BOMB SIGHT – Mapping WW2 Bomb Census

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Partners: The National Archives London, Location Insights Ltd, Geobits Ltd

JISC Content Programme 2011-13, Strand C: Clustering Digital Content

BOMB SIGHT
Mapping the WW2 bomb census

www.bombsight.org

Synopsis

The Bomb Sight project, originally known as Stepping into Time, brings World War 2 bomb damage maps into the digital world using web and mobile mapping technology. Built around the London Bomb Census Maps, showing where bombs fell during the 1940-1 London Blitz, it successfully integrates diverse archival sources via open source mapping. Bomb locations were extracted and stored within a Geographic Information System (GIS) on top of which was built an interactive web-mapping application integrating memories and photos, plus a mobile phone application for use as you walk around the streets of London. The project was funded by Jisc and led by Dr Catherine (Kate) Jones, University of Portsmouth, in partnership with The National Archives, Location Insights Ltd and Geobits Ltd.

Introduction

The project's main aim was to widen access to geo-historic datasets, and to add value to archive material for students and citizen researchers. The challenge was to combine disparate datasets in a coherent framework, and then make them accessible via easy to use software interfaces. The underlying structure was based on an interactive archive of the WW2 Bomb Census in London which used maps and places to link together locations of falling bombs, anti-invasion defences, geo-located memories and photos.

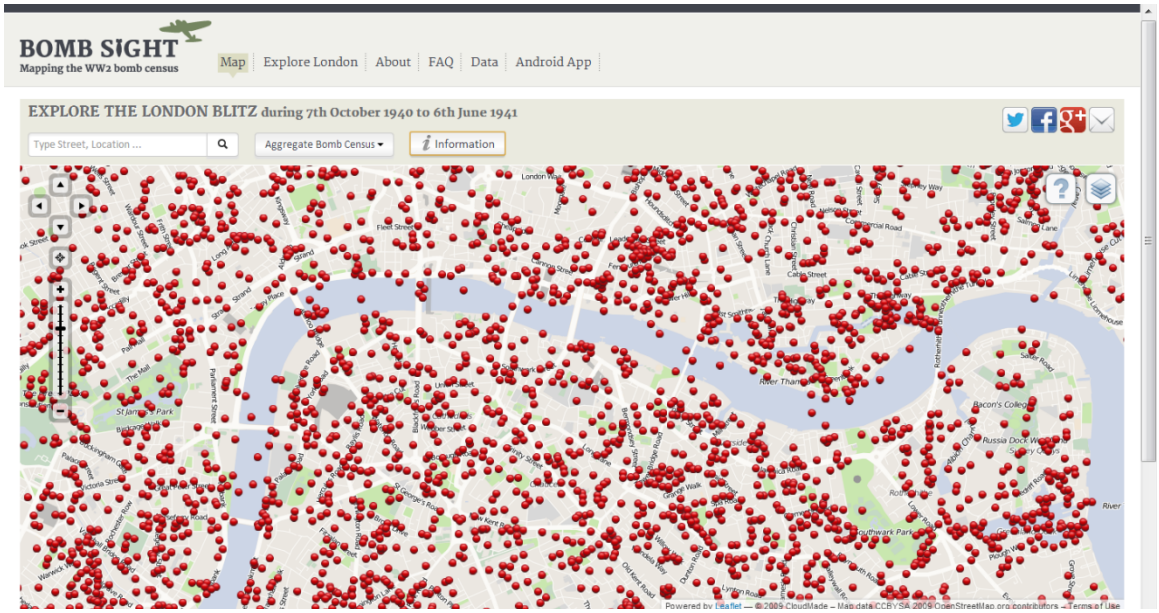

Figure 1: Screen shot Bomb Sight website

Context and Challenge

Geographical Information Systems (GIS) are desktop software packages for creating maps. They have traditionally been expensive and complex, making them hard for non-experts to use. However the past decade has seen substantial change in both methods and technologies used for acquiring, processing and sharing geographical information (Goodchild 20081; Sui 20082). The emergence of web-mapping applications based on online “slippy map” APIs (Bing Maps, Google Maps, OpenStreetMap), has led to internet users having much greater spatial awareness. These technological advances have also increased public access to geo-data, and the decreasing cost of computing power and storage makes it possible to capture, process and analyse many large datasets. Further, these developments mean there is mass-market adoption and consumption of geographic data and services by members of the public.

Geography enables users to understand the significance of historical datasets through linking datasets together by place. For historical datasets this is highly relevant as it enables the construction of a continuous picture for a particular location over time, or for neighbouring places for a precise date in the past. The project team implemented

[1] Goodchild, M.F 2008 Commentary: whither VGI?” GeoJournal 72: 239-244.
[2] Sui, D 2008 The wikification of GIS and its consequences: Or Angelina Jolie’s new tattoo and the future of GIS. Computers, Environment and Urban Systems, 32: 1-5.

mechanisms for linking and clustering historic data gathered from the WW2 bomb damage maps by employing geography to identify different data which have the same physical location. This included geo-referencing scans and digitising bomb locations, importing data into a spatial database for access via Geoserver software, which enables spatial information to be displayed cartographically, so locating place names geographically and then manually adding locations to screen scraped images based on the image description, with appropriate copyright.

The complex nature of the historical data sources and their inaccessibility often leads citizen researchers, academics and teachers to bypass them in favour of more readily available material. Including a geographical dimension to link different datasets opens up potential new avenues of research, and ways to use the data for teaching and learning. Implementing an online mapping interface also gives users interactive access to archival data within a technological context they are familiar with, through either an interactive website or the mobile phone app. The combination of an interactive website and locational information for historical documents enhances the user experience by providing a simple and effective method of showing results of interest.

The digital historic datasets used in Bombsight included maps held by The National Archives which had not previously been digitised. The maps chosen were aggregate maps of nightly bomb drops between October 7th 1940 - June 6th 1941 and weekly plots of central and east London showing week day and bomb type just for 7th-14th October 1940. This small subset was selected as representative of the potential for a much bigger project using the full

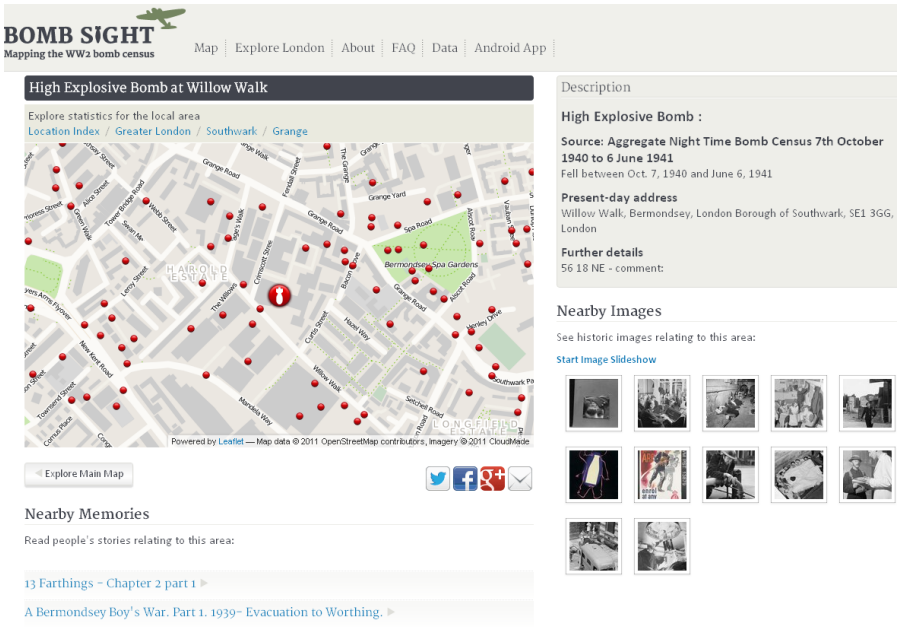

Figure 2: Individual Bomb Sight record

collection. Also included was the Defence of Britain dataset, created through research by volunteers for the Council for British Archaeology, which describes the anti-invasion defences. Clustered with the bomb sites are geo-located photographs from the Imperial War Museum and geo-located memories from the BBC WW2 People's War Archive. The combined datasets form a cohesive framework, also called a (geo-)spatial infrastructure,

which form the basis for the web site and mobile mapping app, reflecting the profound impact and usage of mobile devices in modern society.

The website is designed to adapt to the particular device it is running on, changing layout for different screen sizes, from a desktop monitor to a tablet or mobile phone. The android mobile app enables users to interact in situ with historical information associated with the urban landscape around them, overlaying and augmenting a user's view of the streetscape with historic information. This combination of live images from the camera on the mobile, with maps and historical visualisations is derived from the geographically conflated data contained in the spatial database.

This project has delivered a useful and usable interactive web-mapping and augmented reality mobile phone application to enable users to explore historical material in relation to the present day but there were technical challenges in creating the site. The first problem was that the fragile nature of the historical documents required use of an auto focus digital camera rather than precision scanning equipment, and consequently somewhat lower resolution images.

To optimise the user experience the project consciously adopted principles and development techniques from the field of Human Computer Interaction. User centred design principles included the use of wireframes to explore design options with volunteer user testers. The key philosophy behind the design was to keep it simple thus making the site easier to navigate and more engaging for users. The programme code behind the mobile app had to be specific to the particular mobile platform. The project chose to develop an Android app, but hopes to release the app code as open source in the future and it was therefore written as generically as possible within the platform-specific constraints, using an abstract application development framework called Phonegap to provide a skeleton.

Lessons

The steepest learning curve encountered was at the very beginning of the project and concerned Intellectual Property Rights. We originally expected to use maps from a smaller and more local archive, but providing wider access to an educational audience as expected by JISC proved incompatible with their own income-generating activities. Disappointingly, this eventually led to their complete withdrawal from the project. Although a suitable alternative was found in the form of The National Archives a valuable lesson was learnt from this experience. Recommendations arising from this lesson for future projects include; speak to the funding body to determine exactly what they expect; start discussions with the repository holding the historical documents at the earliest possible stage in writing the project proposal; have a face-to-face meeting with the archive to avoid misunderstandings; establish how the archive currently use the documents in question and especially whether there is any commercial use; and consider what impact allowing educational use and reuse for that data might have on the archive. Finally ensure you have a contingency plan already in place should preliminary negotiations fail.

Another lesson learnt was the importance of balancing a project's fixed budget and award period against establishing a sustainable technical infrastructure required by the funding

body. The technical infrastructure incorporates basic hosting of the website. Cloud-based solutions were investigated. One option was commercial, a Virtual Machine provided via Amazon Web Services, which was in fact used for prototyping. This offered great flexibility on file store, cores, RAM and operating systems, but proved impossible simply because there was no source from which the monthly charges could be met once the project grant ended. Instead a private cloud operated by the University of Portsmouth was selected. Although this offered less flexibility in terms of operating systems, RAM, processors and storage it could all be paid for **in advance** at a set price. Key points learnt from this process included the need to identify sustainability requirements and include the necessary funds in the project budget; determining what operating systems and technical specifications are available and will be supported in future; recruiting a departmental/faculty mentor to help with this process; ensuring the technical developer has the specific expertise to support the server infrastructure when they are being recruited; involving the infrastructure provider in system specification and development.

Impact

This project exposed newly digitised archival data to people around the world. It introduced new researchers to the possibilities available within historical data, sometimes providing them with a window into their personal past: via their own experiences, those of older family members and friends, or in connection with somewhere they have lived or worked. It created a very visual representation of a short period in the history of World War 2 and can be used to help explain the severity of the Blitz to younger generations. In addition the mobile app enables users to interact with the historical materials in the exact real world locations they document. The undergraduate who worked on geo-referencing the locations where the bombs fell commented that this task was a "somewhat humbling experience given the sheer number of points".

Media

The project had very extensive global media coverage on the internet, TV and in print including national television news and newspaper articles, technical and specialist web reviews, and regional radio items and local history blogs. The depth of interest from a wide range of media together with the viral nature of the social media coverage, particularly on Twitter and Facebook, meant the launch was more effective than even the most optimistic predictions. The press liked the striking nature of the initial pin map view, together with the simplicity of the interface and the immediacy of the results.

The following is a selection of reactions to the site:

- Pocket-lint made the site its website of the day on 7th December describing it as "Truly fascinating stuff"
- The Independent used the headline "Jaw-dropping 'Bomb Sight' map shows where blitz hit London Streets" for their article on the site published on the 6th December 2012.
- On the 8th of December the Daly History Blog said "This fantastic website was launched yesterday... it's a great example of geography and history working together"
- The same day The Marauding Carto-nerd blog also posted "Overall a really great example of how a web map can be used as a portal to archive material and how the map is part of the overall presentation which works well when you have a rich dataset."

There were also some great responses to the site on Twitter including;

- "I have to say **@BombSightUK** is one of the most impressive online archive resources I've ever seen. Brings alive the sheer scale of the Blitz."
- "The **@BombSightUK** map tallies well with anecdotal reports of WW2 German bombs from the old timers in my neighbourhood. Fascinating. "
- "What an astonishing use of **#augmentedreality** & mobile apps by **@BombSightUK**... this looks brilliant... "
- "Always suspected my housing block was built on a WW2 bomb site, and thanks to http://bombsight.org I can see I was right!"

Statistics

The web site "went viral" very rapidly following its launch, initially via Twitter but then through the extensive media coverage noted above. From an initial forty visitors a day, the interest built, rapidly, going to one visitor per minute and then peaking at 6 per second. The team believe becoming an internet phenomenon virtually overnight was due to the site's easy-to-use design and the often personal connections the public have with the places bombed, and with the people who were there. This table succinctly demonstrates the variety of ways people entered the site during the launch period and the importance of social media and direct links from popular mainstream media channels such as the BBC and the Daily Mail:

	Source/Medium	Visits ↓	Pages / Visit
1.	(direct) / (none)	161,364	2.14
2.	bbc.co.uk / referral	106,266	2.64
3.	google / organic	48,918	3.69
4.	facebook.com / referral	14,546	2.00
5.	dailymail.co.uk / referral	13,529	1.11
6.	m.bbc.co.uk / referral	6,900	2.08
7.	metro.co.uk / referral	5,900	3.52
8.	m.facebook.com / referral	5,848	1.54
9.	wiadomosci.onet.pl / referral	5,571	2.18
10.	t.co / referral	4,772	1.51

Figure 3: Site referrals 1/12/2012-31/01/2013

The website itself has had 416,672 unique visitors in the six months since launch (Dec 2012-May 2013). The busiest day so far was 7th December when it had 184,436 unique visitors. This was the day when the site featured on the front page of BBC online. The site continues to engage user's interest, with usage since the launch peak ranging between 1,214 and 9,074 visitors per week and over 26% are repeat visitors. By the end of April 2013 the number of project blog views was in excess of 90,000 from 139 countries showing the widespread appeal of the site and the interest in the methodology used to create it.

The mobile app has been downloaded 1086 times and the site has been accessed 88,954 times from mobile devices, including tablets, which use the responsive mode functionality of the website. This compares with the 356,293 times it was accessed more conventionally from a PC by the end of January 2013.

Partnerships and stakeholders management

The team comprised the programme director/project manager, three student researchers (who were involved in data capture, adding co-ordinates and quality control), a map archivist from The National Archives, a web developer, a mobile developer and a graphic designer. The project really took shape when the graphic designer, web developer, mobile developer and the project manager came together for weekly meetings following the data collection phase of the project. User testing at the National Archives went well, following on from the definition of a test script in which each team member ran a test to allow real observation of the interaction between the user and the end product, so improvements could be identified and implemented.

Creating and releasing the website

The concept for the website was built around Open Source software and low cost solutions. These included Geoserver and a PostGIS database within a Python GeoDjango web-app framework on the server-side, plus JQuery and the Leaflet framework on the client side. Embracing open source technology meant a low cost solution could be developed whilst implementing recognised web standards. All data available for download through the mobile app conforms to GIS standard formats with an attached metadata file. All material provided by the individual repositories remains within their copyright. Permission must be sought from the relevant organisation for reuse of their data. All data created by the project itself will be released under the following creative commons license:

> Bomb Sight by University of Portsmouth is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

Dissemination

Social media have provided useful tools for disseminating knowledge about the website. The You tube video describing the site has had approximately 14,000 views, the Twitter account has 842 followers (as of 03/06/2013) and the team have made it easier to recommend the site by enabling specific map views to be shared via Google+, Facebook, Twitter, You Tube and email.

In addition to the media and social networking the project team also engaged in more academic dissemination activities. In March 2012 the project was presented at the JISC GECO Geoculture event held at Kings College London. In November it participated in the AHRC's Digital Transformations Moot in London. In December it was presented at a one day conference in Edinburgh, 'Working digitally with Historical Maps', organised jointly with the Old Maps Online project and the National Library of Scotland. Future presentations will be given at The National Archives in July 2013 and at the Society of Cartographers Annual Conference in September 2013.

Sustainability

As discussed above, all Bomb Sight content is hosted on a virtual server operated by University of Portsmouth Information Services, who have been paid in advance for hosting over the full five years to 2018 required by JISC. Portsmouth IS are responsible for maintaining the hardware and system software, but not for maintaining the specialised geospatial software behind the site (PostGIS, Geoserver, GeoDjango). The site developer has supplied documentation for the maintenance of this specialised software to the University of Portsmouth, but he is currently responsible for monitoring the performance of the site.

The site currently uses www.cloudflare.com for caching and as a firewall. This has the confusing consequence that bombsight.org appears to be located in San Francisco, but Cloudflare is just a cache which could be turned off at any time. However, it proved invaluable during the launch and continues to enhance access times. Other external dependencies are on Street Map, Bing

Aerial Imagery tiles and the Mapquest geocoding service, but these could easily be switched to alternative open source products if necessary.

The Android app will remain available for download although there are no plans to update it. However, having based it on Phonegap should aid its longevity. The University will sustain the API with which the app communicates as part of the Portsmouth server.

Conclusion

The project team has successfully created a website and mobile app that simultaneously engage users with both past and present. The site offers easy access to learning materials, introducing users to historical documents by placing them in a current context. Bomb Sight provides flexibility in how users can access data: a conventional web site; the mobile phone app; a data download facility. Using Cloudflare to support the project during the peaks in popularity proved a significant factor in ensuring that a service could be continuously provided. The site demonstrates many of the new ways in which GIS technology lets us work with historical maps, and the resulting benefits. Looking forward, the success of Bomb Sight provides a foundation for future projects enhancing the resource, possibly including a crowd-sourcing element to add user participation.