Web Mapping of Geo-tagged Shipping Information; Case Study: The LLOYDS Lists

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Abstract. Inspection and analysis of geo-tagged shipping information could provide insights to the transformation of a variety of "global spaces" during times of rapid globalization. One of the famous resources of shipping data is a shipping newspaper called LLOYDS lists. The list contains weekly and later daily information on global shipping since the late seventeenth century and are therefore of interest to historical studies. This paper presents the results of an ongoing research project which aims to design and develop a web-based GIS for spatio-temporal analysis of the shipping newspaper LLOYDS List. The data model and system architecture are presented and discussed. The paper concludes with providing an outlook for future work.

Keywords: WebMapping, Geo-web 2.0, Shipping data, LLOYDS Lists

1. Introduction

The shipping newspaper Lloyd's List and its direct predecessors contain weekly and later daily information on global shipping since the late seventeenth century. The Lists' tabular contents is formed by the categories "Shipping Intelligence", "Speakings", "Foreign Mail", "Casualities", and "War". Specifically, the first two categories are essential in our research (Mobasheri et. al, 2013). The "Shipping Intelligence" consists of exhaustive lists of the arrivals, departures and other nautical activities of civilian ships in practically all important ports of the world. The "Speakings" list sightings of ships at the high seas and give both the sighted and the reporting ship with name and geographical coordinates.

A primarily quantitative analysis of the "Speakings" and "Intelligence" will allow us to analyze, for instance, the shifting patterns of shipping routes; the time it took to get information, goods, and humans from one harbor to another depending on the year and season; the "black spots" and interruptions of service due to natural disasters or wars; the shifts in trade intensity between specific regions; the constantly changing patterns of transcontinental/international trade and migration; or, in short, the transformation of a variety of "global spaces" during times of rapid globalization. So far, only very few researchers have recognized the analytical potential of the Lloyd's lists (Yrjö Kaukiainen, 2001 and Roland Wenzlhuemer, 2010).

The aim of the research project is to establish an exemplary interactive system that allows for the exploration of shipping information within the spatiotemporal context dealing with arising ambiguities and vagueness (possible pasts). To achieve this it is necessary to develop specific tools for linking, managing, visualizing, and analyzing historical information simultaneously via the World Wide Web.

2. Data preparation and modeling

As mentioned before, the Lloyd's list is a shipping newspaper which scanned copies of them for specific periods were ordered by the group for research purposes. As an initial attempt towards digitization, a large amount of published information for a specific time period which was of interest for historians; specifically years 1851 and 1871 were read and transferred into Excel spreadsheets in a formal tabular format. In the next step, in order to design a geo-database for the Lloyd's data, a geo-data modeling task was performed. Spatio-temporal modeling of Lloyd's data is essential in order to capture the information in a coherent and flexible manner which would later allow spatio-temporal analysis and querying of this information. The "Speakings" information contains latitudes and longitudes that could be best captured by a point feature as well as two timestamps. The first timestamp is for the date that the actual speaking has occurred and the other timestamp contains the actual date when this information has been reported. Among several approaches of spatio-temporal data modeling discussed in the previous section, we select the Object-Oriented (OO) modeling because of its four main advantages in spatio-temporal modeling (Mobasheri & Bakillah, 2014):

- Efficient temporal data handling
- Uniform treatment of spatial and temporal data handling
- Simple queries due to its capability of dealing with each single object of an entity

In order to design a geo-database for the Lloyd's data, a geo-data modeling task using the Object-Oriented (OO) modeling was performed. From all the necessary information that needed to be recorded, a total amount of 6 tables were designed, each of which carry special attributes.

Figure 1 illustrates the data model for each table in a class diagram fashion using Unified Modeling Language (UML). Note that the first four tables are normal tables containing several necessary information (e.g. Ship name, Captain name, Event date, Journal Date, etc.), yet the two last tables are considered as feature types since they have spatial components, thus can be treated as point features. As it can be seen two main tables are tbl_Speakings and tbl_Intelligence which contain the shipping information. Furthermore, tbl_Speakings is the most special table in this model which contains coordinate values in forms of latitude and longitudes where the actual speaking has happened (somewhere in the sea) as well as information about the plan of the other ship (the sighted ship) such as its port of origin and destination.

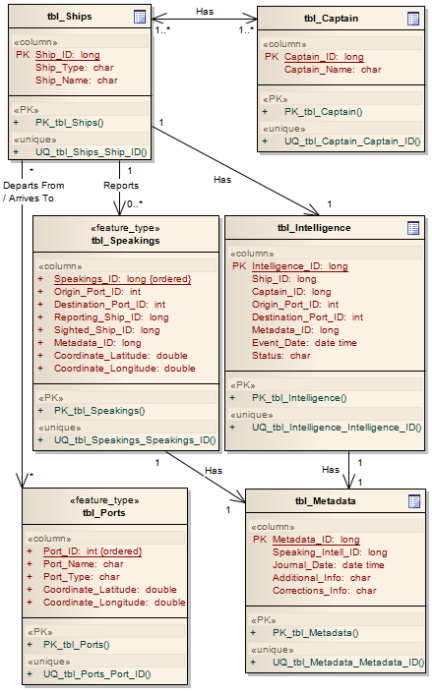

Figure 1. Main part of the data model in Unified Modeling Language (Adopted from (Mobasheri and Bakillah, 2014)

3. Web-GIS architecture and prototype

In order to implement a web-based GIS prototype for visualization, inspection and analysis of shipping information we have developed a geo-database based on the designed data model and populated the geo-database with the "Speakings" information of year 1851. Figure 2 shows the system architecture of the WebGIS and its connection with the geo-database. The system is designed in order to provide three core functionalities a) textual data inspection and querying, b) we-based graphical visualization and c) spatio-temporal analysis and clustering. Figure 3 shows a screenshot of the system which visualizes the "Speakings" information of year 1851 which have took place somewhere between South Africa and South America. Please note that the visualization of data was also beneficial in finding the incorrect reported and digitized data where the ships have been located in land.

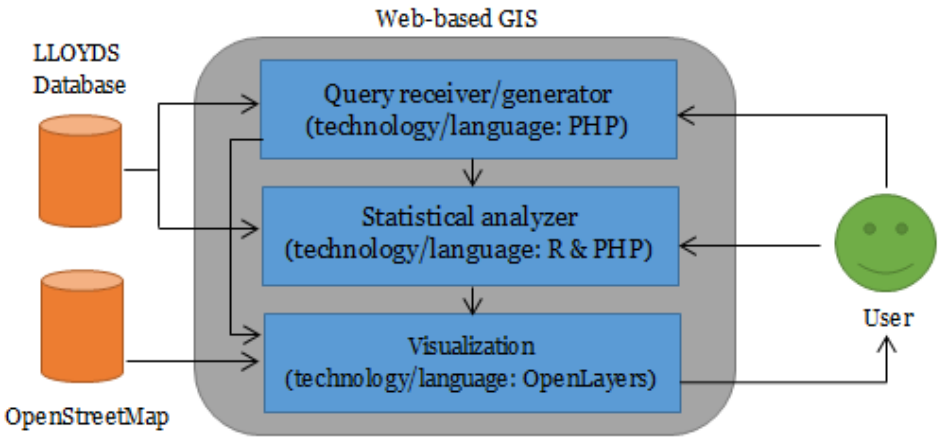

Figure 2. The System Architecture

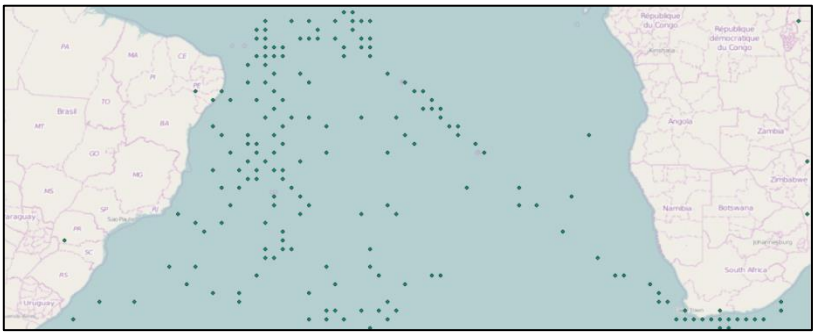

Figure 3. Visualization for a part of the „Speakings" shipping data of year 1851

4. Conclusion and future work

In this paper we introduced a web-based GIS system for explore and analysis of shipping data belonging to the LLOYDS Lists. By referring to our previous work, we presented the data model in UML and briefly discussed the details behind this model. The paper continued with designing and presenting the system architecture, showing the three core modules of the WebGIS and how they are interconnected. Please note that at this stage, the second module (statistical analysis) is not implemented and we presented a snapshot of the WebGIS while the user has passed a query of inspecting and exploring shipping data for a selected route (between South Africa and South America).

For future work, we would implement the statistical analyzer module which would be a web processing service aiming to apply geo-statistics on the data in order to perform clustering functionalities. Therefore, relevant changes to the other two modules (e.g. query generator and visualization) would be applied as well.

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