in which the texts were written, given that the locations West describes in his work may have changed considerably over time.

This project has revealed some issues with the deep mapping of historic data. The Geoparsed locations in the text are dependent on the accuracy of the Natural Language Processing software and the robustness of the gazetteers used, and West's descriptions of the stations were before the advent of GPS, so the true position of each station is subject to interpretation of the text. In this project two of the eight stations did not have fixed locations on the Crosthwaite Map, so we used location data found by the Lake District National Park Authority in a review on West's work [8]. Uncertainty in the data can be difficult to represent on the map, whether it is the accuracy of West's stations or the parsed locations in the text. By placing markers on the map and linking the parsed locations to specific coordinates, the implication to the user is that the locations is absolute.

The use of Panoramas from Google Street View provides a useful visualization of different locations, but they come with some technical problems and concerns about historical representation. The panorama linked to each station is the closest available image from Google and in some cases can be a fair distance away from the position indicated in the Crosthwait map. The panoramas are modern day images of the Station locations, and could have drastically different environments from the historic environment West described. Due to deforesting, reforesting and the introduction of foreign species, the floral environment today is likely to have changed from that of 200 years ago. The quality of the images is subject to the device, and or person that took the images, and on the effectiveness of the registration, or stitching, during processing of the images to create a panorama. Many of the Google Street View Panoramas have significant error.

6 Conclusion

This project has allowed us to explore deep mapping in a historical context. As our overarching project is heavily centred on the literary texts of the Lake District, our

Crosthwaite map has demonstrated how the text and spatial elements can be brought together. Understandably, the creation of a historic deep map is complex and will require thought as to which features will bring the most value to the application. The representation of time, and the historic nature of the content, is another key consideration that emerged from our study and will need further thought. As highlighted here, this impacts both on user interface issues (e.g. visual representation of the original pages of the books) as well as side-by-side presentation of materials (such as original drawings, paintings and modern web-based panoramas). This application has revealed that our future deep mapping applications will need to consider how to maintain the historic context of the data using different visualization technologies, and how to represent ambiguity in the spatial features found in the data. Our prototype provides a model for exploration, and focus on linking historic content to the visual representation of place in a deep mapping application.

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