Conceptual study of Web-based PPGIS for Designing Built Environment: Identifying Housing Location Preferences in Littleborough

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Summary

Public participation is a core of neighbourhood planning in UK. PPGIS has long been used to incorporate public knowledge of places into community planning. The need for instant spatial data acquisition and automated analysis process for decision making in planning process necessitates the update of public participation methods. This study focuses on developing a conceptual website where PPGIS has been used to collect locational preference of residents for new housing in Littleborough neighbourhood. The website was based on 'Virtual Slaithwaite' model with additional option for virtual panoramic tour through Google® Street View to improve the precision and accuracy.

KEYWORDS: Spatial Planning, Housing, Web based PPGIS, HTML, JavaScript.

1. Introduction

Public participation has always been a central concern of urban planning (Brabham, 2009) from the beginning of its widespread use in 1960's (Evans-Cowley and Hollander, 2010). The Localism Act (2011) of UK also encourages public participation considering it as a right of the communities rather than legal requirement in the preparation of neighborhood plans (Neighborhood Planning, 2014). Littleborough, a small township in Rochedale within Greater Manchester (Figure 1), is also preparing a neighborhood plan like other parishes in the UK to reflect their shared vision for development and growth of the community by choosing the use of land for building new housing, shop and offices (Neighborhood Planning, 2014). In the initial stage of the planning, consultation was required with the existing neighborhood forum on the issues which has been sorted out from preliminary survey. The survey showed that, majority of the residents expressed dissatisfaction on the quality, type, location and impact of recent housing development. Moreover, they possess a conflicting view on the type of new housing. Due to the increasing number of local population, Policy C1 of Core Strategy for Rochdale (Rochdale Borough Council, 2014) also permits to build new housing in Littleborough, however, only a limited number of housing can be provided as Littleborough is surrounded by tight greenbelt boundary (Littleborough Neighbourhood Forum, 2015). The problem of conflicting views and restricted land space necessitates an open forum where residents can share their own interest as well as review the preference of others.

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Figure 1 Location of Littleborough in Within Greater Manchester

The traditional public involvement process (meetings and board discussion) in this case is limited by the availability of time as most of the residents need to go outside the neighborhood for their day-to-day works. Under such circumstance, this project aimed to develop a 'Web' based Public Participation Geographic Information Systems (PPGIS) to overcome the spatial and temporal limitation of traditional public participation (Kingstone *et al.*, 2000) and provide a 24x7 access to make widespread active participation in the planning process (Brown, 2012). Littleborough residents will be requested to generate spatial data in a web portal along with the relevant housing choice attributes to inform the decision makers. The process will be volunteered but is significantly different from Volunteered Geographic Information (VGI) as the scope goes beyond general enjoyment of participants and involves policy implications and requirement of good governance (Brown and Pullar, 2012; McCall and Dunn, 2012). Development of Google® Maps and Google® Earth 'mashups' through an application programming interface and Web2.0 geospatial applications, PPGIS become a vital tool for active participation and collaboration in decision making process, particularly for spatial planning (Brown and Chin, 2012; Brown and Pullar, 2012) which forms the proper way of communication between public and policy makers as well as planners (Mansourian *et al*., 2011). Considering such context, the process and effectiveness of web-based participation for Littleborough Neighbourhood planning have been discussed in the following sections.

2. Methods

Based on the aim to collect locational and housing preferences of the users of Littleborough Neighbourhood, a website prototype has been designed following the idea of 'Virtual Slaithwaite' model developed by Kingstone *et al.* (2000). Three aspects have been considered during the development of website (1) Web ergonomics, (2) Basic functionality and (3) Relevant interactivity. The model provided 'Architecture of participation' for any web users, and it enables to create a web environment that is user friendly, have the ability to meet the requirement, and provide the essential ways to interact with the user.

In addition to this, the web-design work has been performed in three major section following the basic of web design, (i) development of server relations and data collection form (ii) develop a web-site proto type to make bridge between the server and the user (iii) attract users to make active participation.

The server design process has not been fully performed in this case, however, a tabular form of SQL database to restore the information has been considered. For the overall development of the web proto-type, HTML5 has been used for structuring the website while the spatial functionality has been incorporated using JavaScript API of Google map. The styling of the website was done using CSS.

The overall structure of the website is designed based on the simplest 'three boxes' layout where the first box provides basic information about the neighborhood and development of this platform. The second box (lower-left) incorporates Google® map for virtual visualization of the neighborhood area. The map interface has been kept simple and the style followed the general land use maps in physical planning. The styling was done with some CSS customization. This section also works as a portal between users. The clients can input their spatial preference for housing by clicking on the map, which produces point marker, and can provide preference attribute in a pop-up window appeared over that marker. The coding of this frame created a marker array utilizing different loops and JSON.parse to store this data along with the privilege of deleting the misplaced preference and retrieve the stored data to review other clients' preferences. The stored data will be saved as a tabular SQL database from where decision makers will retrieve the data of latitude-longitude of the preferred location, client type and preferred types of housing from server side. Additionally, JavaScript API object google.maps.Geocoder() has been utilized to incorporate a geo-code bar to geo-code certain location from user search. Furthermore, this frame enables the user to go full screen mode, zoom in and out option to facilitate precise input. Finally, the map integrated an option of 'Pegman' which created the point of view (POV) for 360^0 virtual tour of the neighborhood utilizing Google® Street View, embedded beside the map. google.maps.streetviewpanorama, was the object working behind the scene. This will increase the authenticity of collected data by providing users better knowledge of the surroundings of their chosen location.

At the end, the third box (lower-right) provides the instruction of data input and integrates four different social media linkage (Facebook, Littleborough Local, Littleborough Neighborhood Forum and Twitter) which redirect the user to the websites providing information on Littleborough neighborhood and update about their ongoing plan where users can also provide feedback of their actions.

3. Results and Discussion

Figure 2 displays the overall web-system developed in this proto-type website. The integrated structure has been designed to get the best possible view of location, and disseminate related information to the target audience.

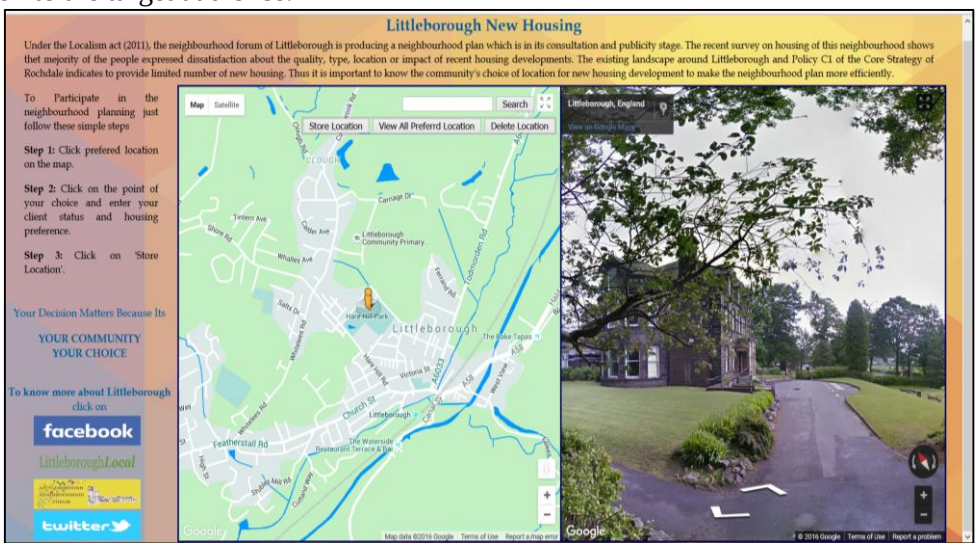

Figure 2 The components of the proto-type website, displaying different frames

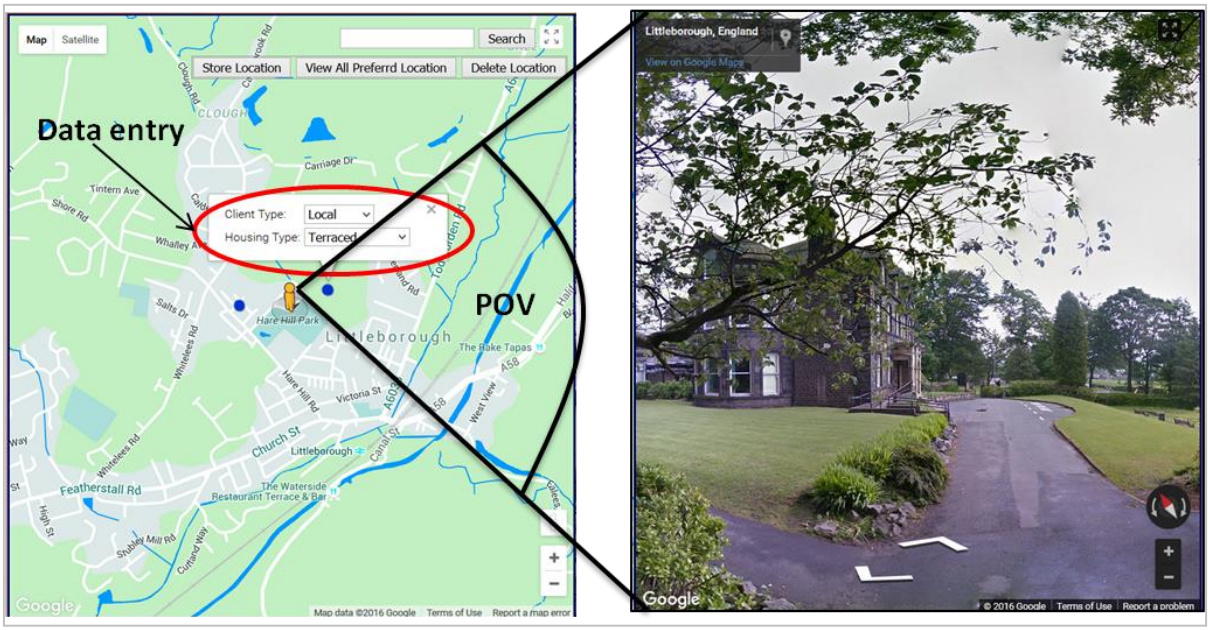

Figure 3 (a) Point marker, data entry form for the users and the location of their Pegman (b) Street view of the corresponding Pegman based on related POV.

Figure 3 illustrates the main frame of the website; Figure 3(a) indicates the point marker (location) and related table for the user to fill their options and preferences (i.e. Client type, Housing type), as well as it shows the Pegman and the POV of the Pegman. In this case, Figure 3(b) is showing the 360^0 image from Google® Street View, based on the POV.

Though the basic idea followed 'Virtual Slaithwaite' model, unlike the GIS model used in it, the website developed for Littleborough used the advantage of Google® map for the user interface as this map interface is familiar to the general map users and is immensely used for navigational purpose. Moreover, the GIS analysis part has been kept for the experts in the server side who will back-up the housing plan. Though the GIS analysis has been kept for the experts, clients can also retrieve the locational preference of other users and can have hot-spot type visualization in their mind, to see the pattern and preference concentration. Considering the web ergonomics, the website has been embedded with optimum functionality which was required for precise data input and the one-tab interface integrated simplest usability, social media, basic information and logical roadmap which can be navigated with ease. The prime interactive window (Figure 3) occupies larger part of the website navigating the users to the actual purpose of the website thus creating relevant interactivity. As the map view is not restricted with the map tile, the clients can analyze their preferred location in a wider perspective (i.e. Distance to work, city center) and explore whether their preferred location is close or away from major roads, surrounding schools and other facilities. Finally, all these functionality, both from user and planning authority perspective, make this a highly potential platform for active participation and make the planning process more effective and acceptable, which in turn would raise the level of satisfaction among the users.

4. Conclusion

Use of PPGIS through Google map mashup is becoming a highly appreciated tool, and its use has been already accepted in different fields. Success of physical planning is a matter of wide public participation, and the use of web-based PGIS system can make it available to wider community, remove the barriers of time and location. Therefore, in spatial planning process it is an emerging tool to be considered seriously. For further work, test run of the web-site with real users are required, along with comprehensive data analysis.

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Biography

Shrabanti Hira is a former Post-graduate student, SEED, University of Manchester; her research interest includes land-use planning, urban climate, thermal remote sensing and web-based GIS.

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