www.election.co.uk - the creation of a geographically referenced web site for the 1997 General Election

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Abstract

Internet technologies have been widely used over many years in the academic and research communities to disseminate ideas, data and code.

Electronic mail, telnet and ftp protocols have provided both pointers to and access mechanisms for remotely held geographic information. Recently, the development of the World Wide Web has raised users' awareness of data resources and expectations of the strengths of the functional systems used to access them.

Providing on-line access to geographic data and complex spatial analysis software is not straightforward over the Internet. Files are typically large and applications highly interactive - demanding graphical processing, multiple selections, drawing tools and so forth. Even the World Wide Web has not, until very recently, supported the systems required for truly interactive interrogation of geographic data.

Business Geographics have been developing web-enabled interfaces to geographically referenced data since 1995, starting with the Locale system (www.geoweb.co.uk) for the production of local area demographic reports.

Recently, the company has made significant inputs to the Election '97 web site. This site (www.election.co.uk) – which has received over four million ‘hits’ – is designed to provide background information on the 1997 General Election and features maps, political facts, political commentary and geodemographic profiles for each of the United Kingdom’s 659 parliamentary constituencies.

The Election '97 site offers four mechanisms for identifying and interacting with UK constituencies:

- A town to parliamentary constituency lookup accessed through a text interface.
- Sets of image maps for navigation from county through to constituency level.
- Virtual Reality 'worlds' showing constituencies in three dimensions, the third dimension reflecting electoral density.
- Fully scaleable interactive vector maps of the United Kingdom accessed through a dedicated ‘plug-in’ for Netscape and Internet Explorer browsers.

This paper describes the development of the Election '97 web site, with particular reference to the use of on-line vector mapping.

It is suggested that the new mapping technology offers an extremely effective interface to geographical databases, and that the use of this technology will broaden the user base of those wishing to access geographic information both within and across organisations.

Background

The Internet – the large network of interconnected computers originally designed for military purposes – has been widely used in recent years by academics and researchers for disseminating ideas, data and code.

Until recently, Internet networking protocols have not allowed for the display of rich text and graphics. Prior to 1992/93, and the advent of the World Wide Web, communications over the Internet relied upon command line driven interfaces:

- **File Transfer Protocol (ftp)**
  For sending and receiving ASCII or binary data.

- **Telnet**
  For establishing connections and running processes on remote computers.

Whilst geographic data could be shared using these protocols access was restricted by two factors 1) the problem of finding the relevant data on the network, 2) the need to be familiar with ftp and/or telnet command line arguments to retrieve the appropriate files.

The invention and subsequent development of the World Wide Web has done much to address these problems. Hyper Text Transfer Protocol (HTTP) uses specially coded ASCII files (written in Hyper Text Markup Language, HTML) containing text, pointers to image files and 'hyperlinks' to other HTML pages, images or files.

Web browsers – such as Netscape Navigator or Microsoft Internet Explorer – interpret HTML instructions to provide screen-based access to information that looks, for all practical purposes, like any word-processed document. However, because HTML supports event-driven processes there is considerable scope for developing rich information delivery systems.

Business Geographics have recently developed a website (www.election.co.uk), accessed over four million times in the run up to the UK General Election, dedicated to providing information relating to the 659 parliamentary constituencies which returned new Members of Parliament on May 2nd 1997. This paper describes the development, and some of the features, of the site.

Planning and early development

All websites need a Uniform Resource Locator (URL). The URL is associated with an Internet Protocol (IP) number which uniquely identifies the computer hosting the relevant web site. A good, memorable, URL is a great asset for any website.

The URL www.election.co.uk was registered roughly six months prior to the start of the election campaign. Work did not start on site design, database development or data capture until late February 1997. However, a number of priorities for the project had already been identified:

- **Scope**
  The website would be the first to cover any UK General Election in depth.

- **Purpose**
  We considered it unlikely that the website could be sold to any news organisations, most of which were busy developing their own web-based offerings. However, by approaching the Election from a different angle – and a distinctly geographical one – we suspected that Business Geographics could benefit from considerable press interest. The World Wide Web is an excellent and cost-effective advertising and public relations vehicle. As such the site was designed to boost the profiles of the various companies involved with it.

- **Content**
  A well-designed, clearly laid-out home page was essential. We envisaged links from the home page covering:
  - The background to the General Election
  - Key facts relating to all 659 constituencies
  - On-line polling and poll results
  - Frequently Asked Questions
  - A history of UK General Elections
  - A background to each of the mainstream and minority political parties
  - Editorial and comment

Several companies collaborated in the project. Business Geographics led the database development and data collection operation. The Internet Factory provided technical support and web-hosting facilities. October Design were responsible for the graphical look of the site. In addition, geographic and geodemographic data were made available by Business Geographics, the Automobile Association and CDMS.

The website was launched on the day the election was called, March 14th 1997, three to four weeks after we started work. At launch, the site held over 70000 words of text, over 900 bitmap images and around 50 virtual reality worlds.

UK political geography

Following the Boundary Commissioners Report (HMSO, 1995) the United Kingdom of Great Britain and Northern Ireland (UKGBNI) was divided into 659 parliamentary constituencies.

The 1996/97 parliamentary constituency boundaries are shown in Figure 1. It is apparent that constituencies vary greatly in terms of size. Since population is dynamic it follows that the number of constituencies should also change from time to time.

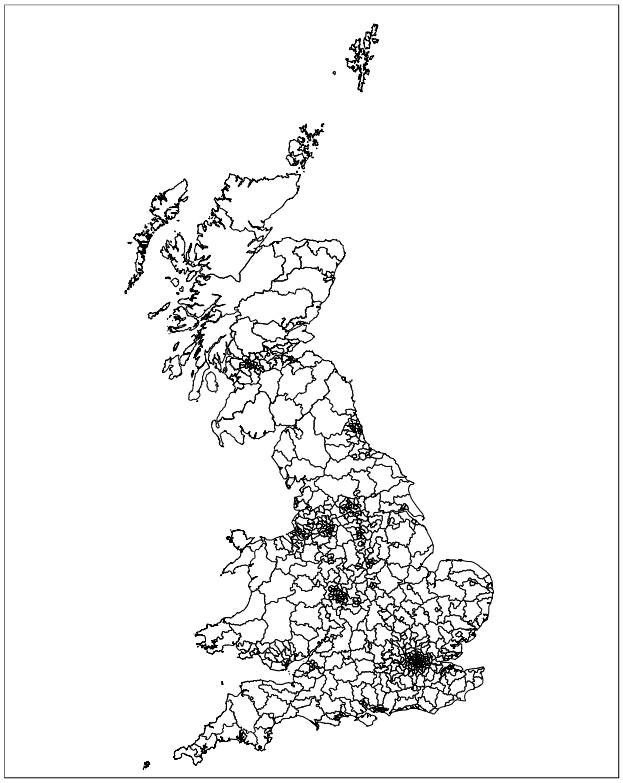

Figure 1. 1996/97 UKGB Parliamentary Constituency boundaries.

The Boundary Commission regulates changes in UK electoral geography. Commissioners, whilst respecting existing boundaries, the local 'sense of community' and so forth, attempt to create parliamentary constituencies with evenly sized electorates, typically in the range of 50,000-100,000 voters. The 652 constituencies used in the election of 1992 were replaced, in 1997, with a new array of 659 seats.

The changes in the underlying electoral geography of UKGBNI posed a number of problems for political commentators in what – early on – was expected to be a relatively 'tight' election:

- Electoral results posted in 1992 could not be compared directly with the boundaries to be used in the election of 1997.
- The Boundary Commissioners created 26 new seats. By definition, there was no historical voting record for the newly created seats, hence voting patterns could only be predicted through imputation.

- Electors, politicians and commentators were largely unfamiliar with the demographic composition and geographical extents of the newly created seats.

Figure 2 illustrates ‘old’ and ‘new’ parliamentary constituency boundaries in an area around Tyneside. Whilst no backdrop data is shown, it is obvious that the changing boundaries cut through population clusters, altering the demographic composition – and hence the voting pattern – of the constituencies.

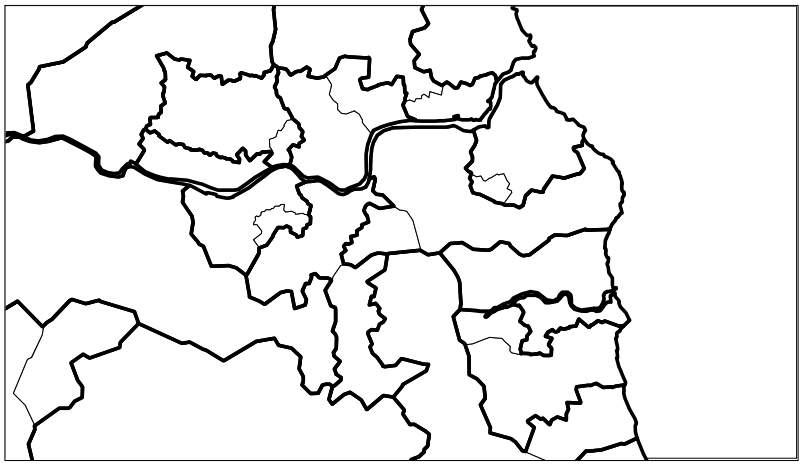

Figure 2. Old (heavy line) and new (light line) parliamentary constituency boundaries around Tyneside.

The Election ’97 website was designed to provide access to information covering the changing political landscape, using:

- A town to parliamentary constituency lookup (overcoming the fact that many electors cannot remember the name of their constituency)
- Sets of image maps for navigation from county through to constituency level
- Virtual Reality 'worlds' showing constituencies in three dimensions, the third dimension reflecting electoral density
- Fully scaleable interactive vector maps of the United Kingdom accessed through a dedicated ‘plug-in’ for Netscape and Internet Explorer browsers

Whilst a technical description of the site and examples of output are given overleaf, there is no substitute for looking at the site, which will remain indefinitely at the URL www.election.co.uk.

Technical Considerations

Most websites rely on HTML files for their content. The Election '97 site – which aimed to provide around 50 information items for each of the 659 parliamentary constituencies – could not operate using a conventional HTML file-based approach.

Instead, data were loaded into a relational database management system (RDBMS) and scripts were written (using Cold Fusion) to access the content in the database. The approach has several benefits:

- Very few scripts are needed to extract the data and format it into HTML
- Data need only change in the RDBMS to be reflected in the output
- Data entry forms can be written which update or insert data into RDBMS tables
- Scripts can easily be rewritten, instantaneously altering the output of any query to the database

Very few hard-coded HTML files were used in the election website. Nearly all 'pages' were in fact Cold Fusion scripts which could, for example:

- Serve different graphics according to sponsor (try accessing the site with the URL www.election.co.uk?sponsor=telegraph)
- Provide text entry boxes, pick lists or other forms of interactivity

The following sections detail the inputs to the database and some of the data preparation necessary to provide the functionality available on the site.

Data Sources

Four weeks prior to the call for the 1997 General Election we were faced with a data collection exercise.

In order to provide the level of content that the site demanded we required:

- 1992 constituency boundaries
- 1997 constituency boundaries
- 1992 election results (including name and proper title of the MP together with the votes cast for all the major parties)
- An estimate of 1997 results based upon imputation of 1992 results
- Geodemographic profiles for each of the 1997 constituencies
- A commentary or sketch for each of the 1997 constituencies

Business Geographics' 1992 and 1997 parliamentary constituency boundaries were used to produce the mapping and database links needed for the site. Whilst Ordnance Survey might have appeared the obvious choice for the constituency boundaries, OS's reluctance to publish Crown copyright data over the Internet prevented us from using the most accurate source of parliamentary map data.

Information regarding 1992 voting patterns and MP's titles came from the Parliamentary Information Office and from the noted psephologist, Robert Waller, who was drafted in to rewrite the sketches given in his Almanac of British Politics (Waller & Criddle, 1996).

Estimates of 1992 electoral results mapped to the new 1997 constituency boundaries were based on Rallings & Thrasher's (1995) work for the television broadcast industry. Permission to use geodemographic data (Super Profiles) and map data on the site came from CDMS and the AA respectively.

Data preparation

Data collection and licensing – whilst time consuming – did not present any particular problems for the team. Data preparation, however, involved considerable work in structuring a relational database system, laying out map views and creating virtual worlds. Processes included:

- Intersecting post town boundaries with 1997 constituency boundaries to create a post town to constituency link. A postcode or postcode sector to constituency link was considered unreliable, since it is difficult to allocate postcodes (themselves positionally inaccurate) to boundaries that are in turn an approximation of reality. The output from the post town to constituency link is shown in Figures 4a and 4b.
- Creating a map for every constituency in UKGBNI by running a MapBasic program outputting WMF graphics files which were subsequently converted to GIFs by Paint Shop Pro.
- Making clickable image maps running from County level down to parliamentary constituency to cover UKGBNI. Maps were based on AA and Business Geographics data displayed in MapInfo software, saved to GIF or JPG graphics formats and subsequently manipulated in Adobe Photoshop.
- Creating virtual reality worlds by parsing MapInfo export files (MIF files) through a bespoke program written in C to output Virtual Reality Modelling Language (VRML) files.
- Formatting Business Geographics and AA map data for use in Autodesk's MapGuide Internet vector graphics software, which was used to provide fully zoomable and selectable maps on the site.

The outputs from this work are illustrated and discussed below.

Interfaces and outputs

The fundamental output of the Election ’97 website is shown in Figure 3. Output consists of a map, political facts and calculations of majorities and swings, political commentary and a geodemographic profile (the latter two items being outside the extent of the screen grab).

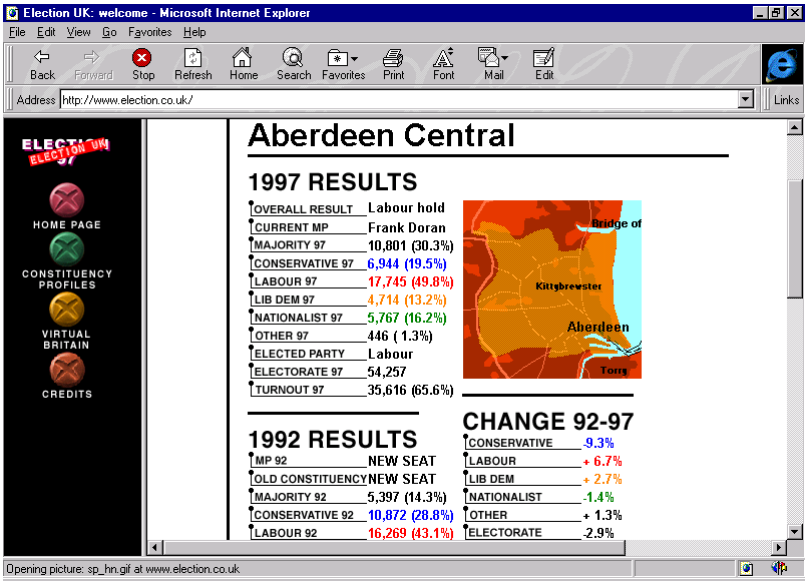

Figure 3. ‘Constituency Profile’ output from the Election ’97 website.

Whilst the eventual output of the site is similar for every constituency, the four navigation mechanisms provided allowed all users – whether or not they had downloaded ‘plug-ins’ – to access the information.

Figure 4 illustrates the interface of the town to constituency link, in which users enter a town to return a list of the intersecting constituencies.

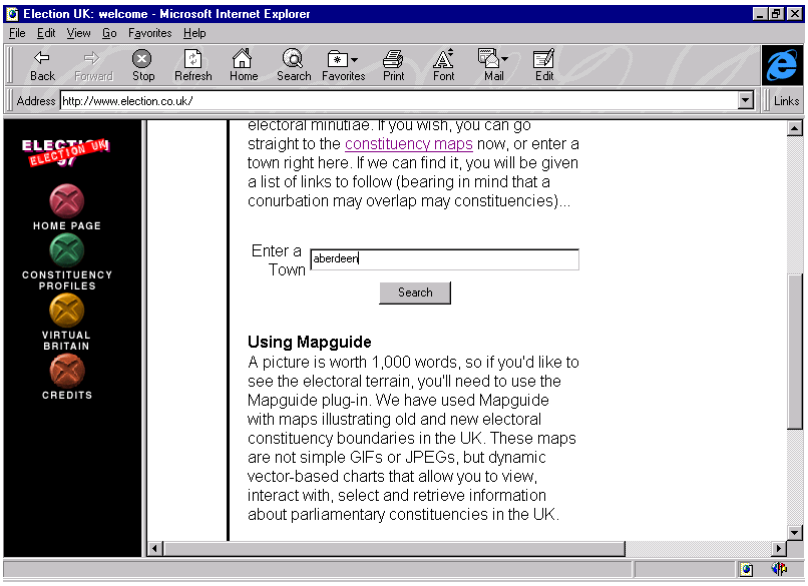

Figure 4a. Retrieving a list of constituencies by entering a town.

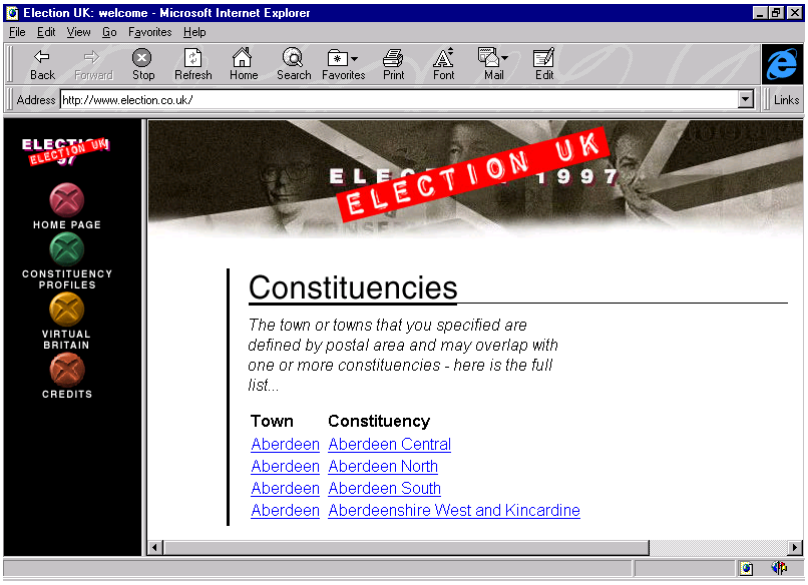

Figure 4b. The list of constituencies returned.

In addition to the simple text entry interface, two highly advanced options were available.

The first, Virtual Reality Modelling Language (Figure 5), represents the electoral geography in three dimensions, the third dimension reflecting electoral density.

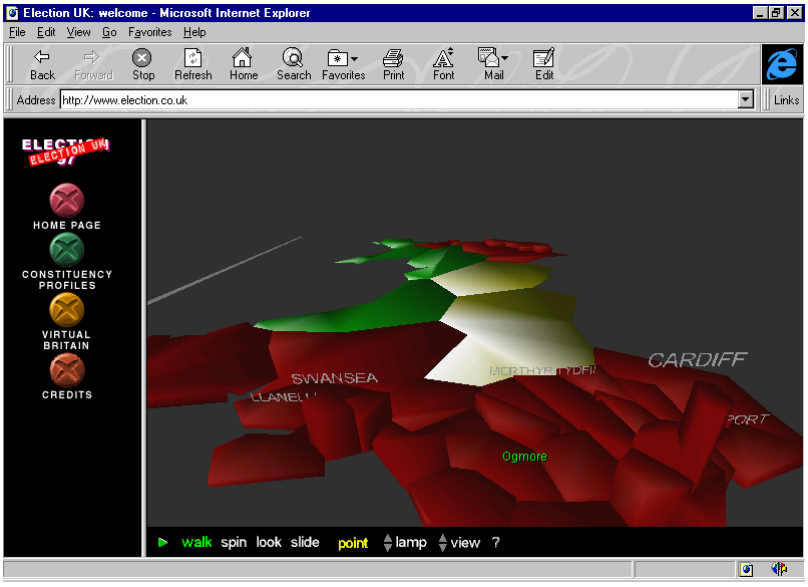

Figure 5. VRML – a 3D interface to geographic information.

The VRML plug-in to Netscape Navigator or Microsoft Internet Explorer browsers (included as a default in version 3 and later of both products) allows the user to ‘spin’, ‘slide’ and ‘walk’ their way through the political landscape. Clicking on a constituency calls the Cold Fusion script to return the constituency profile.

Finally, Autodesk’s MapGuide server was used to send vector graphics as a bitstream to a dedicated plug-in at the browser. Figure 6 illustrates the entry view to the MapGuide screen.

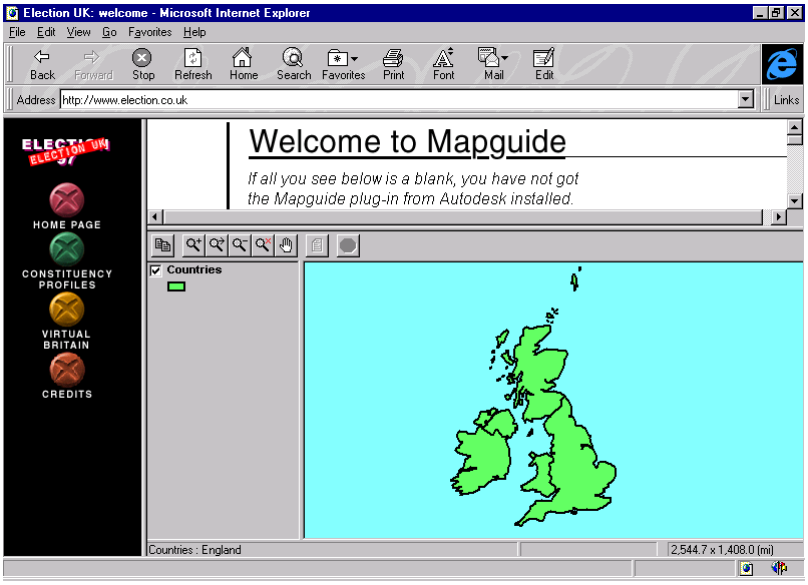

Figure 6. The entry view to the MapGuide pages.

MapGuide was one of the more interesting advances demonstrated in the Election '97 website. The plug-in receives a highly compressed bitstream of vector graphics and rendering instructions from the MapGuide Server to create a highly effective geographic information system within the web browser. The product supports:

- Zooming, panning and Zoom Goto functions
- Scaleable vector graphics with user control of map layers
- Selection and multiple selection of map objects
- Reporting based on map selections

Figures 7 and 8 illustrate a zoom-in to the Manchester region shaded first by 1992 election results and then by 1997 results.

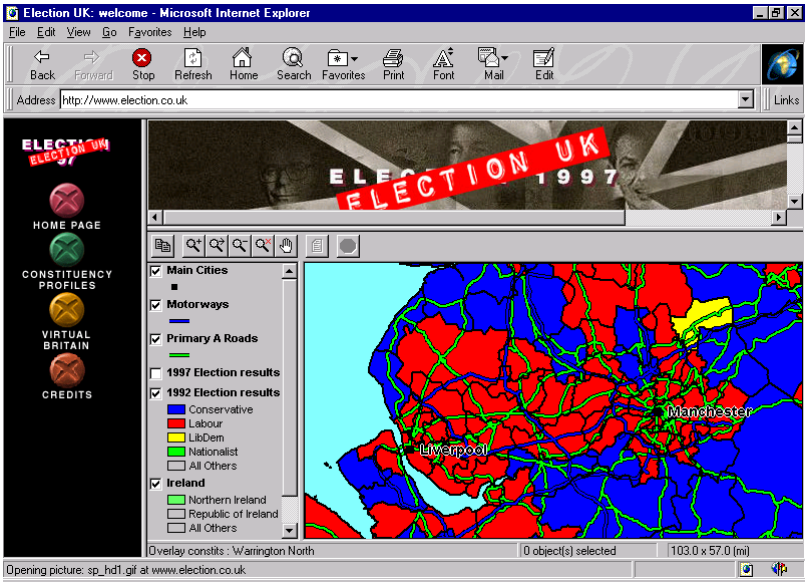

Figure 7. 1992 election results around Manchester.

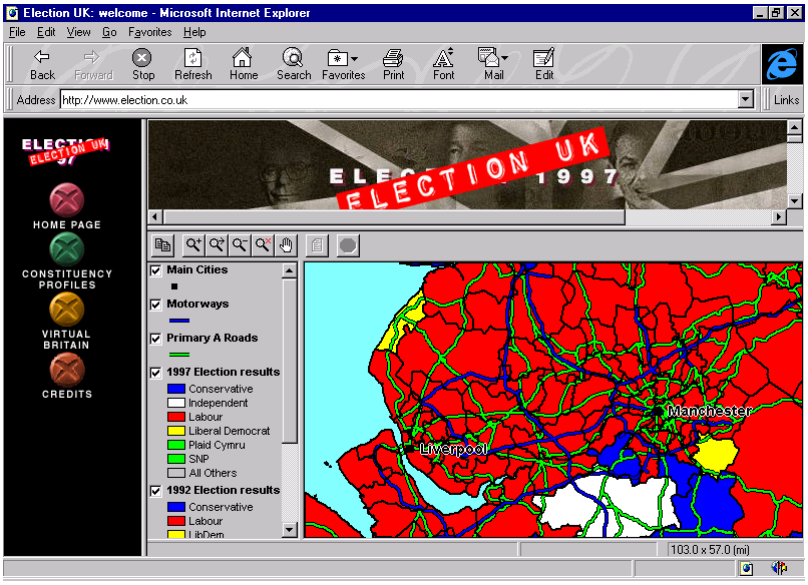

Figure 8. 1997 election results around Manchester.

The combination of interfaces provided ready access to the wealth of information held in the Election ’97 database.

In the one month period between the launch of the site and the election results being posted, the website attracted over four million hits. A detailed analysis of the log files captured by the web server will shortly be posted on the site.

Conclusion

The UK General Election of 1997 provided a unique opportunity for Business Geographics to create a website with a high level of information content, much of it geographically related.

Whilst previous attempts to display geographic data over the Internet have been hampered by old-fashioned access mechanisms, the invention and development of the World Wide Web has created a range of attractive, usable interfaces for querying map-based data.

The interactive data access methods used on the Election ’97 website can readily be adapted to many other information delivery applications, whether these are over the publicly available Internet or a protected company intranet.

Business Geographics expects that Internet and intranet based geographic information systems will generate substantial benefits in usability and data distribution over older, desktop-based, GIS software products. The company expects to be at the forefront of these developments.

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