Some proposals from yGeo for your work experience, bachelor or master thesis…

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Game-based learning and interactive environments to learn SQL spatial queries

There are some special web sites and applications focused on learning to code SQL (e.g. Schemaverse or SQL Island offer a gamified SQL learning experience). The major point is that all these initiatives do not tackle SQL spatial to manipulate geographic objects. Data analysis through SQL spatial queries requires to learn about specific data types and thematic, geometric and topological operators, etc. Therefore, this project wants to explore new ideas and interactive environments, from interactive tutorials to game principles and simulations to reach the training goal of learning SQL spatial. The main focus concerns (1) the design of "storylines" that illustrates with a game flavor the use and usefulness of geometric and topological queries (e.g. extend the storyline of SQL Island - www.sql-island.de - with a geospatial context) . The project aims also at (2) the development of at least one prototype to illustrate the result of the study. This work would require to consider existing systems that facilitate the development of serious games.

Keywords: serious games, interactive environments, SQL, spatial queries, user experience

Sharing cartography: from conceptual design to implementation

Cartographic portrayal interoperability requires a common cartographic language that favors the sharing of cartographic visualisations between distributed systems and rendering engines. Currently, this topic is covered by one standard known as the Symbology Encoding specification at the Open Geospatial Consortium (OGC SE in below). Unfortunately, since it's first edition in 2005, it is nowadays almost obsolete. In other words, it is unable to answer all the new requirements which have appeared in ten years of evolution of cartography using web technologies. Therefore, the authors of this proposal have recently elaborated a conceptual model - http://heig.ch/rutsu - to be considered as the base of a major revision and improvement of OGC SE. Based on this conceptual design, the main focus of this project is to (1) define the default encoding rules based on XML technologies (definition of XSD schemas so as to be able to describe a cartographic visualisation using XML encoding). Also, considering a proof-of-concept that has been started with the OrbisGIS platform - http://se.orbisgis.org, the work would then also require (2) the implementation within this platform of new cartographic capabilities introduced by the conceptual design.

Keywords: standardization, cartography, computer graphics, XML/XSD design patterns

Spatial Runner: synchronize music and running pace

Running is an activity that many people exercise using a smartphone application. Today such applications enable users to track their paths, to play music and to suggest trainings specific for their needs. Often runners follow the rhythm of the music and use the music in order to get into a specific pace. Music thereby can potentially increase or decrease running speed. The goals of the suggested project are (1) to investigate the influence of music on running pace (2) to identify ways to select music depending on a runners preferences in terms of taste and condition and (3) to suggest routes and corresponding music that take into account pace as well as length and slope of a road graph. The objective is to build a prototype that can be tested in the field. The following skills may be helpful: spatial databases (e.g. PostGIS), road graphs and routing, software to analyze music, programming (e.g. Python or Java).

Keywords: mobile application, running pace, music analysis, geospatial routing

Using public picture collections for the determination of interest in spatial features

Millions of people take pictures with GPS enabled devices such as smartphones every day. The GPS coordinates of these pictures are saved with the pictures.

Behind every photo there is a reason why it has been taken. With the coordinates of a photo collection, it is possible to say that certain places are more interesting than other places (e.g. because more photos have been taken at one place than at another place). There are also existing methods that are capable of detecting the angle of view of a photo using DEMs. With the coordinates and the angle of view, the contents of a photo can be analysed, e.g. using databases containing roads, buildings, mountains, etc. This method enables the establishment of zones of interest (e.g. no photos in the area or area only visible in the distance= area not very interesting). These zones of interest can be used for instance for finding spots for wind turbines (=> no photos in the area or only visible in the distance) or for determining scenic routes, etc.

Technically the method could be implemented as follows: online photo collections such as flickr or panoramio have APIs (http://www.panoramio.com/api/data/api.html) to extract photos for given coordinates (e.g. Google uses this functionality in Google Earth). These photos can be used for the detection of the angle (e.g. https://www.youtube.com/channel/UC3A4_-OEqktq4jKsMETGWbw). Another possibility for the detection of the angle are stereoscopic methods (e.g. using IGN's Micmac). Once the angle of view has been detected, several data layers could be used for the analysis of interest (POI's roads, buildings, etc etc.)

Required skills (Python or similar), GIS, spatial data

Establishment of semiotic rules for the display of geographic information in augmented reality applications

For traditional maps well-established cartographic rules exist (e.g. point-line-symbols for common features such as railroads, waterbodies, POI or rules for the utilization of colors, shapes and labels). Augmented reality (AR) applications are a recent trend in geographic information sciences and few publications regarding rules and recommendations for the display of geographic information in these kind of applications exist.

The main goals of the suggested project are to:

- Identify differences between traditional cartographic rules: (including paper maps, and computer-based interactive maps) and AR applications

- Identify which traditional rules can be re-applied, which rules need to be adapted; for which cases no rules exist. Suggestion of rules

Other important objectives are:

- Comparison of existing encoding standards (e.g. SLD) vs the identified rules: how to adapt an existing standard in order to standardize symbology encoding in AR applications
- Development of a prototype based on existing technologies in order to test rules.
- Validation of suggested rules with test users

Keywords: Cartography, geographic information, augmented reality

Programming skills (e.g. HTML5/Apache Cordova/Wikitude)

Scientific research skills (literature review)