Virtual Collaborative System supporting Multiple Conferences with Real Time XML Recording

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Abstract. With development of Internet technologies, Internet based communication has emerged as an important method of communication. Therefore, virtual learning or collaboration through Internet may be introduced as an effective way in education or research. In this paper, we propose a virtual collaborative system supporting multiple conferences. The proposed system consists of two parts: multimedia content authoring for presentation and virtual collaboration for conference. The integrated authoring tool enables users to create multimedia contents for presentation. Media objects are synchronized with the temporal and spatial information using Synchronous Multimedia Integration Language (SMIL) defined by W3C. In virtual collaboration, users use digital images and associated spatial data elements which are symbols such as arrows or polygons along with text and used to represent areas of interest in images. The content of each conference which is spatial data elements from the participants with respect to certain topic can be recorded into an XML database using Unstructured Information Management Architecture (UIMA).

Keywords: Virtual Collaboration, XML, Multimedia Content, Digital Image Annotation, Distance Conference, SMIL, UIMA.

1 Introduction

Due to advances in network and multimedia technologies, the Internet usage has continued to increase rapidly and Internet is providing various services such as multimedia contents, communication, games. Therefore, virtual learning or virtual collaboration based on the Internet can be expected as a powerful method in education or research and enables users to learn or collaborate wherever and whenever. Fox et al. [1] proposed a collaboration system that provides integrated multimedia services and implemented it globally. Suebnukarn et al. [2] proposed a tutoring system that makes use of chat, discussion and experts’ opinion to draw a conclusion. Pooshfam et al. [3] proposed a system for annotating images and videos in a collaborative way. Bouyakoub et al. [4, 5] proposed a temporal authoring tool for SMIL document with incremental authoring based on H-SMIL-Net model. Tellez [6] presented an IMS
formats authoring tool for Docbook to produce SMIL compositions and e-learning contents.

In this paper, we propose a virtual collaborative system supporting multiple conferences. The proposed system helps users to create multimedia contents for presentation and to exchange opinions over digital images using layered architecture that separate images from annotation. Unstructured participants’ opinions may be recorded into XML database using UIMA.

2 Related Techniques

2.1 SMIL

SMIL (Synchronized Multimedia Integration Language) \[7, 8\] is a XML based markup language by W3C recommendation to create multimedia presentations. SMIL integrates diverse media elements such as text, images, video and audio by synchronizing them. The proposed system makes it possible temporal and spatial synchronization of integrated media types using SMIL.

2.2 UIMA

![Fig. 1. Basic concept of UIMA framework](image)

The Unstructured Information Management Architecture (UIMA) \[9-11\] is a framework developed by IBM and an open source project maintained by Apache. UIMA analyzes unstructured data such as text, audio, and video, and extracts and stores information in the Common Analysis Structure (CAS). UIMA has three types of components: Collection Readers, Analysis Engines, and CAS Consumers. The collection reader reads unstructured data from source and sends it to an analysis engine in CAS. The analysis engines analyze the data and create annotations in CAS. Finally, CAS consumers generate structured data as output. XML descriptors are used to configure UIMA components. Fig. 1 shows the basic concept of UIMA framework. In the proposed system, data along with associated elements from synchronous and asynchronous collaboration is recorded into structured XML database by UIMA.
3 Implementation of the proposed system

The proposed system provides an integrated graphical authoring environment that enables users to synchronize media objects and generate SMIL files without knowing SMIL. The system architecture of the content authoring part is shown in Fig. 2.

![System architecture of multimedia content authoring part](image1)

**Fig. 2.** System architecture of multimedia content authoring part

The proposed collaboration system offers multiple conferences and access control mechanism that restricts users’ access right to the available resources to protect the system and data from malicious operation. There are four types of access rights: Administrator, Member, Observer, and Restricted user. A conference must be created by the system administrator upon the user’s request. Once a conference is created, detail topics can be created and be associated with the conference. Users can join several topics in different conferences. Fig. 3 shows the communication architecture between a server and a client.

![Communication architecture between server and clients](image2)

**Fig. 3.** Communication architecture between server and clients

In the proposed system, users can collaborate in synchronous mode and asynchronous mode. 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.
However, asynchronous collaboration is also possible by allowing users to log on to the topic at their convenient time and leave new marks and comments at any time because other’s opinions and their related information are saved in database. In virtual collaboration, users can place a symbol on the location of interest in a digital image and associate it with their opinions and multicast those to all the participants in the discussion so that they may be able to exchange their opinions. All the discussion data may be recorded into XML database using UIMA.

4 Conclusions

In this paper, we have proposed a new virtual collaborative system offering multiple conferences with structured XML database. The proposed system enables users to produce multimedia contents for presentation using content authoring function and to exchange opinions over digital images using layered architecture that separate images from annotation in virtual collaboration. Unstructured data along with associated elements from synchronous and asynchronous collaboration may be converted to structured data and be recorded into XML database using UIMA.

References