Finding your way with Google Maps

Nick Bearman and Katy Appleton explore ways to collect spatially based responses using the technology available through Google Maps

If you are conducting an online survey (e.g. via SurveyMonkey or something similar) how do you go about collecting spatial data? If you just want to know where people are located, you could collect their postcode or nearest town / city. But postcodes often aren't precise enough, particularly in rural areas. How about if you want to ask people which way they commute to work, or where they would consider their 'neighbourhood' to be? Postcodes just don't cut it, and even neighbourhood names have their limitations. The ability to collect precise spatial information could be of great benefit for questionnaires and surveys within a variety of contexts.

We used Google Maps to collect this sort of spatial information – including points, line and polygons (e.g. where do you visit for recreation? Which route do you take to work? Where do you sail on the Norfolk Broads?). This allows the user to much more easily describe a route or area, and gives us much more precise data to work with in further analysis. This extra information is very useful in many situations, and the case studies cited here couldn't be done without it.

Our work created a Google Maps element for use within a larger, traditional online survey to collect precise location responses from participants. There are two pieces of work that used this interface: the Countryside Recreation Survey (Fig.1) requested locations, routes or areas relating to recreational activities, while the second survey (Fig.2) examined participants' understanding of particular datasets by asking them to highlight specific areas of data. If you would like more information on the individual case studies, please see the reference on page 55.

API options

There are many different web mapping interfaces (Google Maps, Yahoo! Maps, Bing, OpenStreetMap, OpenLayers, etc.) available on the internet. Most offer an API (Application Programming Interface) that allow users to load their own data into the web interface, customise how it is shown on the map and how the user can interact with it.

We chose to use Google Maps API, because it was the most popular mapping service (so many of the participants were already familiar with it); it was the most widely used in previous research projects; there were very good examples and tutorials on the Google website, and forums available to answer any questions or problems we might have. An alternative option would be to use the Open Source alternative, OpenLayers, but when we found it significantly more technical to implement and there were fewer tutorials and support facilities.

The Google Maps APIs are available in JavaScript and require a reasonable level of computer/web knowledge to use, but not a vast amount of programming knowledge. We would describe ourselves as experienced GIS users, who are comfortable using scripting for some of our GIS analysis (e.g. ArcScripts). It is also useful to have a basic understanding of HTML and some type of scripting language (e.g. VBA or Python) but this is not necessary.

User interface

The map interface presented to users is very similar to the standard Google Maps interface, and they can click on controls to start recording points, lines or areas. If you are collecting different types of data (e.g. points, lines or polygons), the audience will need to know (or be told) which data type they want to provide, but if you are collecting only one type of data, the type(s) available can be limited. The data is recorded in a MySQL database as a series of points, which can then be reconstructed in desktop GIS software for further analysis.

You will need a webhosting service which can host a MySQL database, but these are fairly common and can most likely be provided by your organisation's IT department. The data could be stored in an explicitly spatially aware database, but this adds a level of complexity to the programming. It is not necessary as the data (stored as XY points) can be reconstructed into spatial data using any of the number of available tools for importing GPS data.

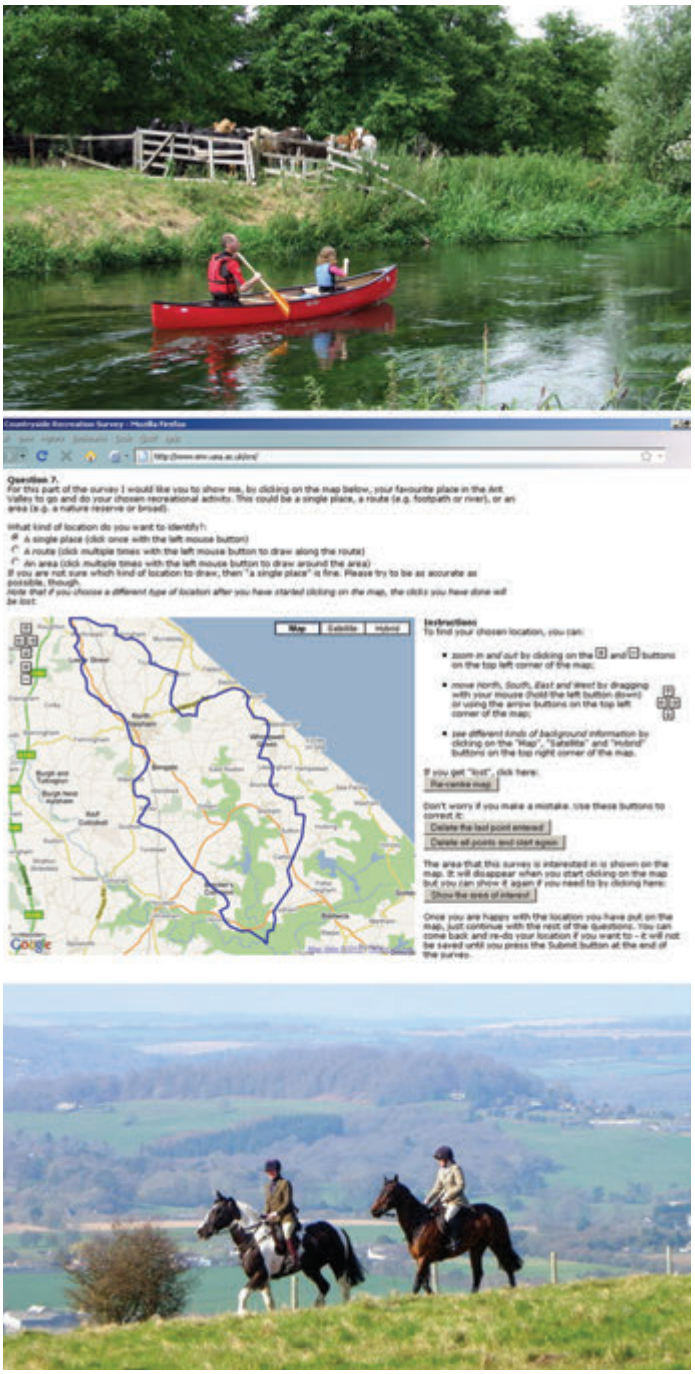

Fig.1: The Countryside Recreation Survey requested locations, routes or areas relating to a variety of recreational activities
Courtesy of: Top picture © Keith Evans, from Geograph,.org.uk., Lower picture © Trish Steel, from Geograph,.org.uk

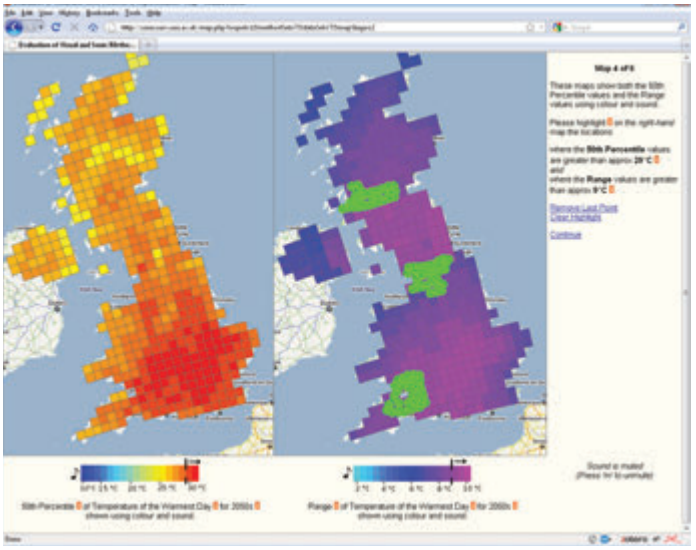

Fig.2: Evaluating visual and sonic methods of representing temperature variations

The participants found the interface easy to use, potentially because they were already familiar with the widely-used Google Maps interface and mapping style. The users in both the case studies had varying levels of experience with GIS or technology in general, so ease of use was very important. This is of particular concern if the survey is completed without supervision, as was the Countryside Recreation Survey, as users who encounter problems during the survey have no source of further help and may abandon the questionnaire.

Potential issues

The most significant potential issues fall into two categories. First, the API is a remote resource so will be subject to the reliability of the internet connection wherever respondents happen to be, as well as the status and reliability of Google's own servers. Furthermore, it is a resource provided by a third party and so may change without notice. Google's code is updated every three months, although there may also be interim changes that could affect its implementation in your application, and old versions remain available for three years following a major update.

The second issue concerns the information provided by participants and relates to their knowledge and understanding of the task. One particular problem we encountered was with the accuracy of locations specified. For example, a number of people clearly intended to highlight the river as the location for a waterborne recreational activity, but their input ranged from being precisely on the river to being more than two miles away. This could be addressed through clearer advice to users, but future work will also examine the potential to only allow input at higher (more detailed) zoom levels in Google Maps, or at least record which zoom level was used, which may act as a proxy measure for accuracy.

Overall, using these mapping APIs can provide much more precise and useful spatial data than traditional survey methods recording named places or postcodes. The APIs do require additional time to set up and test, but an in-depth knowledge of programming or web design is not required. There are significant help resources available on the internet, particularly for the Google Maps API used in this work.

If you are interested in the case studies, please see the reference below or contact the authors.

Bearman, N., Appleton, K. (2012). Using Google Maps to collect spatial responses in a survey environment. Area. doi: 10.1111/j.1475-4762.2012.01081.x

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