

SOME OBSERVATIONS MADE ON THE DEVELOPMENT OF GIS

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Abstract

I am introducing in this paper some remarks on a research work for my thesis on the subject of GIS, its development and the forecast about Geographical Information Systems (GIS) entering the 21st century based on the development of the components of GIS such as: personal computers, work stations, software, hardware, RDBMS, etc.

Keywords: artificial intelligence, CD-ROM, client oriented approach, RDBMS, extra-terrestrial, GIS, information technology (IT), integral systems, object oriented work station.

Introduction

We are able to obtain nowadays good results of physical positioning on a global scale using extra-terrestrial methods, such as GPS. However, we still fail to achieve these results in real time with short delay, or achieve micrometric variations on short time intervals on the earth, such as data on continental drift and flood alerts. Absolute accuracy can never be achieved due to constraints in completeness of computed data, observed data and equipment used. Unless we develop better equipments, methods in order to achieve better accuracy, GIS will have its limitations.

What we need are faster computing machines for larger amounts of information to obtain real time with no delays results. Consequently, we will have one data bank for the whole earth at our fingertips. Although we have taken a big step the last decade in computing equipment and methods let us hope that information technology will advance in velocity and not just in speed, that is, it will have a direction as well. Thus we will be able to obtain a four dimensional product on our environment. Using GIS tools that will have characteristics of a quasi-artificial intelligence and with object oriented databases we will enter the 21st century with new hope. These above issues and applications are explored in my thesis for future prediction of the GIS destination.

A brief synopsis is given about several systems in the broad field Information Technology as related to land management from its conception in the late fifties through the nineties and the accelerated developments that take place recently and will get to enter the 21st century with a new thrust.

It took decades for information systems to make a reliable and meaningful advancement (SÁRKÖZY, 1995). This trend continues and the time it takes now for new developments is reduced drastically to few years only. If the tendency is like that we can expect changes to occur as fast as several months, in the Geographic Information Systems.

As we drive faster we have to pay attention more carefully to the small details and establish guidelines so that we enter the new century with confidence that we are all prepared with the best knowledge, equipment, methods, precision and people to make our world better than our forefathers built it for us in the current century.

Past, present issues and prediction to the future will be discussed on current problems in environmental resource and management applications that concern governments, local authorities and the private sector. The question we have to ask ourselves, whether we are not going too fast just because technology is available and we should have rigid policies before we take a ride on this computer monster and use it efficiently.

On my research about GIS development it is heavily reflected by the development of PCs therefore I am bringing here the highlights of Personal Computers for the benefit of the theme I am studying.

The Personal Computer is becoming the most useful and versatile appliance of all the other machines at home. It can pay the bills, send messages all over the world and can get you a degree long distance. But most of all it can handle GIS databases and solve our environmental problems using data obtained on ground or extra-terrestrial methods such as: remote sensing and GPS.

The PC has evolved over the past 25 years from a game for hobbyists to virtually household appliance. For example, now in one of three US homes own at least one PC.

In the sixties a disk was developed to solve information in Random Access Memory (RAM). At the time a lot of data was available electronically. However, until then only sequential access mode was available for data processing, with the mentioned disk, graphic display mode was also introduced.

In 1969 a team of computer scientists figured out how their computers using phone lines from the telephone company, e.g., AT & T could talk to each other. These modes laid the foundation for the internet concept.

In 1977 microcomputer systems manufactured by Digital Equipment Corporation, VAX machines were introduced and range from desktop personal computers to implant networks. The latter were used for information processing in large businesses, colleges and organisations. These network computers were the largest, fastest, and most expensive class of computers before the microcomputers were introduced. This idea is further developed these days and we are entering an era of so-called network of networks. The same time approximately in 1977 Apple II designed the first computer as PC by two college dropouts. This easy to use PC became the state-of-the-art and sold at about 1300 Dollars. The very same PC still was used in schools eighteen years later. The BASIC was created by Gates and Allen. This highly accessible and widely used computer language, launched Microsoft in Redmond, Washington.

In 1978 Texas Instruments introduced popular Speak and Tell that pronounced 165 words. It is the first talking toy to use speech synthesiser chip. VisiCalc was also introduced, as the first electronic spreadsheet for Apple II microcomputers to perform both simple and complex financial computations.

In 1979 CompuServe, the first on-line information service started with 1200 subscribers and offers only electronic mail and a few databases, now subscribes 2.4 million. Subscribers can reference the CompuServe network via the common telephone system.

In 1980 work stations by VAX and graphic possibilities were developed and still remain the backbone for GIS operations.

In 1981 IBM-Big Blue's, PC storms the market, derived from the company's use of a distinctive blue point on its mainframes and other equipment. It is run by a disk operating system, that becomes the industry standard. Lotus 1-2-3, the spreadsheet programs utilising visuals such as graphs and pie charts and database management.

In 1982 Compaq Computer Corporation takes advantage of the availability of parts used in IBM PCs and created the first clone and portable computers.

In 1984 Mac Debut, Apple launched the Macintosh first PC with built-in sound, sophisticated graphics, click-on icons, a mouse and a user friendly operating system.

In 1985 Windows, Microsoft unveils Windows, as a graphic-based operating environment, lets users manipulate icons with a mouse to control the computer. Commodore's Amiga of Commodore Business Machines, Inc. (manufacturer of Amiga family of microcomputers and several other microcomputers including the popular Commodore 64), its sharp graphics made it a favourite among future programmers.

In 1990 Prodigy, the largest on-line services in the United States, a joint venture of Sears and IBM start up with 450,000 subscribers. It is an on-line information service that offers business, shopping news and information services. Innovative features include the use of a bit-mapped graphical user interface. This bit map is a data structure that describes a bit image being held in computer storage. Each picture element 'pixel' is represented by bits stored in memory.

As the principle of GIS depends heavily on huge memory, it is important to pay attention to the fact that bit-mapped graphic is notorious for using lots of memory. It takes up to one million bytes of memory and may be required to store a bit map for a high resolution screen display or to store a full scanned image.

In 1993 CD-ROM takes off as a rocket. The disc that contains sound, text, pictures and graphics help fuel the sales of multimedia computer systems. Contents are typically an entire encyclopaedia on a single CD. Internet the computer network now in the media highlight has more than 20 million users world-wide.

In 1995 Wildfire developed a filter that will be able to handle faxes and e-mail like telephone calls.

These days the client server architecture is a new trend (SÁRKÖZY, 1995) to specialise in pin point areas. PCs have reached the capacity of work stations of five years ago. The speeds of PCs are just at the footsteps of the work stations.

New forms of computer systems are involved in Artificial Intelligence (AI), natural language, expert systems. These are groups of technologies that attempt to emulate certain aspects of human behaviour, such as: reasoning and communicating as well as to imitate biological senses, including seeing and hearing. This advanced AI, also referred to as the fifth generation computer systems, are expected to represent the next quantum leap in computer technology.

We are entering a new era of faxes, e-mail, voice mail, on-line news, etc. We are jammed with information like never before. Wildfire is just one of those filters as offered by Nick d'Arbeloff, vice president and co-founder of Wildfire communications, in Lexington, Mass, USA, is described in the Newsweek, dated February, 27, 1995 (Newsweek, 1995). In the next 12 to 18 months, says d'Arbeloff, Wildfire will be able to handle e-mail and faxes in a way as it handles telephone calls.

It is a computer revolution at its tenuous stage. We are moving to a cybernetic age. The specific impact on the environment applications will be discussed in the thesis, how to ensure that its benefits will be broad and benign.

Techno judge, a computer technology that can project exhibits in court hall while the trial is on in real time and present evidence, the witness may point on objects that are to be considered by the jury at the murder trial of O. J. Simpson being now on headlines in USA as shown on CNN (CNN, 1995a). The aforementioned technique could serve as a leap in GIS applications where evidence has to be presented in court concerning tax invasion. When property owner expanded his construction without building permit and it was discovered only years later by photogrammetric means.

In a medical application GIS may be applied by mapping the biological cells of a patient who is waiting for an implant of a potential donor who dies in an accident and leaves his body for saving other lives. The computer is given the task to match between the two.

Another current GIS application should be the study of environmental refugee trends (CNN, 1995b), this is a phenomenon of large populations migrating from their close neighbourhoods due to drought or loss of forest. This takes place in South Africa and the trend expands and will get a greater intensity in the future. The problem is even more severe due to live stock that continues the process of deteriorating the environment. Solutions suggested are by replanting the forest and adding water to the subject area. The third world poverty is too much of a luxury that we afford to ignore. GIS tools can be applied in data capture and later analysing the collected data files.

Developments will continue to take place in GIS and Informatics with the help of PCs, work stations, hardware, software, RDBMS, etc. These all will have an impact on forecasting the GIS trend as it approaches the end of the century and well beyond it onto the twenty first century.

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