CHAPTER 2
USING MULTIMEDIA IN EDUCATION

This chapter describes the multimedia concepts used in designing and implementing ARITHELP. Section 2.1 briefly describes the concept and use of multimedia in education. Section 2.2 looks at the concept of interactive multimedia. Section 2.3 highlights the concept of hypermedia and section 2.4 discusses the hypertext concept.

2.1 MULTIMEDIA
Multimedia can be defined as a medium comprising data such as text, digitized voice, digitized video, still digitized images and graphics. It refers to the combination of two or more of these media, of which at least one is discrete medium (such as text, image) and one is a continuous medium (such as video and audio). Literally, multimedia means many media or multiple media.

Today, developments in computer use in education are focused in the direction of 'learning machine' and interactive multimedia. A computer can display information in various ways such as text, graphics, sound, motion video, animation or combinations of these media. The kind of media used in the system is dependent on how to present teaching materials, method of interaction and level of user. Each of the lesson and help facilities may be represented using different kinds of media. The design of an interface with fancy graphics, lots of color and sound must be balanced between motivation of the multimedia and text only educational programs. Using multimedia in education can give a lot of advantages [Auberger, 1998]:-

- It enables the user to accomplish difficult tasks by user natural actions.
- A domain to be taught can be presented in an easy way.
- It offers an alternatives to a user and make current computer oriented tasks easier.
- By computerizing learning tasks, the learning process can be simplified.
- It supports disable users and it enable users to interact with computers in difficult situations.
The multimedia lessons can provide the student with varying levels of instructional support such as examples, explanation, step by step procedures and advice from expert which are all within the control of the students.

Besides of its capabilities to improve learning, a multimedia system is also user friendly. It is also independent of time and locations where the student can go through the lesson without being dependent on an instructor or on specified class hours. Multimedia systems however have some disadvantages [Auberger, 1998]:-

- The implementing of this system is complicated
- It requires large storage devices.
- It requires additional hardware and software which is expensive and involve high cost at the development stage.
- Sometimes, the incorrect use of multimedia can result in negative effect, which may reduce the effectiveness and efficiency of information and knowledge transfer.

2.2 INTERACTIVE MULTIMEDIA

The multimedia component is a combination of media, which includes text illustrations, photographs, audio, graphics, image, voice and animation. Interactive multimedia consists of materials which are both multimedia and hypermedia. Interactive multimedia engages the user by allowing them to make choices such as clicking to activate an audio, click and dragging to match objects or clicking a button to navigate. The interactive component involves interactively within the system which provides the learner with some influence over accessing the information. The learner is also given control over the outcome of the system. Within an education, interactive multimedia can be use as an instructional aid, interactive tutorials and reference work. ARITHELP will present the learner with choices of lesson and the choice taken by the learner will influence the path the system follows. This method gives several advantages such as an interactive instruction giving a more effective than conventional instruction. It also allows practicing of already learnt lesson compared with conventional instruction where learner may not have a chance to repeatedly do practical work.
2.2.1 Examples of an Interactive Multimedia

2.2.1.1 Information Kiosk
Information kiosks are stand-alone information system which provides information about a location, site or an attraction. It was used in a mall as a directory on the location to help the user by providing information about the attractions of a tourist destination. Kiosks application are usually colorful and attractive to the user. It is easy to use and less expensive system in providing service to the user.

2.2.1.2 Interactive Video
Interactive multimedia gives a meaningful visual component to online shopping. It enables the customer to find a clear vision of what they are buying. Here, a wide variety of products can be sold such as recreational goods, clothing and others. One of the advantages of this system is that it has no time constraint as on-line shopping is available irrespective of the time.

2.3 HYPERMEDIA
Hypermedia offers much to the learner in terms of providing an environment that engages the learner, allowing the construction of knowledge in a meaningful way. Hypermedia is a combination of hypertext and multimedia elements such as images, audio and video. It is the software that utilizes linked media. Linked media allows the user to interact with the software such as clicking on highlighted text, graphics and icon that will jump to another part of information. On the other word, hypermedia is the combination of multimedia and linking.

Hypermedia consists of three level:-
1. Read only hypermedia
This level is appropriate for the student who does not know what to learn. It is similar like reading a book. This level hinders student from acquiring information, building critical thinking and developing the habit of making connections with facts or information learned.

2. Participatory Hypermedia
At this level, students will participate such as newsgroup and exchange information. They work together in doing exercises, writing assignment and other works.
3. Exploratory hypermedia
This level allows students to explore and construct their own learning. Here, students can learn at their own place, pace and speed. They can repeat difficult lesson or skip mastered lesson. At this level, students have maximum control of their learning and it is beneficial for those who are already knowledgeable about domain knowledge.

Hypermedia supports student-driven access to the learning materials. The student can select any related learning materials from the generated list to move to a related page. The selected materials and practice question are presented to student who can read information about the learning materials, working with example or problem presented to them. The student can play with an audio and animation explanation for the example questions and help materials. Here, the student can repeatedly view the materials and practice the questions until they master the obtained knowledge. This approach is naturally structured and tightly interlinked hyperspace of educational material which supports advanced navigation [Brusilovsky & Pesin, 1996].

2.4 HYPERTEXT
Hypertext is non-linear text which contains connections called hyperlinks, hot words or hot links to other documents. It is the same as regular text where it can be stored, read, searched or edited. Within education, hypertext has been seen as a new valuable new constructivist tool for supporting teaching and learning. The two major components of hypertext documents are the nodes and the links. Nodes are the primary elements of information. The size of nodes can be a text or a combination of image, sound and video. The links was function to tie the nodes together. It associates the nodes with regards to their semantic relationships. Figure 2.1 [Vrasidas, 1996] shows the relationship between nodes and links.
There are several advantages of hypertext listed by nodes [Conklin, 1995]:-

- **Ease of tracing references**
  Machine support for link tracing means that all references are equally easy to follow forward or backward.

- **Ease of creating new references**
  Users can grow their own networks or simply annotate someone else's document with a comment (without changing the referenced document).

- **Information structuring**
  Both hierarchical and non-hierarchical organizations can be imposed on unstructured information even multiple hierarchies can organize the same materials.

- **Global views**
  Browsers provide table of contents style views supporting easier restructuring of large or complex document to serve multiple functions.

- **Customized documents**
  Text segments may be threaded together in many ways allowing the same document to serve multiple functions.
• Modularity of information
Since the same text segment can be referenced from several places, ideas can be expressed more modularly. For example: less overlap and duplication.

• Consistency of information
References are embedded in their text. If the text is moved even to another document, the link information still provides direct access to the reference.

• Task stacking
The user is supported in having several paths of inquiry active and displayed on the screen at the same time such that any given path can be unwound to the original task.

• Collaboration
Several authors may collaborate with the document and comments about the document being tightly interwoven.

However, there are disadvantages of the hypertext such as information overload and user disorientation where user feel lost in the hyperspace. It means that the user do not know where to go next, how to go and they may not know the overall structure of the system. Thus, this problem can be overcome using hypertext adaptations.
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