BRAVE NEW CARTOGRAPHY

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„SZÉP ÚJ" TÉRKÉPÉSZET

Összefoglalás

A huszadik század második felében sok változás történt a különféle tudományterületeken, s ez alól a térképészet sem kivétel. Ebben a rövid tanulmányban ezen folyamatok főbb állomásait szeretném felvillantani, s kísérletet teszek a közeljövő változásainak előrejelzésére. A térképészeti technológiák változása magára a térképészetre is visszahatott, ennek függvényében hogyan is jellemezhetjük ezt az új térképészetet. Ezen új technológiák mindenki számára előnyösek lesznek vagy olyan veszélyeket jelentenek, amelyekre a szép, új világ kifejezést szokták használni? Hogy ezen kérdésekre válaszolhassak áttekintem az elmúlt 50 év legfontosabb technológiai változásait a térképészetben.

Summary

The second half of the 20th century caused big changes in many areas of sciences, including cartography. This paper summarizes the main challenges of this process and tries to forecast the trends of the future development. The changes of the cartographic technologies react to cartography itself – but how can we describe this new cartography? Are all these new technologies are advantageous for us or some of them may cause a brave new world? To answer these questions the author reviews the most important technological advances in cartography in the last 50 years.

Aldous Huxley wrote a satirical piece of fiction and not a scientific prophecy in 1932 in his famous book, „Brave New World". Even the epithet „brave new" has suggested something positive, but after Huxley's famous book using these two words together means something totally different. Are these adjectives characteristic of the state of the art of cartography in the meaning Huxley used?

Changes at the beginning of the digital era

Cartography – as most sciences – is continuously changing. The change is the essence of science. If you check the changes in cartography, we may realize that in the last 50 years the level of changes has dramatically increased.

There were important changes in the map producing techniques in the second part of the 20th century. During the 1950s, offset printing became the most popular form of commercial printing as improvements were made in plates, inks and paper, maximizing the technique's good production speed and plate durability. The largest change was the implementation of the digital technologies (making the previous technical process unnecessary): desktop publishing and its inventions (image setter, laser printer, software). However, there were more specific changes at that time in cartography.

Much of the world was poorly known and mapped until the widespread use of aerial photography following World War II. Modern cartography is based on a combination of ground observations and remote sensing. The satellite images became the useful tools of mapping: giving the chance to map areas that are difficult to map with ground techniques and to start making the secrecy of topographic maps less relevant. Satellite images have given access to information in the whole world, and this makes the global mapping a reality. The main difficulty is the efficient use of this information: satellites provide so many information (pictures), which are difficult to use.

Nowadays, ground observation is used primarily for verifying the details of maps made using remote sensing techniques. Maps generated only by ground observations are still important but are usually for limited distribution: they are local and small scale (e.g., architectural plans and land surveys).

Data used to produce highly technical maps or maps made for wide distribution are typically collected with aerial photogrammetry or remote sensing from low Earth orbit.

GIS

GIS is a complex technology that includes the data input processes, the storing of information in a computer system, the checking and analyzing of data, the manipulation, the extension and the graphic representation of geo-referenced data.
The data integration and analyzing capabilities make the GIS different comparing to other information systems.

Maps are used for centuries to the representation of spatial data helping the better understanding of the spatial relationships for the users. The digital manipulation of spatial data got great importance in the last decade. The environment in which the users interpret the maps has dramatically changed providing the deeper understanding and analyzing of connections.

The GIS allows the integration of data derived from various sources. The GIS can test user models on the stored data and the users may try to get answers to their special questions. The intense efficiency of maps in the communication of information is enabled by the usage of mapping rules („the map language").

The maps created in GIS software are mostly not processed cartographically, so these maps generally do not implement the cartographic rules strictly. The maps in GIS are

created automatically, therefore the interpretation of these maps is difficult for the normal users; the main purpose of GIS generated maps is decision making.

Cartography is not a part of GIS and GIS is not a part of cartography (this is my personal view, and other GIS experts and cartographers may have a different opinion – however, such a discussion does not make too much sense). Nowadays, most of the new maps are generated from data, and every country works on digitizing their state topographic and cadastral maps. Most of our data we are using for map production is available in digital form. The logical consequence is that most (if not all) maps have to be created by using GIS techniques.

However, the mapmakers have to be familiar with the new techniques, because the GIS based map making requires different type of knowledge.

Morita (2004) defined the differences between GIS and maps. GIS means data input, database building, data analysis and data output for spatial information. Mapping includes not only map making, but also map use and map communication, as it considers the interaction between map, spatial image and the real world. GIS is system function oriented, whereas map is human-oriented, including spatial cognition, decision making and communication.

The higher education in cartography has conformed to the new circumstances, and in most places not only the curriculum has been modified, but the name cartography has been removed from the curriculum's name.

GPS

The Global Positioning System (GPS) was designed and built and is operated and maintained by the US Department of Defense. It used to be known as the Navstar Global Positioning System and was first brainstormed at the Pentagon in 1973 as they were looking for a satellite system that was error-proof. In 1978, the first operational GPS satellite was launched. In 1993, the 24th Navstar satellite was lunched into orbit, completing a network of 24 satellites. With a GPS receiver, which is not a very expensive device, we can instantly define our location on the planet within a few meters (or depending on our device and aims a little bit more precisely). The process of the definition of geographic location does not require special skills for the users, but the use of the result needs additional skills to interpret.

This new technology was made possible by a combination of scientific and engineering advances, particularly development of the world's most accurate timepieces: atomic clocks that are precise to within a billionth of a second. The clocks were created by physicists seeking answers to questions about the nature of the universe, with no conception that their technology would some day lead to a global system of navigation.

In 10 years time GPS receivers became daily used devices: they are also available as built-in-devices in mobile phones, as interfaces to laptop and handheld computers. GPS has totally changed the terrain navigation; in most areas, the traditional ground techniques havd disappeared, because the use of GPS is fast and very easy.

The increasing number of GPS users would like to use correct, updated maps. The coordinates provided by the GPS are not enough for the location and navigation, we need digital maps, which are completely geo-referenced. The update is the most difficult issue. Japan and Korea are the most developed countries which extensively use all available techniques. Europe and North America are less developed in this sense; in these countries, people are aware of privacy.

Internet

Offset printing made it possible to produce thousands of identical maps in a short time. Internet has made it possible to simultaneously „print" and distribute thousands of maps every second.

If we check the statistics of the most frequently used words in Internet search engines, the word „map" is among the first ten most frequently used terms. Internet users are looking for maps, and if demands are issued on the web, there are services to fulfill the demands.

The young generation uses Internet as the main source of information, so they are looking for maps for the first time on the web. These people are also very open to buy and use new devices, like GPS receivers, but the device itself is not attractive enough. GPS receivers became more popular where more detailed and updated maps became available for car navigation or outdoor activities.

GPS can easily collect geographic data, but the problem is the visualization, the representation of our data. To visualize data requires some experience, and for most users this is quite difficult. However, the main problem is the lack of easily available cartographic data. In many countries (especially in Europe), the state topographic and cadastral maps are not freely available.

Peterson (2005) is highlighting the fact that Internet is redefining how maps are used. Maps on the Internet are more interactive. They may be constructed by interacting with an online database, thus engaging the map user on a higher level than is possible with a map on paper. In addition, Internet is making it feasible to distribute more easily different kinds of cartographic displays such as animations. Internet presents the map user with both a faster method of map distribution and different forms of human-map interaction. The combination of maps and Internet is a significant development in cartography, not only for improving the distribution of maps but also because it makes a more interactive form of mapping possible.

Detailed global maps became available only in the past few years. Services like GoogleMaps (GoogleEarth, a stand alone application), Microsoft VirtualEarth etc. became very popular. Users can mark location points, share it with others, or find location based services.

What are the cartographers for in this new age?

Cartography and the GIS cannot resist, and they follow the common tendencies. Both areas use the opportunities of Internet more intensively, because the demands of users are changed rapidly: everybody wants to be present on the web, everybody is looking for information on the web. And most users want free maps.

The mobile communication is a new challenge for our profession: the maps and applications optimized for the web are important because cartography may target a new audience which was not a map user previously.

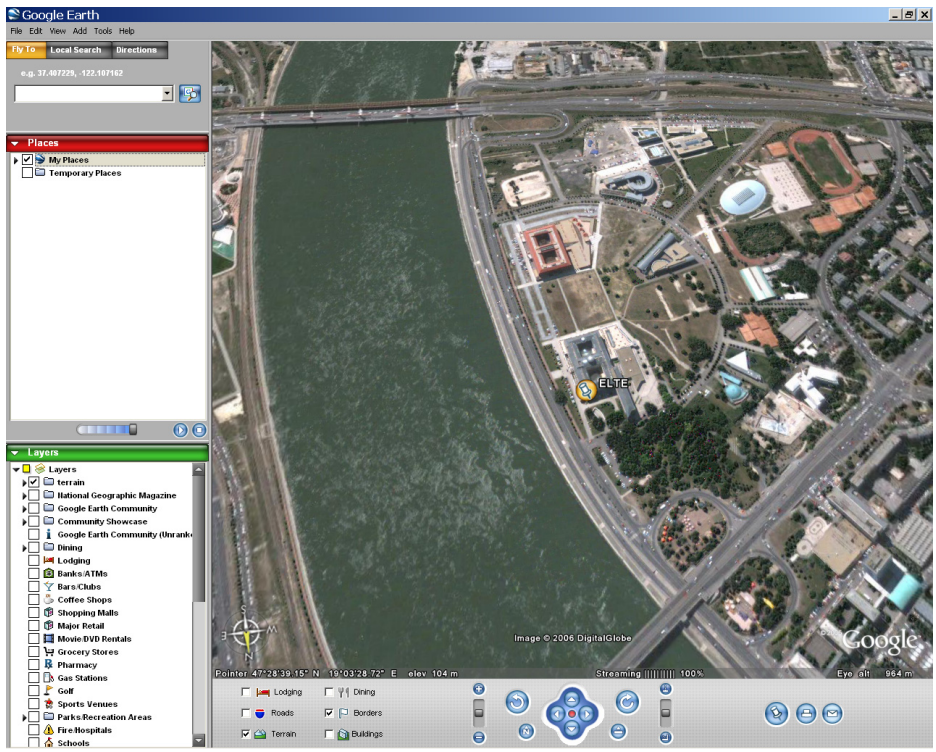
There are additional ideas for cartographers to realize extending the digital map to the third dimension. The third dimension does not simply mean the height of points (elevation model), but in cities a real 3D representation is expected (the real height and outlook of buildings).

Software may contain cartographic intelligence to help the non-expert users, but creating programs making use of the cartographers' experiences is necessary.

Location based services are offered to the users and maps are the key elements of this service. The users have special devices with limited screen dimensions and resolution, so the maps have to be re-designed for these devices. The most important and most difficultly

„realizable" function is the updated map. The continuous update of the maps can give enough work for the cartographers: we have to develop methods and devices which can make this process as efficient and fast as it possible.

Services like Google Earth, Windows Live Local, MS Terraserver give new type of maps for the users, such as global maps and satellite images. The only question is that how the work of cartographers is financed. If the cartographers are creative enough, they may invent new services, they may pique, and they may generate new demands.



Eötvös Loránd University, Lágymányos Campus in Google Earth (oblique view from north)

Users want current maps, but they are apprehensive of being observed by the big brother. Nobody is keen on being controlled, but some location based services require the contribution of users to allow defining their location and sharing it with others. This must be a voluntary decision to keep the privacy. To share my actual (or any previous) location has to be my decision.

Cartographers have to create methods and techniques to create as up-to-date maps as and possible as efficiently as possible. This is the main challenge for us in the near future.

What about Huxley's brave new world?

Brave New World is centred on control and manipulation. Do the maps of our ages help the „world controllers" (service providers, large IT companies) to get your goal?

I hope cartography with the help of Internet can make the world a little bit better. We have tools (software) and data available, so every user (cartographer) can create their own map and publish it on the web. The world is really under control, but we control it ourselves (leastways we hope it).

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