



ESCWA
for Regional Integration

Information and Communication Technology Division

Round Table on ICT as an Enabler for Economic Development

29-30 April 2004

UN-House, Beirut, Lebanon

Distr.
LIMITED
E/ESCWA/ICTD/2004/WG.1/6
27 April 2004
ORIGINAL: ENGLISH

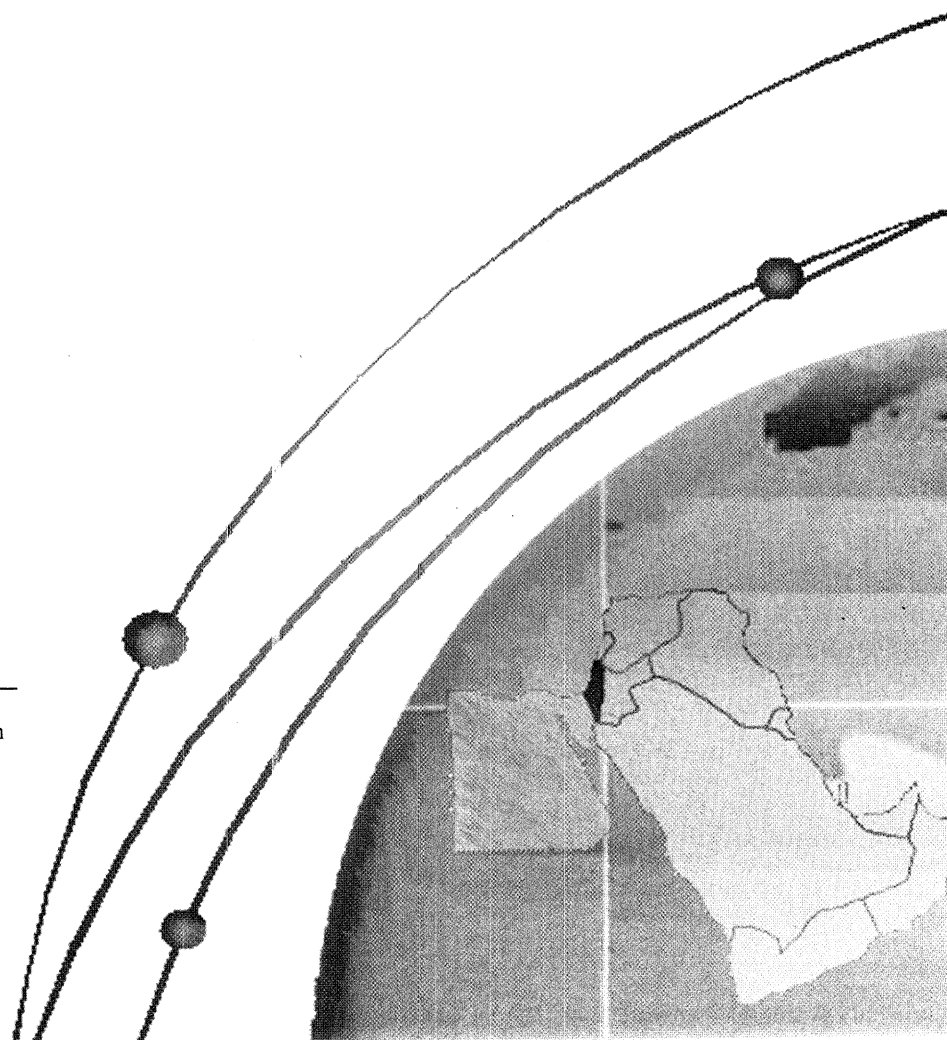
EVOLVING FROM "E" TO "SEE" IN THE WEB AGE

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INTRODUCTION

The Electronic World (e-world) has been expanding in an unprecedented manner. It is expected to grow even faster with the advent of all types of emerging digital technologies. It has indeed touched every component of the economy and development sectors without exception. In today's world the "e" attaches itself to almost any word. We are witnessing the rise of e-governments, e-economies, e-commerce, e-businesses, e-services, e-learning and many more "e"s. In general, the aim of an e-gov is to operate as a reference portal on the internet in an integrated catalogue of information and services that one can search and interact with dynamically saving time and money.

Yet little is known and understood about this phenomenon and its future impact on our lives. Despite its popularity, its adoption, diffusion and successes have yet to be proven within the community at large.

I. THE INSPIRATION

In the May 2003 issue of Geo:connexion, Europe's leading GIS magazine, I had introduced the "SEE-" concept, the acronym for Spatially Enabling E- in the W3. I then approached it from a strategic viewpoint based on statements made by prominent thinkers in an interview in Harvard Business Review in 1997. For entire article please see (<http://www.geoconnexion.com/magazine/article.asp?ID=757>)

In brief, the visual languages of today which are based on GIS and spatial information technologies combined with simulation and distributed environment provide advanced knowledge that is subject to rapid and abrupt shifts as proclaimed by Peter F. Drucker. In such an environment it becomes essential to keep pace with those developments and understand Esther Dyson's comment that *"through the www, the world can now easily see organizations for what they are, not what they pretend to be"*.

Yet is it truly possible to *see* as Ms. Dyson claims? The answer is certainly Yes, but it is only by spatially enabling the "E" that it will be possible for us to SEE (Spatially Enabled Electronic-). Hence, we can envisage a transition not just from E-governments to SEE-governments, but to SEE-cities, SEE-countries, and SEE-world. Effectively the "E" is animated, empowered, and replaced by SEE-realities.

One area where the e-world has to focus upon more is spatial information and communication technologies, such as Geographic Information Systems (GIS), engineering and medical imagery (EMI), Global Positioning systems (GPS), communications, and several others. Consequently, it is only by Spatially Enabling the "E" that we shall start to "see" the world as it is on the web, a challenge yet to be met, opening windows of opportunities as an enabler for economic development.

In my current article, I will attempt to move the bar an additional notch and address the "SEE-" from the mechanics of Vision and Visualizing the Semantic Web. It is important to distinguish here between the popular visualization term referring to any graphical representation and the more intelligent, insightful and intuitive representation of the digital world discussed in this article.

II. SEEING

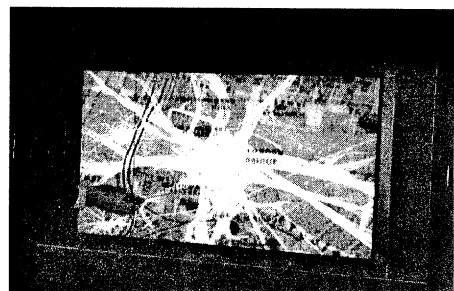
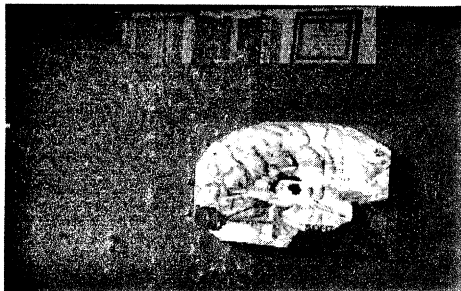
Vision is generally defined as the ability to see the features of objects we look at, such as color, shape, size, detail, depth and contrast. Vision is achieved when the eyes and the brain work together to form pictures of the world around us.

The eye-brain pathway, constitutes a computer-like mechanism designed to construct a stable visual representation of the real world (reality), in which the seeing is subjective, active and interpretative (Do you see how close Mars is? Do you see those lines? Do you see this beauty?) If adequately emulated the "SEE-"

will provide more insight into the digital world and bring it closer to a uniform reality with less ambiguities and uncertainties. This process is already in the making. Geographical Information Systems (GIS) and related technologies combined with the Semantic Web are, I believe, at the forefront of such innovative technologies that are making the “SEE-“ happen.

The more the need to understand large amount of data increases, the more the inclination to emulate the eye-brain pathway to construct the digital world gains impetus. The second generation of the web, referred to as the Semantic Web is already launched. Combined with GIS and spatial technology it resembles, to a great extent, the eye translating the electromagnetic vibration of light into patterns of nerve impulses. In turn, these are transmitted to the brain where they can be understood and acted upon at astonishing speed by a large population of sensory neurons that shift and work together to enable the seeing happen. The Semantic Web (XHTML), which is being built atop the current web using XML and its family of technologies, has the ability to emulate the seeing process. These are web-friendly, data-rich, and UML-based intelligent-object-oriented technologies. They allow users to structure data with regard to their content rather than their presentation. They are behavioral in nature and provide the tool to map tacit knowledge into explicit knowledge. Thus large amount of data could be analyzed, diagnosed, made sense of, and seen and understood by both the humans and the machines.

A pertinent example would be the legendary London taxi drivers where studies showed that they create an intricate mental spatial map of thousands of streets and locations, store them in the section of the brain called hippocampus and then see them with their eyes as they drive across the city.



Likewise, synergy of the Semantic Web and 3D Intelligent Visualization can drive the “SEE-“, Spatially Enabled E-, to strengthen its cause and replace the lone-standing “E-“. CNN’s latest technology announcement about researchers developing 3-D search engine, based on the voxels volume representation rather than just shapes, is most relevant.

III. INTELLIGENT VISUALIZATION

The many forms Intelligent Visualization (IV) of the cyberspace can take may clarify further the “SEE-“ concept. Visual displays have also their important role in providing orientation and context. In this respect, two types of visualization of the digital world have prime merits. These are scientific visualization and information visualization. These two forms are capable of addressing: data inventory and analysis; measurement and decision support; and modeling and simulation in an interactive manner, both off-line and in near real time, making the seeing and the “SEE-“ in the cyber space become real.

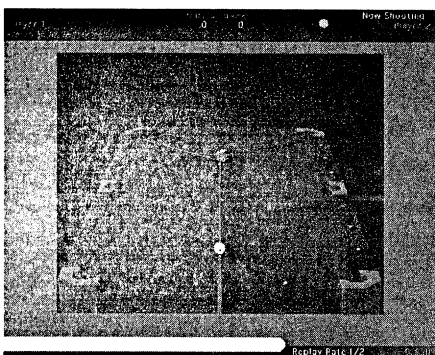
While “Scientific Visualization” focuses mainly on computational science, in which the relationship between variables is fairly well understood and makes it visible and comprehensible, “Information Visualization” has the power to reveal patterns, clusters, gaps, trends, or outliers in statistical data, stock-market trades, ROIs, NPVs, computer directories, document collection, and other new insights into a phenomenon.

Furthermore, products of scientific visualization, namely Geospatial data representation in 3D visualization as well as engineering and medical imaging, assist experts to visualize their cases in 2D, 3D and in Virtual Reality Modeling Languages (VRML). They allow these experts to see, understand, examine, explore, and be precise in their works.

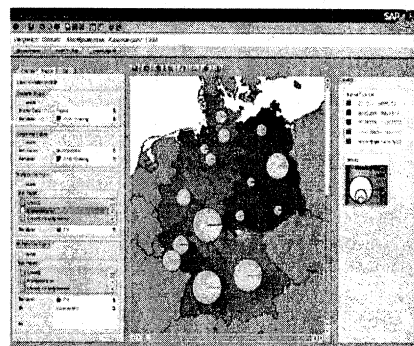
Likewise, information visualization could help in knowledge discovery and business intelligence. It permits professionals to see and make sense of their businesses in ways they have been long dreaming of and helps them in better decision-making by using artificial intelligence (AI) and heuristic and holistic approaches.

In both cases interactive visualization, aided by graphics, trees, maps, images and real-time data capture, is capable of supporting several user tasks simultaneously such as search, analysis, navigation, zooming, and others. Meshed with the Semantic Web, intelligent visualization will provide results that otherwise would not have been possible through the naked eye. While the examples of the Zen archer and the virtual pool are helpful in one case and the spatial visualization of SPSS lifeless columns and rows of numbers is supportive of the other, the “SEE-” seeking mantra comes here to the rescue.

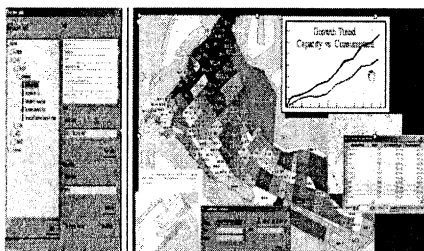
Consequently, city planners can see their cities digitally long before they are physically developed; medical doctors can see beyond an epidemic to divulge trends and patterns; environmentalists can see the results of their policies; engineers can see the effect of a simulated outage; bankers can see the situations and forecasts of their future business activities and the true color of their businesses; investors can see trends and patterns in stock-market trades; with GPS-based navigators, drivers can see far beyond their wind shields; meteorologists can see inside a 3D model of a storm cloud; and scientists can see the effect of atomic, cosmic and common three-dimensional phenomena.



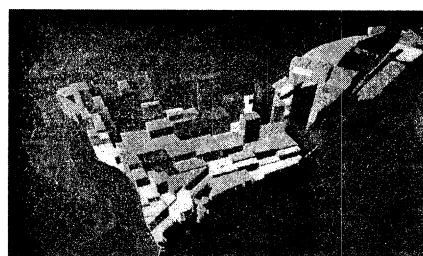
In case of the Zen Archer and the Virtual Pool while the seeing is real the hitting becomes optional.
(CELERIS, MacPlay)



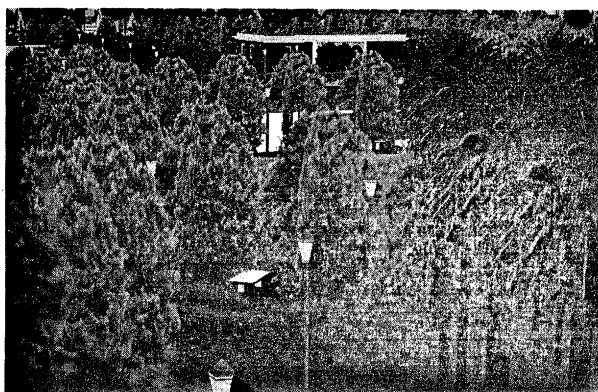
Let me see demographic information by postal code using color fill, and let me see sales by state using stacked bar charts (SAP-ArcGIS)



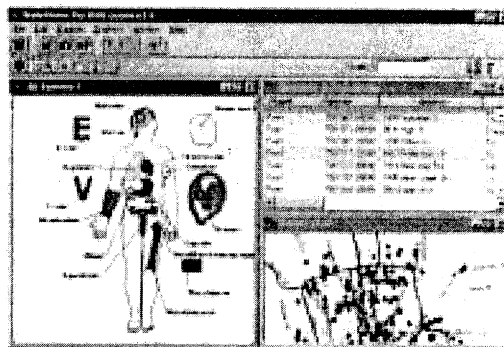
Tree and multi-window visualization and multiple dimensions within a spatial GIS display of the ADWEA Utility Enterprise GIS Project



Cost, length, and consumption combined in a 3D Visualization – ADWEA Utility Enterprise GIS Project



3D intelligent visualization of the
Khafji community Park



Body Viewer and Patient Access

IV. SPATIAL AND VISUAL TECHNOLOGIES

Currently available spatial and visual technologies that can meet the above needs and requirements are advancing. They may be far from being perfect but surely heading in the right direction. The evolution in the theories and in the practices is striking. The efforts undertaken at universities, to mention only two, the University of Maryland human-computer interaction Lab (HCIL) and the University of Birmingham Visual and Spatial Technology Center, are of great relevance and value to the advancement of visualization in cyberspace and the Semantic Web. The public and private sectors are also providing their share in the evolutionary process. User-centric approaches continuously are proving rewarding as confirmed by the feedback provided by early users.

As mentioned above, a prominent and most promising technology in this domain is GIS and converging technologies such as remote sensing, imaging, GPS, VR, telemetry, simulation, and others. In general, comprehensive GIS software similar to ArcGIS and its family of technologies interfaced and integrated with Subject Matter Expert software products, offer meaningful answers to many of the visualization requirements of the semantic web and for the SEE- to be realized.

GIS-based applications, (such as zooming, filtering, detailing-on-demand, relating, dynamic querying, spatial analysis, buffering, allocation, address matching, overlays, intersection, tracing, dynamic segmentation, pathfinding, locating, and others), performed on spatial, non-spatial and temporal data constitute undoubtedly an excellent framework for achieving the desired visualization results in 2D and 3D. Existing Object Model Diagrams are of great help in this regard.

In the process of the "SEE-" many visualization techniques, (such as viewshedding, visibility, hillshading, suitability location, least cost travel, obstacle to travel, cost surface, shading and transparency, slope, aspects, steepness, level of illumination, line of sight on a surface and many more), are very well supported by GIS, imaging, spatial analysis and 3D analysis.

Recent expeditions to planet Mars, not only overwhelmed the world with the spectacular colored photos captured by the eye of cameras but also the data interpretation and information visualization that have allowed scientists to see beyond the naked eye to divulge trends and patterns and understand the past, present and future of the planet.

Back to ESCWA's roundtable, ICT as an enabler for economic development, the case of Lebanonatlas, the Muchref Community Development and the Municipality of Amioun and Broumana's web-based GIS portals support visually the evolution thesis from "e" to "see".

CONCLUSION

The visualization process in the semantic web is in the making. Tremendous effort by researchers and experts are being vested to make it happen. Analogies drawn from the eye-brain pathway would give most meaningful results for researchers and users to capitalize upon. But, users need to be motivated, stimulated and encouraged to see the tangible and non-tangible benefits. Spatially Enabling E- “SEE“, being closer to the real senses, would accelerate dissemination and rationalization of the 3D intelligent visualization of the digital world in the cyberspace W3 era where one “SEE-mails” not just “E-mails”.

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