GroupCollaborate2: Interactive Community Mapping

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Abstract. This paper presents GroupCollaborate2, a prototype Participatory GIS for the management of 3D community maps which support the shared design of public policies by offering a virtual representation of the territory and by enabling the crowdsourcing of heterogeneous types of contributions, including documents, 3D models and comments, within focus groups. The paper sketches user requirements and personalization opportunities for this type of application.

Keywords: Participatory GIS, 3D User Interfaces, Community Maps.

1 Introduction

Public Administrations use web-based crowdsourcing platforms to extend participation in public policy making beyond representatives of major stakeholders. For this purpose, Participatory GIS support the publication of information and the collection of people's feedback in geographical maps, as this is an immediate visualization format for geo-referenced data. The concept underlying such systems is the Community Map, intended as a way to represent people's view of a certain area and value attached to places or elements of their living space by gathering and presenting site-specific data; see [1].

Most participatory GIS handle bidimensional maps and collect textual feedback from users. However, the provision of virtual representations of the territory and the integration of other types of contributions, such as 3D information, are important to (i) improve the understanding of the intended effects of planned policies and (ii) enable people to make synthetic and expressive proposals. Moreover, the integration of advanced search features can enhance the exploration of the information space.

Our view is therefore that community maps should be enriched with interactive features to provide a flexible support to information sharing, access and communication. With this idea in mind we developed GroupCollaborate2, a Participatory GIS which enables the on-line sharing and editing of geo-localized documents and 3D models. The system supports the establishment of discussion groups similar to those used in participatory processes and it enables group members to communicate, share information and search for information within a community map which provides a virtual representation of the territory, of the collected proposals and of the emerging opinions about them. A

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key aspect of our system is the provision of information filtering features supporting the visualization of maps which reflect specific interests.

We designed GroupCollaborate2 in a user-centered development model, involving domain experts and generic internet users as these are expected to use this type of Participatory GIS. A very preliminary test with a restricted number of users has provided initial, promising results which we will further validate. Moreover, it has provided a few personalization requirements to be investigated.

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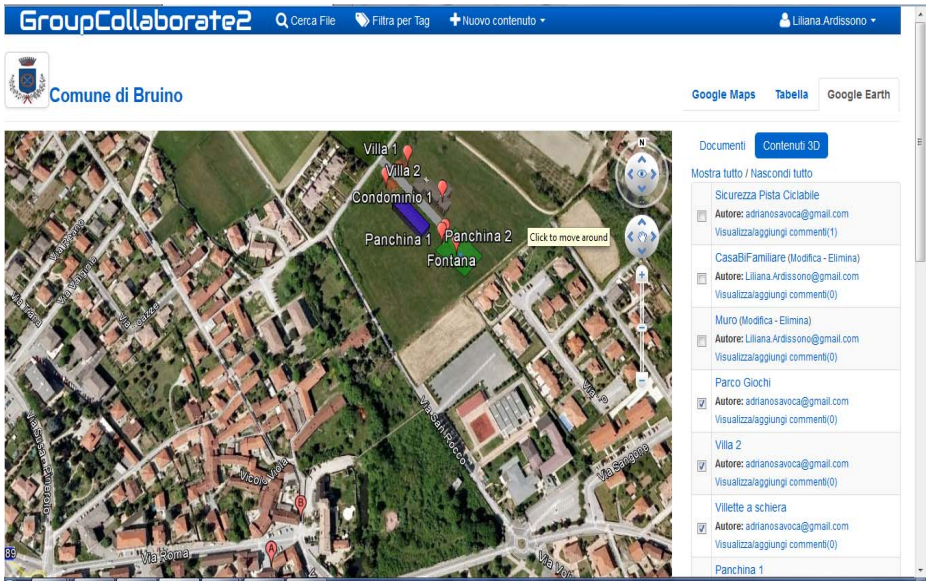

Fig. 1. Community map displaying geo-referenced documents (markers labeled with letters in the bottom part of the map) and 3D models (located in the upper part of the map).

The system enables to create open and closed discussion groups supporting the collaboration to the development of shared plans. Group members can communicate with each other and send messages to the whole group via e-mail. Within a group, users interact with a community map which represents the entry point to shared information items and which can be visualized as a bi/three-dimensional map. The system enables users to share and collaboratively edit geo-referenced documents of various types (e.g., text, drawings, spreadsheets); moreover, it supports the sharing of 3D models and the sketching of drawings (lines, polygons) in the map.

All the geo-referenced items shared within a discussion group can be visualized in the community map and users can publish comments about them. Moreover, the system supports the dynamic generation of community maps reflecting individual information

needs by offering a tag-based classification and filtering of items, as well as the possibility to search documents by name or by included words.

Figure 1 shows the user interface of the system (in Italian) and in particular the three-dimensional community map for a sample discussion group named “Bruino”.

- The top of the page shows the links supporting the content-based search for documents (“Cerca File”), the tag-based filtering of items (“Filtra per Tag”) for restricting the set of items visualized in the map. Moreover, it shows the (“Nuovo contenuto”) link for: (i) creating or uploading a document; (ii) uploading an existing 3D model from a repository (e.g., a KMZ model), or (iii) drafting a new 3D item in the map. Items have to be enriched with metadata (title, author, description) for presentation purposes and can be tagged according to user-generated tags.
  New 3D items can be drafted by means of an editor which enables the user to draw broken lines and polygons (or to resize them) by double clicking their vertexes in the map. The editor also allows the selection of the color, height and orientation of items, and the thickness of lines.
- The community map shows the items satisfying the search criterion (all items, or the selected ones). It displays documents as markers; e.g., A and B at the bottom of the map in Figure 1. Moreover, it displays 3D models as shapes; e.g., the figure shows, among the other, two houses (“Villa 1” and “Villa 2”, uploaded as 3D models), a blue polygon drafted on the map to represent a building, and a green area delimiting a playground with benches and fountain.
  Each marker/3D model can be clicked to view its metadata. Moreover, markers can be clicked to view the content of the associated documents which can be edited or not, depending on their format and permissions. Furthermore, maps can be zoomed.
- The right portion of the page displays items as a checkable list which allows the user to further refine the elements to be shown. For each item, a row reports (i) its metadata, (ii) a link to revise or remove the item (if the user has permission), and (iii) a link which displays the number of comments associated to the item and that enables the user to view/add new ones.

Domain experts who tested the system strongly appreciated the integration of search, filtering, access, modification and commenting features in a community map, as this enables them to analyze and discuss ongoing proposals using a unified environment which provides immediate visualization of geo-data. Moreover, they suggested to introduce new functions. For instance, they proposed to enable users to handle personal views on content based on concept selection (e.g., only scholastic buildings, sport and leisure facilities, etc.) and on the role of users in participatory processes (e.g., generic citizen, Public Administration, etc.), as well as to introduce subgroup management features aimed at supporting focused discussions among selected representatives of the population. These aspects open research paths on data representation (to classify content by concepts), user modeling (to understand the user’s interests and model user groups) and manual/automatic maps adaptation to derive personal views focused on specific interests. Moreover, there are interesting research avenues in the analysis of people sentiment towards specific public policies and about participation culture.

From the viewpoint of usability, the user interface has a neat layout to address basic W3C accessibility guidelines. Various features could be added to support different types

of interaction with users. E.g., the design of simple 3D items might be supported by introducing libraries of shapes to be dragged and dropped. Moreover, sophisticated tools might be proposed to draft complex polygons with irregular shapes; e.g., see [2].

GroupCollaborate2 is a Java web-based application and uses open APIs for the integration of various functions; e.g., Google Map and Google Earth APIs for the representation of the community map; the OAuth protocol for authenticating users, and the Google Drive APIs for data storage. The user interface of the system is developed in HTML5 using JavaScript for interacting with the maps and AJAX to speed up the visualization of the user interface. Moreover, the Google Earth plug-in is used to simulate 3D environments in the user's browser. As the plug-in for mobile phones is not available, GroupCollaborate2 is not accessible from mobile devices. However, device-dependence should be overcome in the next future thanks to the integration of HTML5 with the WebGL standard for graphic user interfaces, currently under definition.

3 Related Work

A few Participatory GIS projects support 3D information management. E.g., LIVE+GOV (http://liveandgov.eu/) combines AR and VR techniques with social networks in order to enable internet users to upload and receive geo-localized information about a city, as well as to participate in polls and discussions. Min Stad (http://minstad.goteborg.se/minstad/index.do) integrates GIS with social networks enabling users to upload 3D contents and to publish comments. In comparison, GroupCollaborate2 lacks the support to deliberation provided by polls and a connection to existing social networks. However, it improves crowdsourcing support by enabling users to share and collaboratively edit heterogeneous types of contents in thematic discussion groups with consequent information hiding. Moreover, it supports tag-based and content-based search for information thus enabling the generation of customized community maps.

4 Conclusions

GroupCollaborate2 is an attempt to integrate community mapping, communication, information sharing and filtering in a Participatory GIS supporting focus group discussion. While the current prototype is devoted to basic user collaboration, the next steps in its development will focus on extending it with personalization features supporting the provision of adaptive community maps. We thank Giuseppe Scaramuzzino for his work on the first version of the system.

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