

## The Multimedia Authoring and Collaboration in Medical E-Learning System

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**Abstract.** In this paper, the proposed system consists of two parts – multimedia authoring and recordable virtual collaboration in medical training system. The former supports synchronized multimedia presentation using Synchronous Multimedia Integration Language (SMIL). It allows synchronization of the contents of a PowerPoint presentation file and a video file so that the presentation shows slides and video on the same topic at any given time. Authors can use text along with associated symbols over the presented power point slides. The last is the web-based collaborative medical system. In this system, The annotations such as arrows or polygons represent associated participants' questions and answers. Those annotations can be easily hidden for training purposes.

**Keywords:** E-Learning, Multimedia Authoring, SMIL, Virtual Collaboration.

### 1 Introduction

Internet-based collaboration or virtual collaboration may be carried out in various ways e.g., simple text exchange through web pages, text chat, voice-over-IP and IP video conferencing [1]. Pooshfam et al. proposed a system for annotating images and videos in a collaborative way [2]. The demands for the virtual collaboration and multimedia authoring tools supporting this have been overwhelming in the sectors including research community, academia, medical and some industry for various purposes, e.g., researchers getting better results by doing collaboration with their peers, schools offer distance education to serve broader community, medical doctors collaborate for better treatment of patients – by getting experts' opinions, industry use collaboration for more efficient sales and marketing meetings, etc.

SMIL(Synchronized Multimedia Integration Language) is a XML based markup language by W3C recommendation to create multimedia presentations [3]. SMIL integrates multimedia elements such as text, images, video and audio by synchronizing them. SMIL provides an easy way for authors to compose multimedia presentations. Bouyakoub et al. have proposed a temporal authoring tool for SMIL document with incremental authoring based on H-SMIL-Net model [4]. Téllez has

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presented an IMS formats authoring tool for Docbook to produce SMIL compositions and e-learning contents [5].

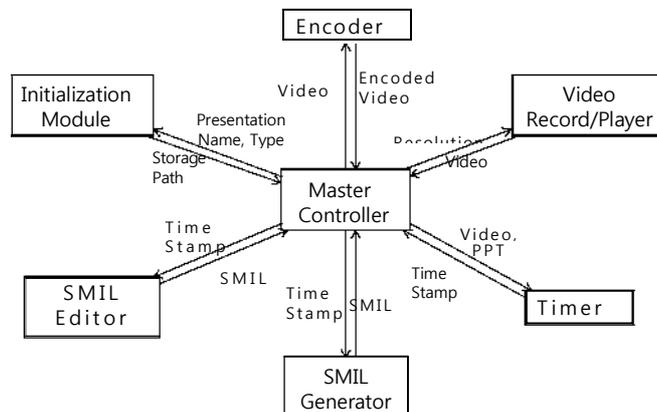
In this paper, we are proposing a multimedia authoring and virtual collaboration medical system that produces multimedia presentations for e-learning contents and enables multiple users to do collaborative work. The proposed system consists of two separate tools: one is a multimedia presentation authoring tool and the other is a virtual collaboration tool.

## 2 Multimedia Presentation using SMIL

The video and PowerPoint file are used to create multimedia presentation. When used with PowerPoint file, video must be synchronized with each slide so that the audience knows what the video is referred to. The following things must be considered when synchronizing multimedia elements:

- Duration of each slide (how long should it be displayed)
- Position of each multimedia element such as video, slide, and/or digital image
- Order of each element (which one shows up first)
- Types of supporting multimedia file and its player

There is W3C recommendation that describes Synchronous Multimedia Integration Language (SMIL). It is a collection of XML elements and attributes that can be used to describe the temporal and spatial coordination of one or more media objects. With SMIL, different media objects can be combined into a single coherent multimedia presentation. SMIL can be used to manipulate location, size, type of media objects, bit-rate, etc.



**Fig. 1.** Block Diagram of Multimedia Presentation Tool

There have been many approaches in adding multimedia to presentations, but many of them are fairly complicated and require expensive equipment. In our approach, we are proposing an easy and inexpensive and yet efficient way of adding multimedia to

presentations using SMIL. This concept was implemented using Java technologies such as JMF and JDOM. As in Fig 1, it captures video and audio from a web cam and creates multimedia presentation by merging PowerPoint presentation slides and a captured or a prerecorded movie. One of the hard parts in creating such material is to specify synchronization relationships among media elements.

Main modules are described as in the following:

- The Initialization Module initializes a user session. It creates or opens an existing presentation based on user selection and initializes other modules in the tool.
- The JMF video capture module records video and renders it to the screen for monitoring. Its video playback module can play an existing video selected by user.
- Timer is triggered by user command. When the timer is started, it starts video capturing module and marks the beginning of the presentation displaying the 1st slide. As user moves on to next slide, it invokes the slide loader and keeps track of the time duration for each slide for synchronization with associated video. When the timer is stopped, it stops the video capturing and marks the end of the presentation.
- Encoder transforms AVI video into streaming format and compress the size of video
- The SMIL Generator compiles the information about slides and time stamp for each slide, captured or pre-recorded video and synchronizes those into one SMIL file that enables synchronized multimedia presentation.
- The SMIL Editor is used for fine-tuning the synchronized presentation. The editor module reads the time stamps from the generated SMIL file. It waits for user command whether to write the edited timestamps back to the SMIL file. It also ensures that the accumulated duration of the entire slides is the same as the video running time.

SMIL files contain only the references to media objects, not the actual media objects itself. Some SMIL players are currently available. The SMIL player we chose was RealPlayer™ due to its popularity.

### **3 Virtual Collaboration System**

One of the important requirements of virtual collaboration is private person-to-person communication between participants. This collaboration system recreates face-to-face experience of traditional meeting by providing the independent (or not tied with the

main window) private window. The participants create a private session with other participants. They can choose the name in the list of participants and request private session. If the recipient accepts the offer, the private session can be created. The discussion and any shared data in a private session are hidden from the other members.

In a shared window, the viewpoints of all participants are synchronized. If any participant expresses opinion using a symbol and comment, the content of every participating client object is updated simultaneously. The user can move freely between the private and shared working space.

In this collaboration, shared working space can be synchronous or asynchronous. In a synchronous mode, the state changes are multicast and updated to other participants' views synchronously so that all participants can see the same view. The synchronous collaboration is typical in shared working spaces such as chatting, instant messenger or whiteboard. However, since the proposed collaboration can record all the synchronous discussions and related materials to the XML database, asynchronous collaboration is also possible by allowing legitimate users to log on the lecture at their convenient time and leave new marks and questions which are recorded in a XML database too. Then, the teacher can log on the lecture and answer those questions at any time.

A discussion through the virtual collaboration tool is shown in the Fig. 2. The opinions from the participants will be associated with the symbol on the image.

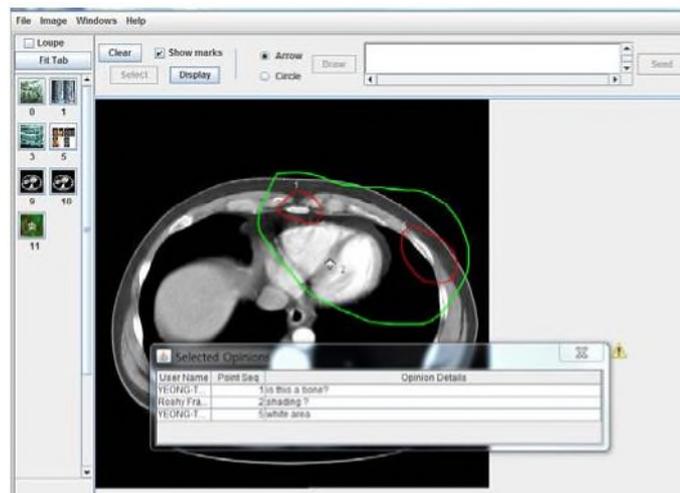


Fig. 2. Virtual collaboration tool

## 4 Conclusions

We have proposed a multimedia authoring and virtual collaboration in medical e-learning system that helps authors to produce multimedia presentations and enables users to collaborate in medical images.

The multimedia authoring system provides authors a tool to create multimedia e-learning contents easy to follow. The proposed system makes it possible to integrate diverse media types including text, images, audio and video, and synchronize media objects by generating SMIL documents automatically. The virtual collaboration tool provides recordable discussions among users using spatial data associated with

students' questions and the slides. Users' questions or answers along with symbols are recorded to XML files and may be saved into web-based database for future context based intelligent search.

Our proposed system is expected to be a powerful educational tool through the multimedia authoring and virtual collaboration. It can be an efficient way for learning valuable knowledge and sharing information through the Internet anytime and anywhere.

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