

## On some commercial and technical aspects of multimedia educational systems

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### Abstract:

This article was made to identify some technical aspects of multimedia in education and it focuses on the issues related to identification of technical aspects of the multimedia educational systems. It also explains the different tools and his operating procedures of the technical components. Some modules are created consisting of interactive learning sessions which high light the features offered by the technology. It includes several short presentations on assorted topics from subjects such as physics, mathematics and chemistry. These modules are demonstrated to students and teachers belonging to different educational institutions.

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### 1. Introduction:

“The characteristics of multimedia elements are so diverse in nature. It is highly impossible to manage them through a particular hardware or software tool”. The audio and video elements have complex spatial and temporal characteristics which require special hardware and software techniques to generate and play them.

The multimedia titles strive to create a personalized learning environment through an intelligent combination of user interface mechanisms. These multimedia educational systems involve the user in every stage of the learning process such as creating awareness, understanding the concept and developing the skills to utilize the knowledge acquired on a given topic.

We choose edutainment as our application in which education is imported in an entertaining manner through interactive multimedia titles. Multimedia technology allows computers to handle different media elements like text, graphics, animations, audio and video. It is essentially a combination of the television and computer technology. The communicative power of audio visual medium coupled with the interactive capabilities of the computer systems.

According to Hertfordshire (1995), the main features of multimedia educational systems are provision of individual attention to learners, self-paced and user controlled learning environment convert the dull and passive learning in to a dynamic one.

A demo module is created consisting of interactive learning sessions which high light the features offered by this technology in T. Vaughan (2000). The demo module includes several short presentations on assorted topics from subjects such as physics, math’s and chemistry. These modules are demonstrated to students and teachers belonging to different schools and collected the feed back them in the form of quest ionized. The system development concepts are discussed and identified by the Bohdan.o (1995) and B.M. Panday (1995).

### **The way we learn**

It is argued that the depth of knowledge required in secondary schools makes it necessary for students to have many teachers who are subject experts. The development of multimedia technologies could soon offer access to knowledge far superior than that of most subject teachers. This may result in teachers needing to develop new learning facilitation skills and reduce the emphasis on knowledge. The know-how is likely to become more valuable than the know what. Teachers primarily require access to learning resources, which can support concept development by learners in a variety of ways in order to meet individual learning needs.

## **2. Multimedia in Education**

Over a past twenty years, education delivery systems are being constantly redefined and the computer has come to play a vital role in implementing new teaching –learning strategies. A fundamental basic difference between multimedia based learning and conventional system of learning is that in the conventional system, the book is basic material which follows its own step-by-step structure and the contents are accordingly structured. In multimedia, on the other hand, the content structuring has to be altered so as to incorporate the self-paced and non-linear, interactive exposition possibility, besides, the fact that the audio and visual material plays a greater role in multimedia than in a book.

In future the “classroom of tomorrow ” as a multimedia class room. The benefits of multimedia-based classroom instruction in education are a stimulating teaching and learning environment and the encouragement of student ownership and self expression in their learning. Hypermedia materials are more engaging than the traditional print materials. The computer with a graphical user interface is an integral component of this multimedia-based teaching. Multimedia can allow students in a variety of disciplines to explore concepts that are typically unavailable to them: they might be too dangerous, impossible to explore, or just out of the budget of the institution. This might include the examination of microscopic environments like journeys through the various organs of the body or the observation of violent chemical reactions in D.P. Mukherji (2000). For students, multimedia may allow them to perform analysis without acquiring powerful, prohibitively expensive, and overly complicated software and hardware.

### **2.1 Modes of Multimedia Educational systems use in Learning**

There are at least five modes in which multimedia resources can be used in teaching and learning of these are

1. Support
2. Exploration & control
3. Tutorial
4. Resource
5. link

#### **2.1.1 The Support Mode**

In the support mode, a student uses the computer to enhance the presentation of work. The computer can help by increasing the accuracy that the student might otherwise be able to achieve. There are a great number of tools that are currently used in some institutions.

#### **2.1.2 The Exploration &Control mode**

In exploration and control mode, the student is able to examine and build situations. This kind of work is often associated with curriculum materials. In this mode, students might create applications which will subsequently be used in any of the other modes. This gives students the important chance to examine the social effects of multimedia technology.

### **2.1.3 The Tutorial mode**

In the tutorial mode, the student will expect to learn new knowledge or skills. This will also give students opportunities to develop at their own pace and to receive feedback upon their progress. It is important to include the possibility of using the tutorial mode for assessment only.

### **2.1.4 The Resource mode**

In the resource mode, the multimedia system is used to access information and other resources. When using the resource mode, students are developing questioning skills. They are solving problems by stating them and re-shaping them to fit different resource frameworks.

### **2.1.5 The Link mode**

The link mode is typified by the computer being used for the communication between individuals. This represents an important role for computers in the coming century. This mode comes to the fore in projects such as the classroom without walls or the global school house.

## **3. Technical aspects of multimedia in education**

This article begins with a discussion on the design constraints which is followed by an overview of the life cycle of the multimedia educational CD development.

### **3.1 Design constraints:**

We have two choices for the development of such educational modules, usage of high level languages such as c++ or VB to create educational modules or utilize the existing s/w tools and create educational CDs. In the first case, it is not sufficient to design the contents of the presentation but it is also necessary to develop the required s/w tools to create and run the presentation. The media elements have their own timings. Constraints which make programming these devices a highly complex process. These are explained in Andrew.e (1) and Bates a.w (2). In order to create a full fledged CD through this approach, we need a team of experienced professionals with hardware and software backgrounds and a lengthily development time.

In second case, by making use of the existing s/w tools it is possible to produce such CD with ease and in a short time as the authors are free from specifying the intricate timing details and the control of several devices associated with the CD which is taken care by these tools. This allows concentrating on the content design rather than on the presentation issues.

In view of R.Hone & M.Kuntz (7), Most of the creators adopt the second approach as, the volume of the contents is very large and it may well become unprofitable and time consuming if we choose the first option. However, certain requirements of CD making not supported by the authoring tools were implemented using the first approach. This is possible by creating customized routines using any high level language and integrating them with the presentation using the authoring tool. Author ware supports customized functions and routines in the form of DLLs.

### **3.2 Multimedia CD development**

The development of educational CD figure is shown below. In addition to the normal process of analysis, design, implement and test, the development of educational cds involves other tasks such as creation of media elements and integrating them to form a meaning presentation.

The media elements were created using appropriate s/w tools and also obtained from scanners, video cameras, tapes and other sources. The authoring tool uses to integrate the media elements according to create executable files. In preparation of CD s, the authoring tool creates the executable modules which

could be run under windows environments. These modules are copied on to a CD-ROM and tested on variety of platforms for finding out the performance of the educational CD.

### **3.3 Components of the title**

The component of the multimedia presentation have been classified according to the way users access the information .The various components view and process the contents in different manner and display the information to the users . The classification is shown in figure is basic and common to similar multimedia applications. The collection of media elements describing the content information forms the major component in any multimedia applications. The media elements were created using appropriate s/w tools.

### **3.4 Navigation and browse**

The key to the success of multimedia educational systems lies in providing the control of learning /viewing process to the users. These are several traditional techniques which are text intensive such as contents search, history list, and context sensitive help. The navigation features provided in multimedia product is extending to other media elements since the browse mechanism should suit the topics described through any media other than text.

#### **3.4.1 Contents**

Manufacturers or creators must design the contents menu to appear in the menu box. This can be done by adding an interaction icon titled contents to the flow line as seen in the design window of the figure. The list of the content is treating by attaching different map icons to the content icon. Each bearing the name of the topic .The interaction type of these map icons is set to filename type. So, that once the user clicks on the contents, a list of the available items displayed. The users have to branch to the chosen type, once they click on a particular item .Authors should take care of erasing the screen when the presentation starts a new topic. This can be done by the erase icon at the beginning of the new module or at the end of current module. Thus, the creator can create any number of menu options on the menu bar .The option of selecting either returnable or non-returnable jumps which provide great flexibility and choices in the design.

#### **3.4.2 Menu**

In this section, we discuss the menu options available on area other than the menu bar of the presentation windows. Here the interaction type is set to click/touch option. Hot-spots define unique clickable areas on the screen for each of the menu item. Programmers can display any text or image with in such hot-spot areas which serve as an indication of the contents and when user clicks on these areas, control branches are appropriate points through jump instructions.

#### **3.4.3 Media gallery**

This feature allows one to browse through the contents by specific categories based on the media elements. For example, one can view only the video clips of the equipments, select only the animations, image or textual narrations among available material in title by clicking on the appropriate menu item.

#### **3.4.4 History lists**

It provides the users with a list of pages or modules they have browsed since the start of the session. So that they may repeat any of the contents, if necessary. The references to the pages and modules are maintained through headers by the system.

#### **3.4.5 Miscellaneous**

There are several unique browse requirements for audio and video elements such as pause, stop, repeat and other features as represented by VCR metaphors. These can be built by using push buttons with appropriate text or image.

### **3.5 Tools and utilities**

There are several instances where a user should be able to perform other tasks while remaining inside the presentation. The utilities shown in figure have been made available in multimedia CDs under the icon tools.

#### **3.5.1 Bookmark**

We can create a custom routine which saves this variable under the book mark category in the user records directory along with many runtime records such as username, log-in time, values of variables etc., and these variables have been used to keep track of run-time parameters of the CD. When user starts a new session, they are provided with an option of starting the presentation from the saved bookmark. These bookmarks can be accessed at any point of time with in the multimedia CD and can be used similar to that of history list.

#### **3.5.2 Options**

Under this heading provides facilities for the user to customize or control the run-time parameters of the application such as volume control of the audio element ,background/foreground colours , printing the screen content etc.,

#### **3.5.3 Help**

This feature provides in a similar style as that of contents button discussed in navigation sub section. The same structure which has been built for navigation has been utilized for the implementation of this feature. Creators have provides several hypertext links in the text

### **3.6 User interface**

Presently, two major input devices available for the user to interact with the system are keyboard and the mouse. The user interface design is uniquely depends on the content in multimedia CD and users interest alive. The user interface is a challenging area of any CD which is limited only by the imagination of the creator in creating an appropriate and effective interface for the topic.

In any form if users interface, users have to be prompted on how to interact with the system. This becomes more important in novel user interface designs. Once the interacts. The system checks whether the user has responded correctly. To do this, the system expects the students create all the possible ways the users may respond to the given interaction.

#### **3.6.1 Text interaction**

This type of response is used mostly to obtain textual information from the users such as user names, and annotations. Normally programmers use this type of response in quiz sessions. The system waits for the user to key in an answer and this string is checked with the correct answer indicated by the programmer during the design stage. If it matches then the score is increased. On the other hand, if it does not match, an appropriate feedback message is given and control branches the next question.

#### **3.6.2 Drag and drop interface**

Here, it is possible for the user to move the object in many in correct ways. In those cases programmers provides appropriate message and the object back to its original position and the user to try

again. This is done by creating a map icon and selecting all the area on the screen other than one marked for correct response as the destination for the movable object.

### **3.6.3 Click-ons**

In this interaction icons or images are displayed to the user and clicking a particular image. Once the user clicks on any one of the alphabet, an audio clip which pronounces the alphabet and an animation clip illustrated the procedure of that alphabets are displayed.

### **3.7 Performance evaluation**

It is always essential to evaluate the user after the learning session as it reinforces the information in their minds .It is meaningful only if the acquired information is put to use in real life and tests and evaluation procedures ensure that the information has indeed comprehended by the users. Hence this component plays a vital role in determining the usefulness of the product.

Most of the programmer's uses mechanisms to test the user's comprehension through quiz and drill sessions. In the quiz session, solutions to the questions are not provided, and score is maintained and indication the number of correct answers given by the user. In drill sessions, users are allowed to repeat the questions till they get the correct answer. The prime idea here is make the users recollect the information learnt.

#### **3.7.1 Object type questions**

This type of question –and-answer session is most important in present day competitive exams and provides an exhaustive bank of questions of this day.

#### **3.7.2 Match the correct answers**

This type provides through drag and drop interface where the users are requested to drag the correct and drop them in appropriate slots. The students are requested to form the proper arrangement of sentences which describes the experiments correctly.

### **3.8 User data**

The personal data about the users such as names ,roll names, class, section and the performance related data such as levels , scores, number of tries ,time taken to answer re logged in separate files. By this user data we can develop customized routines such as average, standard deviation and display the results through bar charts or other graphical mechanisms.

### **3.9 Development of S/W tools**

In this section, the details of utilities developed for the creating of multimedia CDs.

#### **3.9.1 FEATURES OF THE WINDOWS ENVIRONMENT UTILISED FOR THE MULTIMEDIA CD CREATION**

Windows provides several high level multimedia services in the form of MCIs (media control interface) and APIS (Application Programmers Interface) which are utilized by the high level language such as VB and C++. There are two types of interfaces: the string and command interface.

String interface consists of text based commands which are parsed and compared with a string look up table and translated in to device-specific instructions by the driver's .THIS Method is suitable for script-based languages where a sequence of action can be performed by sending a string of MCI commands to MCI drivers.

Message/command interfaces programmers are required to fill an appropriate structure which consists of commands, flags. These structures are sent to devices directly as they map on the command set of the specific devices. Hence execution may be faster in this mechanism due to the absence of look-up table comparison. The information returned from the devices is also available in similar structure from the MCI drivers which the application can make use of in getting the status of the command sent to the drivers.

### **3.9.2 VB SUPPORT TOOLS FOR MULTIMEDIA APPLICATION DEVELOPMENT**

Most of the programmers develops customizes routines through VB for the development of performance evaluation of performance evaluation modules and some unique navigational and browse mechanisms of the CD.VB offers several techniques for multimedia application develops such as dynamic link libraries (DLLs),OLE controls,OLE automation servers and VB custom controls (VBXs)which are discussed in the following paragraphs .

A DLL is a library routine which can be called from a program and associated code is linked with the application only at the runtime and not during the design/compile time. More over the DLLs can be shared by programs written in any language since windows provides a standard language definition for a DLL and ensures that parameters are passed in a consistent manner.

Object linking and embedding (OLE)is a feature unique to the windows environment which enables communication between application currently running under windows. OLE techniques define an interface with which application can be made programmable regardless of the programming language environment. An object consists of properties and a method represents the data variables that the container application manipulates methods constitute a specified action performed on these objects.

There are two types of OLE automation servers in process servers and local server.

These techniques are utilized by the programmers in allowing branching between applications under the windows environment.

### **3.9.3 INTEGRATION OF CUSTOM –BUILT ROUTINES**

Each DLL has several routines with a fixed procedure for parameter passing. Which is described by windows .VB allows compilation of source code in to an executable or DLL file and programmers used the DLL option and compiled the source code in to DLLs. The DLL is converted in to VCD file, which is a header.

Information read by authoring tool, this header consists of functions available in the DLL. The required parameter and definitions, the VCD files and thru DLLs are distributed along with the multimedia application, and thus any function called by the title is linked with the appropriate library routine during run-time and executed by windows.

### **3.10 PERFORMANCE EVALUATION MODULE**

The performance evaluation module can be utilized by teachers to conduct tests. The system supports the teachers to type-in the questions, create multiple choices for the solutions, indicate the correct choice scoring procedure, an time constraints in answering the questions. The text material which is input y the teacher is converted in to appropriate authoring structure acceptable to author ware. Once this done, teachers can preview and edit the quiz.

Once the quiz session is launched the students have to be prevented from logging in to others account so as to prevent any malpractices. This is taken care by allowing the students to open the quiz session only once and prevent them from opening any other tasks during the session.

VB provides elegant mechanisms to implement the above procedure through the OLE techniques where the system from which the quiz was launched becomes the server and the other systems where the students take the tests act as clients.

#### 4. CONCLUSIONS

However, the most difficult part of the system to put in place will be an appropriate educational infrastructure to support the kind of learning needed in the 21<sup>st</sup> century. The provision of appropriate education and training services to run on the information highway is critical: there is no automatic guarantee that people will use the information highway to an extent that justifies the cost of investment. If services are not provided that meet peoples needs. Unfortunately, existing educational institutions were created to meet the needs of a society that are fast disappearing. We need new educational organizations that can exploit the information highway to meet the needs of the 21<sup>st</sup> century. Economic development will depend on much on the success of creating and supporting such organizations, as an establishing the technological infrastructure .It is critical to get this right because those countries that harness the power of multimedia communications for education and training purposes will be the economic powerhouses of the 21<sup>st</sup> century.

The future of interactive media in education ,when it is separated from the issues of technology that tend to mystify discussion and place it firmly in the sole grasp of those that are highly technologically capable ,is that of communication tool. Its dimensions and capabilities will evolve and expand at the same time as the potential to author becomes more widely accessible .The potential for students of all ages to author as part of a creative educational programme that is based on achievement of goals and competencies rather than time served will assist educators to shift from teacher to facilitator and mentor. Interactive communication tools will transform our capability to embrace an educational paradigm that deals with learning as a vital, fulfilling, and continuing part of life at home and in the workplace as well as within educational institutions.

The results of the above are summarized in the following points.

1. The number of educational institutions adopting education through multimedia is on the rise and there are not many organizations to meet the demands of the institutions.
2. The prices of the systems are becoming affordable to many and we force a trend of multimedia computers becoming a consumer product in the next five years.
3. The existing products have been developed abroad and they do not target the domestic audience to a great extent.
4. The market is opening up with more and more organizations becoming aware of the potential of such products.

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