Multimedia Instruction

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INTRODUCTION

Multimedia technology is increasingly being used as a vehicle to deliver instruction.

The terms "hypermedia" and "multimedia" are often used interchangeably. However, a distinction is sometimes made: Not all multimedia applications are necessarily hypermedia. A network representation of information is one of the defining characteristics of hypermedia. An instance of hypermedia consists of pieces of information connected in an arbitrary manner to form a network of references (Begoray, 1990). In this chapter, the terms will be used synonymously. There are many benefits for using multimedia for instruction.

Studies have shown that computer-based multimedia can help people learn more information better than traditional classroom lectures (Bagui, 1998). Several factors have been attributed to the success of multimedia in helping people to learn. First, there is a parallel between multimedia and the 'natural' way people learn, as explained by the Information Processing Theory (Gagné, Briggs & Wager, 1988). The similarities between the structure of multimedia and the information processing theory account for a large part of the success of learning with multimedia.

Second, information in computer-based multimedia is presented in a non-linear, hypermedia format. The nature of hypermedia allows learners to view things from different perspectives. Third, computer-based multimedia is more interactive than traditional classroom lectures. Interacting appears to have a strong positive effect on learning (Najjar, 1996). Fourth, another feature of multimedia-based learning is that of flexibility. There is empirical evidence (Najjar, 1996) that interactive multimedia information helps people learn.

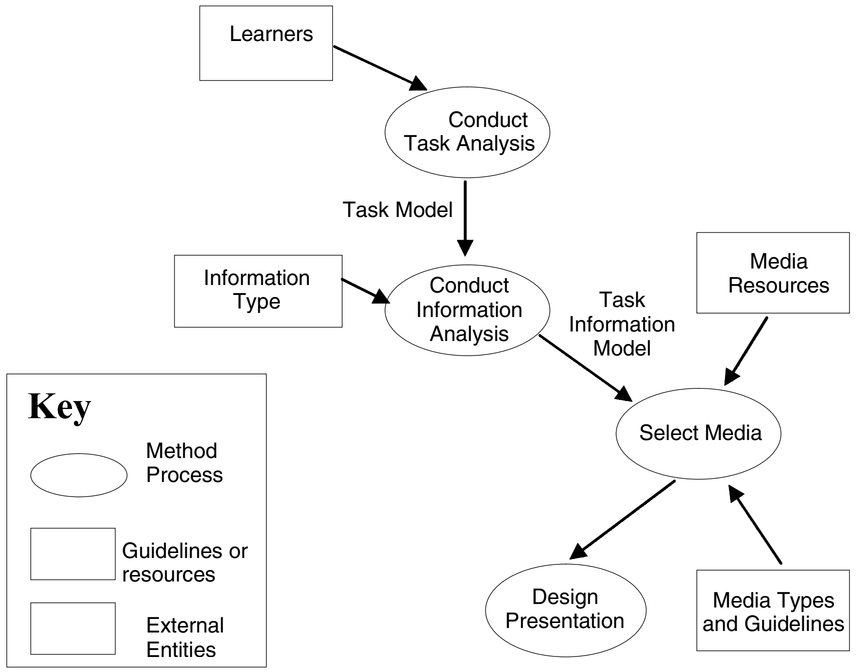
A large number of presentation guidelines have been reported for educational multimedia (Kozma, 1991; Park & Hannafin, 1994) that advise on selecting certain media for different types of content and learning goals. Investigation by Schaife and Rogers (1996) revealed that many of these products exhibit poor usability and are ineffective in learning. Multimedia design is currently created by intuition (Sutcliffe, 1997). Given the complexity of multimedia interaction, it is unlikely that the craft-style approach will produce effective interfaces. A methodical approach to multimedia interface design is needed. Guidelines are required to cover selection of media resources for representing different types of information and presentation design. These guidelines must address the key issues of selective attention, persistence of information, concurrency and preventing information overload. Multimedia provides designers with many opportunities to increase the richness of the learner interface, but with richness comes the penalty that interfaces can become overcrowded with too much information. Using multimedia does not ensure that information is conveyed in a comprehensive manner. Careful design is required to ensure that the medium matches the message and that important information is delivered effectively. To date, there are few methods available that give detailed guidelines to help designers choose the most appropriate medium based on the information types required. Subsequent sections of this article describe a method known as Multimedia Instructional Design Method (MIDM), based on the Sutcliffe and Faraday method (1994) that can be used to help novice designers to develop multimedia instruction.

MULTIMEDIA INSTRUCTION DESIGN METHOD

The method developed is based on the work of Sutcliffe and Faraday (1994). It consists of four main stages: task analysis, information analysis, media selection and presentation, as shown in Figure 1.

The method consists of design principles based on cognitive psychology, media selection guidelines that utilise definition of information and media types,

Figure 1. Overview of the method



validation guidelines for media combination and techniques for directing the learners' attention in multimedia sequences.

The first step is the creation of a task model incorporating specification of the content information requirements. A resource model describing the information media available to the designer then follows this. The method advises on selecting appropriate media for the information needs and scripting a coherent presentation for a task context.

The next design step is to direct the learner's attention to extract the required information from a given presentation and focus on the correct level of detail. This forces designers to be aware of the cognitive issues underlying a multimedia presentation, such as selective attention, persistence of information, concurrency and limited cognitive resources, such as working memory.

Step 1: Conduct Task Analysis

The method starts with a standard task analysis using one of the instructional task analysis methods. Both hierarchical task analysis and information-passing task analysis methods can be used. In addition, a learner analysis would also be conducted. The task analysis would have produced a hierarchy of goals composed of sub-goals, which in turn contain procedures, actions and objects.

Step 2: Conduct Information Analysis

The task analysis does not explicitly state what information is required for each task step, so an information analysis is needed. The main objective of information analysis is to specify what type of information is required during a task, called the task information model. To form the task information model, the initial goal hierarchy from the task analysis model is elaborated on by attaching information types that specify the content to be communicated to the learner. The resulting model should allow the designer to answer the question, "What information content does the learner need for this task sub-goal or input/output interaction?" A set of amodal information types is required to characterise lesson needs. Information types are used to specify the message to be delivered in a multimedia application and are operated on by mapping rules that select the appropriate media types. The information types are similar to those found in many tasks or data models (e.g., actions, objects, procedures). Task actions may require op-

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