HY-MOST: HYpermedia MOdel for Synchronised PresenTations

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ABSTRACT
A brief abstract. In this paper we present a new model for hypermedia presentations. This model is based on an HTML-like language which provides the necessary modules for the intermedia synchronisation of the inline media that comprise the hypermedia document. The model also enables a distributed approach in the storage of the hypermedia documents. Additionally, it is capable of incorporating the necessary protocols needed for the real-time delivery of continuous media such as audio and video.

KEYWORDS: Hypermedia, Model, Language, Presentation

1 INTRODUCTION

In our days multimedia tend to be a basic part of all software applications. The reasons for this trend in software, stem from the need of being more natural and friendly to the end user. However the users' demands are getting higher and higher, thus making software developers producing high quality applications. Developing a hypermedia application imposes several problems involving the presentation. The spatio-temporal relationship among the different media that comprise the presentation is the most important aspect of a high quality presentation [4],[6],[12]. Synchronisation of all these media requires a model for defining the exact place where these media will be presented and the exact time that their presentation will start. In this paper we propose a new model for structuring hypermedia documents. The core of this model is a hypermedia markup language providing modules for a synchronised presentation of the various multimedia objects that comprise it.

2 PREVIOUS WORK

The need for a model meeting the above requirements has been mentioned at the very earlies of this decade. As a result there has been much research work in this area and several standards aiming at these goals have been developed [5]. Karmough [9] proposes a model for structuring multimedia documents. While MHEG [7], [8], [13] is the most promising standard, it is not yet widely applicable. The same stands for Hytime [10] as well. The prevalence of WWW in our days in conjunction with the Hypertext Transfer Protocol (HTTP) [1] is clear. Many browsers such as Netscape and Mosaic offer great capabilities in browsing information made up from static data. However, multimedia information such as video and audio are not handled with the most appropriate way. The problem is that that the whole file containing video for example, has to be downloaded first, before playback begins. Considering that video files take many minutes to be retrieved, the observed latency becomes a restraining factor for a multimedia presentation. Apart from this, HTML [2] which is the most widely used programming language for the Web, does not provide any mechanisms for controlling the synchronisation of the hypermedia objects. For all these reasons the Web itself is inadequate to meet the above requirements.

To the direction of incorporating hypermedia and especially continuous media, new protocols have been developed. The most important of these protocols are the Real Time Protocol (RTP) [11], the Real Time Streaming Protocol (RTSP) [14] and the Resource Reservation Protocol [15]. The basic idea behind these protocols is the usage of a streaming client-server system. The difference from client side streaming from an HTTP web server, is that the web server cannot control the rate in which a file is sent. The integration of these new protocols will be a solution for real-time delivery of multimedia.

3 MODEL DESCRIPTION

During this last year we started designing a new model which could be easier to be implemented and to be used than MHEG, providing modules for a synchronised presentation of hypermedia objects and capable to cooperate with protocols for real time delivery of hypermedia objects. The first step in this attempt was designing a new markup language including time features, capable of handling intermedia synchronisation (i.e. synchronisation between different media).

Indeed, this language encapsulates characteristics for the synchronised presentation of a pre-defined scenario. Using this language it is possible to determine the exact place where all the multimedia objects that comprise the presentation will appear, and the exact time that this will happen. This is achieved by introducing the notion of 'relative playout start time' and media playout duration' for every media that is embedded in the presentation scenario .

The most important feature of a hypermedia language is linking different documents. In traditional hypermedia systems, navigation is enabled via either a "sequential" way or an "explorational" way. In sequential navigation, users have to follow the links defined by the creator of the hypermedia document in order to maintain a logical sequence of the selected information topic. On the contrary, "explorational" navigation can be used to override the logical sequence. In our language we include both of these methods and we expanded the notion of sequential navigation by incorporating timing characteristics in the linking method. This means that a specific link may automatically be followed after the expiration of a time period that is properly defined by the presentation scenario. In this way it is possible to compose multimedia documents for a specific presentation scenario.

Apart from this, the integration of the real time protocols discussed above can be easily implemented. In this way real time service can be provided for the on-demand delivery of multimedia objects.

An other important feature of this language is that it permits the multimedia objects to be stored in different servers, thus providing the model a distributed approach, with all the advantages that are implied from this.

In order to check out in practise all the features mentioned above, we designed and implemented a browser for this language. We also developed a teletraining system which is based on this language and uses the Real Time Protocol (RTP) for the delivery of continuous media.

In the sequel we use the Backus-Naur Form (BNF) to describe the main parts of the language, where terminal symbols appear in capital letters and boldface, while non-terminals appear in brackets.

<Hdocument> : : = **TITLE STRING END_TITLE** <HSentence>

<Hsentence> : : = /* empty */
| <Headings> <Main> <Separator> <HSentence>

<Next> : := /* empty */
|<HyperLink>

<Headings> ::= /* empty */
| <Heading1> | <Heading2> | <Heading3>

<Heading1> ::= **H1 STRING END_H1**

<Heading2> ::= **H2 STRING END_H2**

<Heading3> ::= **H3 STRING END_H3**

<Main> ::= <Par> <Body>

<Separator> ::= /* empty */ | **SEPARATOR**

<Par> ::= /* empty */ | **PARAGRAPH**

<Body> ::= /* empty */

| <Document> <Body>

| <Image> <Body>

| <Audio> <Body>

| <Video> <Body>

| <Audio_Video> <Body>

| <HyperLink> <Body>

<Document> ::= **TEXT** <Text> **END_TEXT**

<Text> ::= /* empty */
| **STRING** <Text>

<Image> ::= **IMG** <ImgOptions> <Source> <Id> <Note> **END_IMG**

<Audio> ::= **AU** <AuOptions> <Source> <Id> <Note> **END_AU**

<Video> ::= **VI** <ViOptions> <Source> <Id> <Note> **END_VI**

<Audio_Video> ::= **AU_VI** <Au_ViOptions> <Au_ViSource> <Au_Vi_Id> <Note> **END_AU_VI**

<HyperLink>::=**HLINK**<to_HyperText> <TimeOption> <Note> **END_HLINK**
| **HLINK** <to_OtherHost> <TimeOption> <Note> **END_HLINK**

<ImgOptions> ::= <TimeOption>
| <TimeOption> <OtherImgOptions>

<AuOptions> ::= <TimeOption>
| <TimeOption> <OtherAuOptions>

<ViOptions> ::= <TimeOption>
| <TimeOption> <OtherViOptions>

<Au_ViOptions> ::= <SyncOption>
| <SyncOption> <OtherAu_ViOptions>

<TimeOption> ::=/*empty*/
| **STARTIME STRING**
| **STARTIME STRING DURATION STRING**

<SyncOption>::= **STARTIME STRING STARTIME STRING**

<OtherImgOptions>::= **HEIGHT STRING WIDTH STRING**

<OtherAuOptions> ::= /* empty for the time being...*/

<OtherViOptions> ::= /* empty for the time being...*/

<OtherAu_ViOptions>::= /* empty for the time being...*/

<Source> ::= **SOURCE** <Filename>

<Au_ViSource> ::= **SOURCE** <Filename> **SOURCE** <Filename>

<Id> ::= **ID STRING**

<Au_Vi_Id> ::= **ID STRING ID STRING**

<to_HyperText> ::= <Filename>

<to_OtherHost> ::= **STRING** < HyperLink >

<Note> ::= **NOTE STRING**

<Filename> ::= **STRING**

4 CONCLUSIONS AND FUTURE WORK

We proposed an extensiom of the HTML model for hypermedia presentations whose core is an HTML-like language with extended timing features, capable to manage the synchronisation between the objects that comprise it. In the future we are going to extend the capabilities of the language with more presentation features concerning both static and continuous media. Additionally, the structuring of presentations will be given in a more formal way, especially in the distribution of multimedia objects and we will provide more interaction to the model. Finally, we are going to develop an authoring tool to facilitate the creation of hypermedia presentations.

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