DUTCH ATLAS INFORMATION SYSTEM

Using the Internet for electronic atlas data retrieval

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Abstract

One of the main drawbacks for atlases is their constant need for updating. Atlas producers always face the dilemma when to invest in publishing a new edition . Therefore there has been a search for systems that could simplify the process of updating. On their introduction, electronic atlases seemed to offer this possibility, yet updating them usually still involves producing a complete new edition.

This paper describes tests on a system of distributing electronic atlas data by means of the Internet, thus allowing publishers to be able to provide up–to–date information against limited costs. The system proposed here does only use the Internet for providing the user with data that needs updating. The electronic atlas itself is an application that runs locally. The advantage of this is that the transfer of large amounts of information over the Internet is avoided, making the system fast and cheap, even when using a modem connection. Thus, sophisticated multimedia techniques can be used for the presentation part of the atlas while the data presented can be kept up–to–date by frequent referral to external databases on the Internet.

To evaluate the suitability of such a system, a demo application was prepared. This Dutch Atlas Information System (DAIS) was constructed using a multimedia authoring product called SuperCard and Marionet, a script-level interface to controlling Internet communication.

DAIS lets one produce thematic maps of a multitude of socio-economic data, using various methods, such as choropleths, proportional symbols and chorochromatic maps.

Updating atlas information

One of the main drawbacks of any atlas is the fact that a significant part of the information it offers will be already out–of–date the moment it appears in the shops. This is especially true for thematic maps of fast changing information, such as socio– economic data. But recent events have shown that topographic information can also change at an alarming rate. At the time the Dutch firm of Wolters–Noordhoff were preparing the 51st edition of their Bosatlas (a well known school atlas), war was still raging through former Yugoslavia and their depiction of this part of the world was therefore sure to be outdated.

When trying to keep their atlases as accurate and up–to–date as possible, producers always face this dilemma: Do we invest heavily to publish a new edition now, taking the risk that users do not see the need or do not want to spend money for a up–to–date edition? Or do we wait and then risk losing part of our market because users perceive the product as outdated?
To solve this dilemma, there has been a search for systems that could simplify the process of updating and thus reduce its costs. In the past, this has resulted in solutions such as loose–leaf atlases and softcover additions, but none of these turned out to be a success.
When electronic atlases started to appear on the scene, it was often stated that these would offer easier and cheaper updating.

Updating electronic atlases

For some years now, electronic atlases have been evolving from a experimental and research phase to maturity, taking their place on the market as alternatives or additions to paper atlases.

Electronic atlases appear in many different forms and formats. Kraak and Ormeling (1996) discern three types of electronic atlases: View–only, interactive and analytical atlases. The first is a simple collection of static maps, through which the user can browse, thus giving user possibilities similar to traditional paper atlases. An example of this is the Electronic Atlas of Arkansas (Smith, 1989), one of the first on the market. The second type, such as the InfoNation atlas (Electromap, 1991), offers a mapping environment were the user can control the way the data is mapped to a certain extent. Even more sophisticated interactivity is offered by the analytical atlases, which offer a range of data manipulation tools and even GIS–like functionality. This gives almost unlimited possibilities, but at the same time makes these systems unsuitable for beginners.

Electronic atlases are subject to the same "instant out–of–dateness" as their paper counterparts. They have the advantage, however, of being much easier and thus cheaper to update. Let's take for instance the changing of a border between two states.
In a printed product, this would usually involve totally redrawing one or more maps, making new colour separations for the affected pages and printing these. Thereafter these pages can be issued separately or incorporated in a new edition of the atlas.
In an electronic atlas, only the border would be changed in the files holding the two countries involved, and the updated files can be issued directly to the users. A new edition therefore involves relatively little effort and costs.
The problem remains how to get the updated information to the users. Although CD–ROMs, the most common media for electronic atlases, are relatively cheap to produce, making them available to all users is not so easy and here the same dilemma as de-

scribed for traditional atlases arises: When to publish a new edition and for what price?

Recently we have seen the emergence of a new factor in all this: the Internet. This can be defined as a network of computer networks based on the TCP/IP protocol, as a community of people who create and use the network, and as the collection of resources stored on those networks (Peterson, 1996). Today the Internet has become a household word and is used to connect millions of computers.

The Internet offers an alternative to publishing electronic atlases in the same way as their paper counterparts. Instead of stand–alone products, sold on CD–ROMs and running on the customers PC, one can offer atlas information directly on the Internet. In light of this, the authors propose to classify electronic atlases according to the nature of their data–storage: Stand–alone atlases (where all data is stored on the user's PC), on–line atlases (where all data and the application itself reside on the Internet) and hybrid atlases, combining the features of the other two.

Stand–alone electronic atlases

This type of electronic atlas is the oldest and still by far the most common. It comprises electronic atlas software running on a local computer system using data that is either incorporated in the application itself or resides on the same computer in some form, as seen in figure 1.

As with paper atlases, the data delivered with the system will partly be outdated and will become more so over time. Some systems allow the user to incorporate updated or third–party datasets, but these need to be purchased separately on CD–ROM or floppy disk.

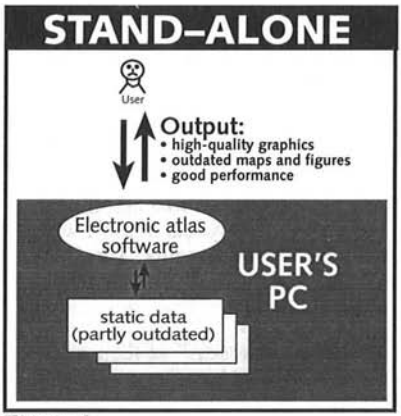

Figure 1.

The state of the art in multimedia technology allows these systems to be highly interactive and user–friendly and offer high–quality maps and other graphics. Because it runs locally, modern computer hardware, powerful yet cheap, can ensure a good performance of the system, resulting in fast response times and smooth running.

On–line electronic atlases

With the emergence of Internet, on–line electronic atlases have become a possibility as well as a reality. Here the electronic atlas software resides on the computers of the atlas producer itself. The data on the system can be kept as up–to–date as possible or there could be links to other sites were the latest figures can be found, such as National Statistical Services.

As can be seen in figure 2, the atlas system co-operates with a server program that supports the HyperText Transfer Protocol (HTTP), which is the standardised communication protocol for the Internet. The software usually runs on powerful mainframes or workstations, because many users can be connected to the server at the same time,

resulting in high data transfer volumes. On the user's side, only some type of HTTP–client software
is needed, for example a browser program such as Netscape or MS Explorer. A major advantage is the fact that this client software is available for virtually any type of computer, thus giving true cross–platform capability.
The functionality offered by the system can vary from offering simple static maps to an interactive mapping environment. Good examples of this are the National Atlas Information System of Canada[2], which is using proprietary software and the IRIS site[3], which utilises Java applets.

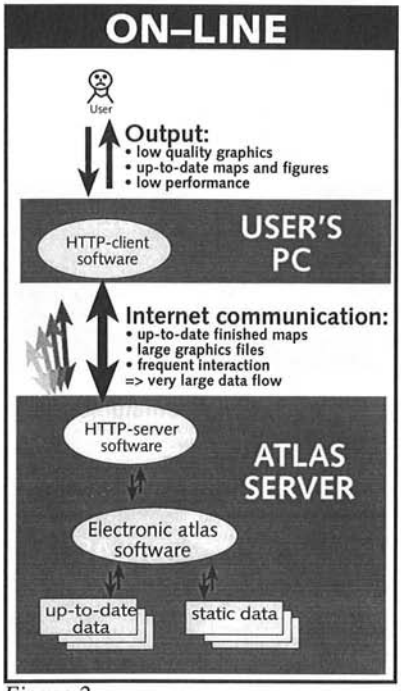

Figure 2.

The problem with this set-up is the large data flow between the user's PC and the atlas server. Transferring finished maps over the Internet involves sending large graphics files and high interactivity and other multimedia features such as animation and sound add up to sending many kilobytes over the Internet.
Here the weak point of the Internet interferes: It is presently a victim of its own success. The present hardware infrastructure does not accommodate the large crowds that are currently travelling this "information highway".
This is resulting in frequent "traffic jams", especially when using a modem connection, as the majority of users do. As long as technology does not offer any solutions for this problem, the only way to make such a system feasible is reducing the dataflow as much as possible. This can be accomplished by offering only low–resolution graphics and limited multimedia functionality. Even then, the performance of such systems is considerably worse than that of stand–alone systems.

A logical development of the two approaches mentioned above would be to combine some strong points into a system that offers both up–to–date information and a good performance with full interactivity and multimedia functionality. This can be achieved in a hybrid system, using both local electronic atlas software and Internet communication.

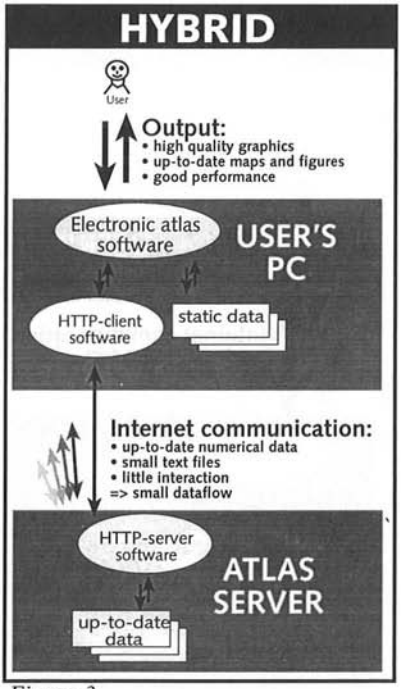

Figure 3.

Hybrid electronic atlases: using the Internet for electronic atlas updating

This approach, visualised in figure 3, offers "the best of both worlds": The data that is subject to frequent change, such as socio–economic figures, is only stored on the atlas server. Every time the electronic atlas software needs any of this, it communicates with the atlas server and receives it over the Internet. This data consist of small numerical data sets only, thus keeping the data flow to a minimum.
Data that is more static in nature is kept on the user's computer, but the system keeps track of the validity of this by occasionally checking if an update is available. If for example there has been a border change, it can download the updated boundary files from the server. The advantage of all this is that the transfer of large amounts of information over the Internet is avoided, because the only data transferred frequently are relatively small sets. Updates of larger files only occurs occasionally. This makes the system fast and cheap when using a modem connection. Thus, sophisticated multimedia techniques can be used for the presentation part of the atlas, while the data presented can be kept up-to-date by frequent referral to external databases on the Internet. The information available is not limited to the one database kept on the atlas server, in theory all the data on the Internet could be used. To enable this however, standardisation of the data–formats would be required.

The Dutch Atlas Information System

In order to evaluate the feasibility of a hybrid electronic atlas system as described above, the Cartography department of Utrecht University has constructed such an application. This, the Dutch Atlas Information System (DAIS)[4], demonstrates the concept by offering a multimedia front–end to the user with which he or she can construct thematic maps of the Netherlands from a set of up–to–date figures.

In order to facilitate fast prototyping as well as a flexible multimedia environment, the DAIS application was constructed using a multimedia authoring product called SuperCard (by Allegiant Technologies, Inc.). Started as a extension of HyperCard, the authoring application that Apple shipped with their Macintosh computers, it has developed into a powerful tool for assembling and delivering interactive multimedia content and custom applications. With the forthcoming SuperCard Runtime for Windows, projects can also be distributed to DOS–based users.

SuperCard projects (and other authoring packages such as Apple's HyperCard and Macromedia's Director) can be made to act as HTTP–clients by using an add–on pro-

gram called Marionet (also by Allegiant), which offers a script-level interface to controlling Internet communication from within the multimedia environment. Thus, the DAIS application running at the user's computer can issue requests for information and files to the atlas server at Utrecht University. This atlas server uses straightforward HTTP– server software called WebStar, running on an Apple Macintosh. This handles the information requests coming in from the DAIS software and sends out files with socio–economic data sets and when necessary updated boundary files.

DAIS lets one produce thematic maps of a multitude of socio-economic data, using various methods, such as choropleths, proportional symbols and chorochromatic maps. All data are stored together with some meta-data, such as the nature of the data, the collection date, if it absolute or relative, etc. Thus, a user with no cartographic background can let the system decide on which mapping method to use, which graphic variables, the number of classes, the classification scheme, etc., In this way, the construction of "wrong" maps, such as choropleths from absolute data, can be avoided. Users with more skills can override all default settings with their own preferences, providing a highly flexible mapping environment.

Because it is meant to be a demo– and test–site, not a finished product, the system is constantly under (re)construction and the functionality will be subject to frequent change. Therefore, the best way to get an idea of its content is to visit the DAIS home–page (at http://kartoserver.frw.ruu.nl/html/dais/dais.html), download the software and test its usefulness for yourself.

Conclusion

DAIS has in the authors opinion proved the feasibility of hybrid electronic atlases. It is meant for demonstration purposes only, with no intention of becoming a finished or even a fully functional system. But even in its current form it shows that by utilising this set-up, the user can be offered an attractive, responsive atlas environment with high interactivity and good performance, resulting in low–cost, high–quality maps which, most important of all, depict up–to–date information.
The work presented here has only touched upon the technical implications and the merits to the users. Certainly some work is needed to evaluate the *economic* possibilities of these kind of electronic atlases as well.

References

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Smith, R.M. (1989). *Atlas of Arkansas*. Fayetteville, University of Arkansas Press.

Notes

1. All trademarks are acknowledged
2. http://ellesmere.ccm.emr.ca/wwwnais/wwwnais.html
3. http://allanon.gmd.de/and/java/iris/Iris.html
4. The DAIS software can be downloaded from its home–page at http://kartoserver.frw.ruu.nl/html/dais/dais.html
   This site also offers more information on the system as well as an electronic version of this paper.