Methodology of Multimedia and Visualization

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Abstract
New visualization tools have been developed but geospatial data models and theories remain unchanged because they enable a user to determine a video's distinguishing content without investing long viewing times or requiring high network- transfer speeds. Recent developments in computer hardware and algorithm design have made possible content to integrate media indexing with computer visualization to achieve effective content-based access to video information. This paper starts addressing the theoretical aspect of a multimedia visualization and a consistent framework to express different types of data sources.

Keywords
Multimedia, Linear Content, Semantic Content Modeling and Perceptual Content Modeling.

I. Introduction

Multimedia is media that uses multiple forms of information content and information processing (e.g. text, audio, graphics, animation, video, interaction) to inform or entertain the (user) audience. As shown in Fig. 1 [1]:

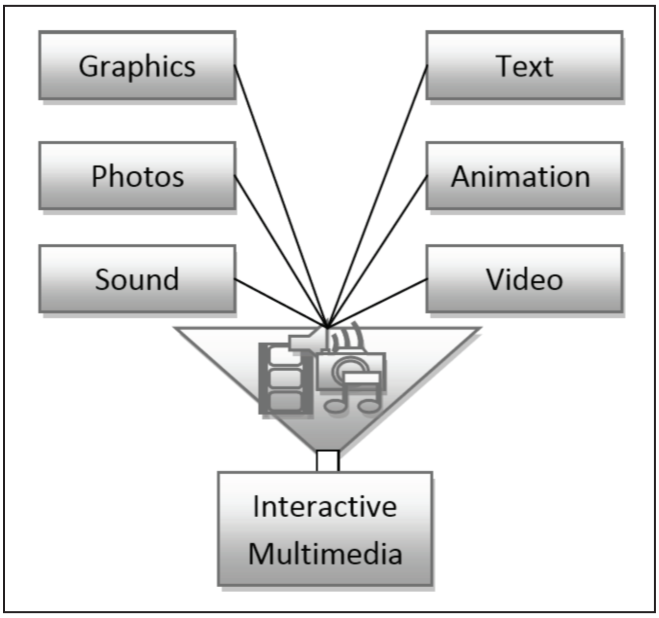

Fig. 1: Disparate multimedia elements funnelling into one unit [1]

The multimedia theme has two areas, Perceptual Multimedia Quality (PMQ) and Semantic Content Modeling (SCM). Work on SCM resulted in the creation of the Content Oriented Semantic Modeling Overlay Scheme and associated extensions. PMQ allows the continued work and proliferation of multimedia applications. Drs Stephen Gulliver and George Guinea were the first to use eye tracking for examining multimedia video sequences, and they found methods for distributed multimedia quality from user perspective. The visualization is related with spatial-semantic visualization and virtual reality and moreover their applications in program visualization, text documents, and visualization of medical data. An important point of investigation within the visualization concerns the study of the structure of scientific knowledge domains and human performance with spatial semantic visualization and virtual reality. Within the visualization theme, research focuses on visualization of medical programs, data and human factors related with virtual reality display. Dr. Timothy Cribbing has recently found how proximity transformation methods, graph-pruning and second order similarity analysis improves the quality of spatial semantic document visualizations, including graph-pruning and second-order similarity analysis. Dr. Guinea has investigated ways to visualize and record pain data of patients. Due to his work, doctors understands the relation that how pain changes with time and effect of meditation on it. Also patients relate their daily routine and meditation with pain. Also Cribbin and Kuljis have worked in knowledge domain visualization.

There are many possible alternatives to visualize geo-spatial data. Some of these alternatives are: Anaglyph, Holography (analog or digital), Virtual Reality, Computer Animation, Polarization Technology and Multimedia. Therefore, to effectively manipulate multimedia content, an authoring application should have following abilities [2]: i. load several media streams simultaneously ii. Easy interface to view and skim contents iii. methods to design important areas along time- line iv. Methods to extract the designated areas and convert them to any of its alternate formats v. media player that handles multiple media types (e.g. WMV, MPEG, WAV, MP3, AVI, etc.)

Perception of Reality to GIS Documentation usually consists of text, translations and information designing [3]. The quality and efficiency of deliverables could be enhanced by use of right kind of images.

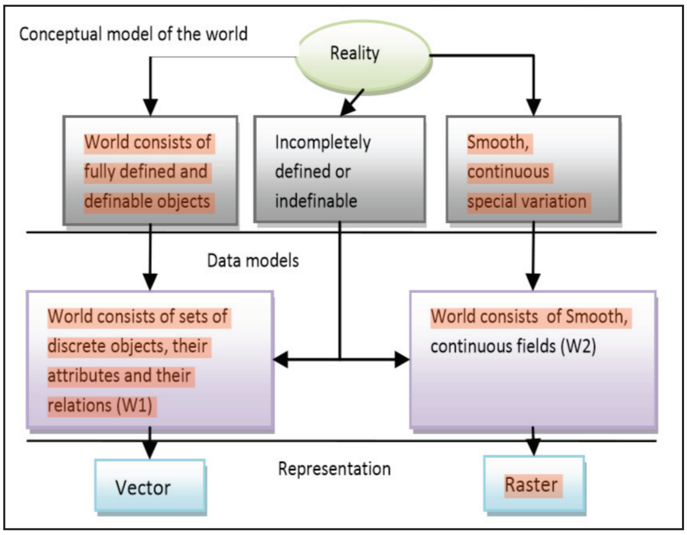

Fig. 2: Main Steps from Perception of Reality to GIS (adapted from Burrough, 1996). [3]

II. Categories of Multimedia

Multimedia can be divided into two categories namely linear and non linear.

A. Linear Multimedia

Linear interactivity remains in continuity without any obstruction of the viewer. Clock is the best example as it plays out in one continuous narrative sequence.

Fig. 3: Linear Presentation

The linear approach is intended strictly for display purposes and is typically a passive "receiving" experience by the viewer, with no expectation of participating. It eliminates the need to take action (by pressing buttons or keys or touching a screen), and the developer. PowerPoint presentation is an example of linear multimedia given by official in a meeting. The presentation is made, arranged, and handled by the presenter in a logical sequence. It is intended to present information in a straightforward manner for the purposes of education and discussion. Productions such as these can be as simple as text with bullet points, or multimedia elements such as photographs, videos, and animation may be embedded in the presentation. The organizers have to click a button or key to start, as to do with a video, and play it for an audience to watch and learn without active involvement.

In linear interactivity user interacts with multimedia application without controlling the progress of contents. In this user acts as a passive receiver the linear content is usually sorted in sequence for example movie.

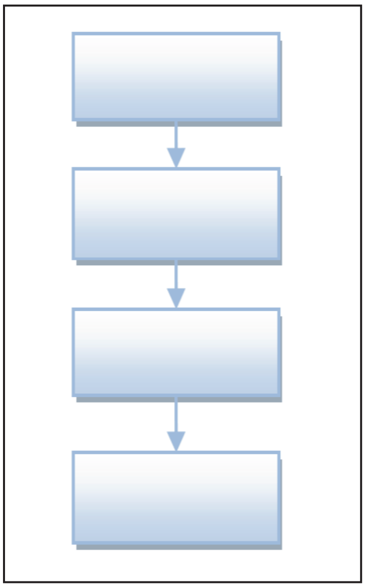

Fig. 4: Linear Interactivity

Multimedia presentations can either be recorded or live. Recorded presentation supports interactivity through navigation system and live multimedia presentation through interaction with the user.

B. Non-linear Multimedia

Non-linear interactivity allow user to interact with the content according to his need. So it's a bi-directional communication. Which means user can control the sequence and progress of the multimedia contents using links, tabs or buttons?

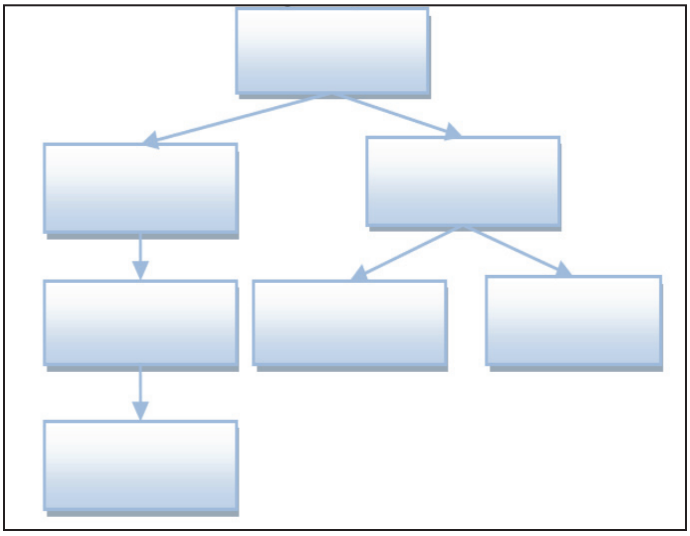

Fig. 5: Non-linear Interactivity

Non-linear interactivity uses tools like hypertext for connection with phrase or word on another screen. E.g electronic book using links to other screen is non-linear multimedia content. Hypermedia is also used for non-linear interactivity. This tool is also similar to hypertext. But, it differs from hypertext as it connects to audio and video media elements.

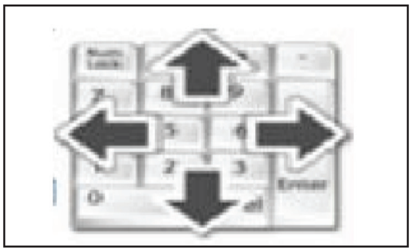

Fig. 6: Non-Linear Presentation

Interactivity results when there is some kind of interface, or connection between a user and a medium. A range of choices are available to the user by way of buttons or menu selections that will lead to other categories and provides with new information. These results became variable depending on the choices made by the user. The program has determined information hierarchies developed by the developer, but the user can explore to eliminate path restrictions and time constraints. So, acquiring knowledge by using random ordered routes is supported. .

III. Approach for Multimedia Information Visualization

The multi-faceted nature of multimedia documents has led to a variety of visual representations for navigating, analyzing and understanding of multimedia data sets [11]. As each representation is specifically designed to address different aspects of the data, innovative approaches combining several visualizations in a single coordinated interface had to be introduced [11].

A. Procedural Information

While representing a method for using a device, it is seen that by using explanatory text and diagram helps users to acquire a cognitive model of how the device works [4]. Studies by Kieras & Bovairfound conclude that this device model allows users to infer procedures quicker than user who learns about the device by revising without full explanation [4].

B. Problem-Solving

Information To improve performance of mathematical problem-solving, graphical presentations of information are good as compared to textual presentations. E.g., study by Threadgill-Sowder & Moyer found that grade school students who scored in the lowest quartile on a cognitive restructuring test were able to improve their scores when the story problems in the test were presented using drawings that organized the problem data. Another study by Tlireadgill-Sowder, & Moyer found that children in grades 3 to 11 solved mathematical word problems better with text and illustrations of the problem elements than text alone. The explanations were more helpful to the beginners than expert ones.

C. Recognition Information

To communicate information that people need to recognize, pictures are extremely effective. In Study by Shepard, people looked at 600 pictures, sentences, and words. On an immediate test, recognition accuracy was 98% for pictures, 90% for sentences, and 88% for words. Another study by Nickerson found that people had 63% recognition accuracy for a group of 200 black and white photographs one year after initial viewing.

D. Spatial Information

The researcher presented the bus route information via maps or lists and asked the students to provide as quickly as possible the correct list of bus numbers in the correct order. The study found that the students learned the bus route information more quickly when they used a map than people who learn about the device by using repetition without full explanation.

IV. The Future of Multimedia Visualization

Computer-based multimedia instruction may help users to understand more information in short time than old classroom lectures. The learning advantage for duplicate multimedia over “mono-media” is not linear. But this is resolved when one takes into consideration that particular situation where the media is presented. Multimedia information is most effective when:

1. It encourages the dual coding of information.
2. The media clearly support one another.
3. The media are presented to learners with low prior knowledge or aptitude in the domain being learned. Multimedia visualization can accommodate data generated today by different types of data acquisition sensors [5]. But, it is needed to avoid the errors made in the development of conventional maps Medical imaging is a huge application domain for scientific visualization with an emphasis enhancing imaging results graphically example using pseudo coloring. Real time visualization can serve to simultaneously analyze results. Multimedia brings many benefits over other methods of disseminating information; it can take several hours to develop one hour worth of interactive multimedia learning.

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