Design of the Hypermedia Presentation Language for Dynamic Hypermedia System

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Abstract

In this paper, we peopose a new control language , HMML (Hypermedia Markup Language) which controls a multimedia presentation by extending HTML, and functions for our Dynamic Hypermedia System. The multimedia information on an internet can be perused by the browser of a World Wide Web association (W3) now. The HTML (Hypertext Markup Language) is used as a language for displaying an information on the browser. This language can display text, images, move, etc. on a window. Recently, if Java or Dynamic HTML is used, the viewing of the object which moves on a window is also possible. However, these languages are not necessarily supporting a scene synchronization of a video and audio, and a lip synchronization. Moreover, although SMIL is providing an easy scene synchronization, QoS guarantee function is not supporting. Then, the language and the function for providing a lip synchronization and a complicated scene synchronization are needed, with maintaining QoS guarantee. So, we propose the language and control functions.

1. Introduction

In order to realize advanced multimedia information systems, we have proposed the new presentation models, architecture and functions for a next-generation hypermedia system with a more sophisticated media structure. In researches [4] and [5], the hypertext presentation is organized by nodes and links, whereas a multimedia presentation is organized by a combination of continuous and discrete media. Furthermore, hypermedia presentation is organized by an extended hypertext presentation model in which each node has a multimedia presentation. However, the definition of Hardman's multimedia presentation was inadequate, as it gave no clear definition of the temporal synchronization between continuous media, such as audio and video, and continuous media and discrete media, such as images, graphics and text, with the presentation scenario. Also not considered was transmission of media over a network depending on the presentation scenario, while maintaining the temporal relation between spacial relation. Then, we defined a hypermedia presentation model consisting of several multimedia presentations [1] And we proposed Hypermedia-on-Demand system (HOD) [2] based on client-agent-server architecture to provide the hypermedia presentation. In addition to these, we provide the control functions to provide the hypermedia presentation [3].

On the other hand, multimedia information on an internet can be perused by the browser of a World Wide Web association (W3) now. The HTML (Hypertext Markup Language) [6] is used as a language for displaying an information on the browser. This language can display text, images, move, etc. on a window. Recently, if Java [7] or Dynamic HTML [8] is used, the viewing of the object which moves on a window is also possible. However, these languages are not necessarily supporting a scene synchronization of a move and audio, and a lip synchronization. Moreover, although SMIL (synchronized Multimedia Integration Language) [9] is providing an easy scene synchronization, QoS guarantee function is not supporting. Then, the language and the function for providing a lip synchronization and a complicated scene

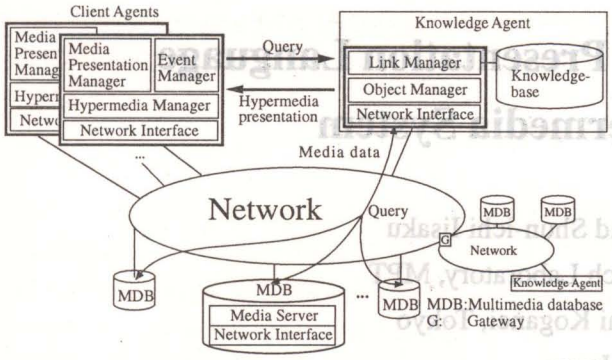

Fig. 1. Architecture of Dynamic Hypermedia System

synchronization are needed, maintaining QoS guarantee. In this paper, we propose HMML (Hypermedia Markup Language) which is the language of controlling hypermedia language, and discuss the control functions for the proposed language.

2. Dynamic Hypermedia System

2.1. The Architecture

The Dynamic Hypermedia System (DHS) is a network-oriented platform for multimedia information networks to provide multimedia information space based on hypermedia presentation. The system architecture of the DHS has three components, as shown in **Fig. 1**. The client agents are located at user stations to provide the users with multimedia presentation capabilities. The knowledge agent manages links to information units by dynamic linking methods[10] and generates multimedia objects. The multimedia databases (MDB) manage multiple media objects, such as text, image, and video and audio data.

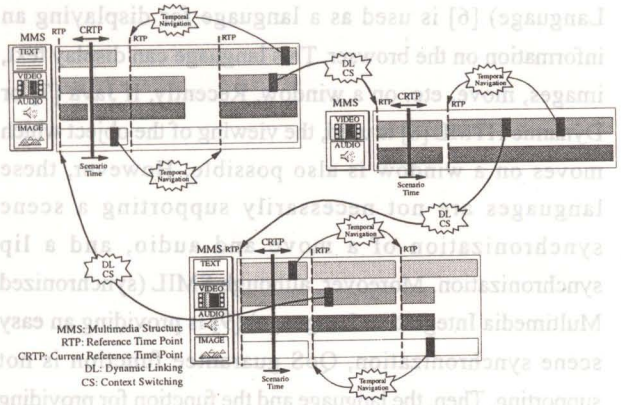

Fig. 2. Hypermedia Model

2.2. Presentation Models

We have proposed three presentation models for an advanced information infrastructure: the Dynamic Hypertext, Multimedia and Dynamic Hypermedia models. These models constitute the next-generation hypermedia information system. They are more sophisticated than the Amsterdam Hypermedia Model [4,5l because they include dynamically linking mechanisms and QoS guarantee functions to expand the flexibility of hypermedia information access.

Dynamic Hypertext model: One fundamental difference between the dynamic hypertext model and conventional hypertext model is that this method supports a link to the dynamically next node at the time of user interaction. The next node is linked by dynamic link methods that search for media data to match the user's intellectual background or level of interest in the information. The Kansi link method is a very suitable example. In addition to this, for continuous media data in video or audio, the linking relation is decided in real time.

Multimedia model: This is the same as multimedia defined generally. Several media sources are integrated temporally and spatially to create presentations.

Dynamic Hypermedia model: This model, shown in **Fig. 2**, integrates the dynamic hypertext model with the multimedia model. In other words, a node in the dynamic hypermedia model, is constituted by multimedia model.

3. Presentation Control Language

Presentation control language HMML (HyperMedia Markup Language) proposed by this research is a language which describes the control structure for presenting the hypermedia presentation as a scenario, in the dynamic hypermedia system. A presentation is performed based on the scenario which carried the multimedia browser which interprets and performs this presentation language in the client agent, and received from the knowledge agent and which was described in this language. Since it is for describing a multimedia scenario, it is structured and time-controlled and navigation consideration of this language is carried out. Moreover, in this language, the text which

extended HTML (HyperText Markup Language) describes a scenario in consideration of the ability of the described architecture of a scenario to be read easily. The walk through of a function is described below.

(1) Structuring

The multimedia scenario described by presentation control language has the hierarchic structure which consists of two or more scenarios, and two or more scenarios serve as the component of the scenario of the high-order layer. The concept of the hierarchy of a scenario is an open ended similarly in a high-order layer. In presentation control language, although the hierarchy of a scenario is an open ended to n layers, the scenario in the DHS defines four layers: Media layer (the 1st layer), Scene layer (the 2nd layer), Story layer (the 3rd layer), and Title layer (the 4th layer).

The Media layer: Behavior of a single media is described. As a media, there are parts, such as animation objects, images, video, a text, and a button, etc.

The Scene layer: Behavior of a media scenario is described. The head of the scenario of this scene layer is Reference Time Point (RTP) [1] in the case of carrying out a navigation.

The Story layer: Behavior of a scene scenario is described. This scenario serves as the description unit in presentation control language.

The Title layer: Behavior of two or more stories is described.

(2) Control of a time

The presentation using the multimedia is described about how to describe to perform the control of a time, and the control of a time in a multimedia scenario. The multimedia scenario has the hierarchic structure and two or more scenarios exist in each hierarchy. The control of a time exists for every scenario, and the control of a time is needed also as an overall. Then, the control of the time for every scenario is described as a local time information closed in the scenario. That is, the single scenario which is the component of a multimedia scenario describes starting of the scenario a time information as an origin of a local time. Suppose that there is a scenario 3 of the 2nd hierarchy containing the scenarios 1 and 2 of the 1st hierarchy. The start time the scenario 2 is described as T2 in the scenario 3. When the time of the events which it is into a scenario 2 is described as t1, the time T of the events in the inside of a scenario 3 can set to T = T2+t1, and can express.

(3) Navigation

A navigation can be performed according to the scenario described by presentation control language. A navigation points out the time and spatial move between presentations here. Two kinds, temporal navigation and dynamic linking methods, are specified as a navigation.

The temporal navigation: It moves to the head of a scene by the event generated during scene reproduction, and a regeneration is continued. The scene of the point to move shall be contained in the same story.

The Dynamic Linking: It moves to the head of another story by the event generated during dynamic phosphorus king story reproduction, and a regeneration is continued.

4. Language Specification

(1) A definition of a window

The viewing area of the rectangular displayed on display is called a window. There are five kinds of windows and four kinds of windows below general window actually specify by presentation control language. The display window shows the viewing area of display itself, and can show the magnitude of a viewing area which the scenario needs. General window specifies the size (a height, width) of a window with the number of dots, and a story window, a scene window, and a media window specify the position (X, Y) of a zero, and a size. The position of a zero is expressed with the offset (dot) from the window zero of the hierarchy on one containing the window. A size expresses a height and width with the number of dots. The occultation of the fraction which the window of a lower hierarchy is drawn within the limits of the window of the upper hierarchy, and overlapped with the window of the upper hierarchy is carried out to the window of a lower hierarchy.

(2) Architecture

The information element which describes HMML using the structured notation technique and to describe is structured

using a tag. A top's hierarchy (the 1st hierarchy) is allowed only the statement of

<HMML>

...

</HMML>.

The statement of a tag of <GENERAL_INFO>, <MEDIA> <STORY>, and <ACTION> <EVENT_ACTION> is permitted by the 2nd hierarchy. The tag described to the 2nd hierarchy is reflected into general window. Namely, the information shown by <GENERAL_INFO> -- the inside of general window -- and, the information shown by <MEDIA> which is an information outside a story window and was described by the 2nd hierarchy -- the inside of general window -- and, it is an information on the media displayed out of a story window. The 3rd or less hierarchy is the same. Only a skeleton shows Fig. 3 as an example of description of a scenario. Here, the story consists of one scene containing one media scenario.

```
<HMML>
  <GENERAL_INFO>
  </GENERAL_INFO>

  <MEDIA ID=1 ATTRIBUTE="JPEG">
    <MEDIA_INFO>
    </MEDIA_INFO>
  </MEDIA>

  <STORY>
    <STORY_INFO>
    </STORY_INFO>

    <SCENE ID=1>
      <SCENE_INFO>
      </SCENE_INFO>

      <MEDIA ID=2>
        <MEDIA_INFO>
        </MEDIA_INFO>

        <EVENT ID=7>
        </EVENT>
      </MEDIA>
    </SCENE>
  </STORY>

  <ACTION ID=3>
  </ACTION>
  <ACTION ID=6>
  </ACTION>

  <EVENT_ACTION>
  </EVENT_ACTION>

</HMML>
```

Fig. 3. Example of structuring description

(3) An event and an action

Two kinds of timer events described in the scenario to be the things which a user makes an event generate are taken into consideration. In the midst of a presentation, a user does the point of the event which a user generates, and it is represented by the mouse click. This event handling becomes indispensable when performing a navigation. A timer event is beforehand set up, when it is described in the scenario and a scenario is performed. For example, when an intervention of the user after a story end makes a navigation nothing, it uses. An action describes the operation started when an event occurs. The correspondence relation of an event and an action is determined when a scenario is constituted. That is, a different scenario can be constituted if the association of an event and an action differs even when it combines the same scene in the same sequence. Therefore, description of an action and the statement of the correspondence relation of an event and an action are located in the outside of <STORY> on an architecture.

5. Presentation Management Module

This section describes the functional module for realizing a hypermedia presentation.

5.1.Multimedia Controller

Couple starting of the multimedia controller in a client

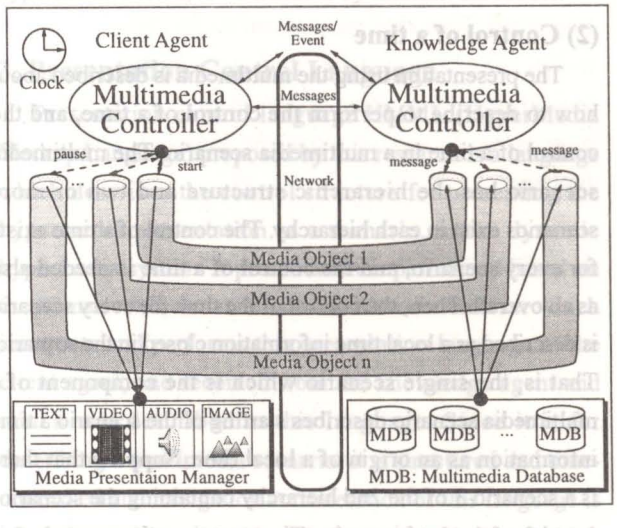

Fig. 4. Multimedia Controller

agent and an information agent is carried out to one presentation, and, as for a multimedia controller, they perform the synchronization control based on the scenario. A multimedia controller performs management/control of all the media objects that constitute a presentation, and the multimedia controller in a client agent realizes a scene synchronization control by the message passing shot in the timing based on the presentation scenario to each media object. Moreover, if scenario time which shows the progress grade of a presentation is managed and the reference time move event from a user is detected, a control message will be transmitted to all media objects, and the move of a present reference time of day will be performed. Media shown in Fig. 4 The modify of QoS parameter of the whole scenario which a Stream Management and Control module supervises the load effect within a system and the status of a network, negotiates with other modules according to the status of the shift, and is contained in HMML is performed. The modify is notified to a multimedia controller. The multimedia controller which received notification notifies the parameter which responded with QoS priority in a scenario to each media object. A presentation is provided in each media object, maintaining QoS assurance with new QoS parameter QoS Maintenance module. Of an information agent, a transmission schedule is changed if needed.

5..2. Hypermedia Controller

Message passing shot performs a management called starting and the termination of a multimedia controller, and the context switching control based on the invocation of author described in each presentation scenario by starting a hypermedia controller within the client agent and the knowledge agent at the time of starting of a system, as shown in Fig. 4. Moreover, the client agent makes possible the context control by which the synchronization was taken, by receiving a status message from the multimedia controller in the client agent, and grasping those status like a multimedia controller.

5.3. User Event

The event in which a user influences to a multimedia presentation in the multimedia architecture in a hypermedia architecture,

start: From the beginning to new multimedia presentation,

pause: pausing a multimedia presentation,

resume: release a multimedia presentation,

jump: reference time point movement or temporal navigation,

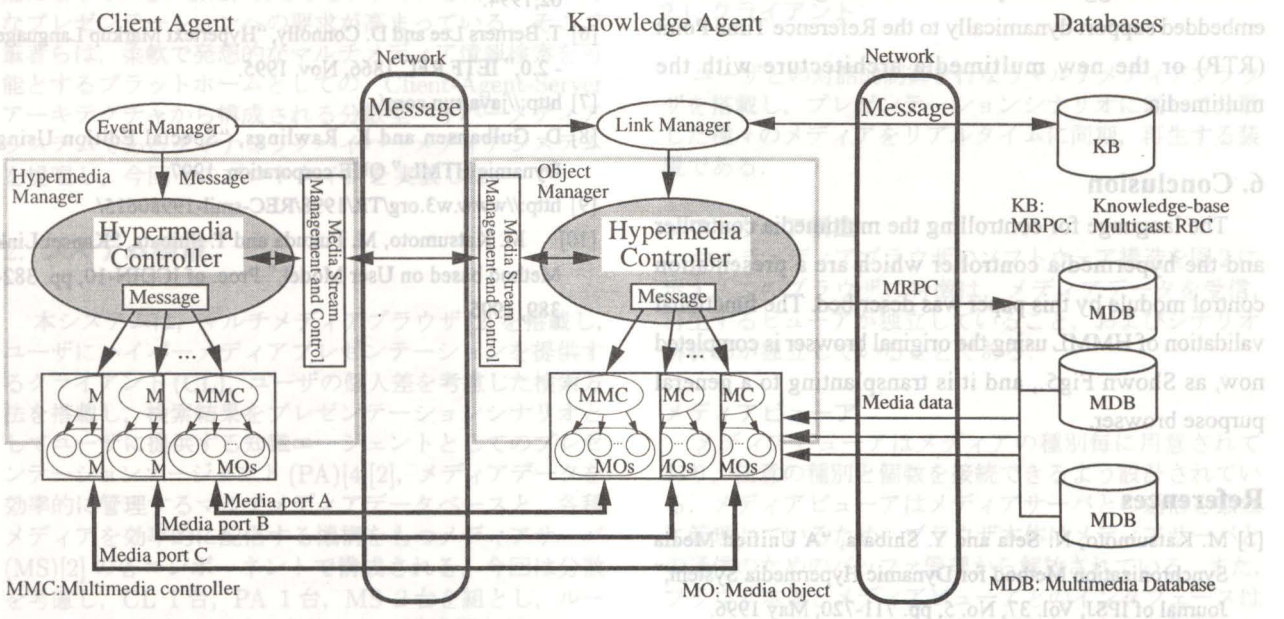

Fig. 5. Hypermedia Controller

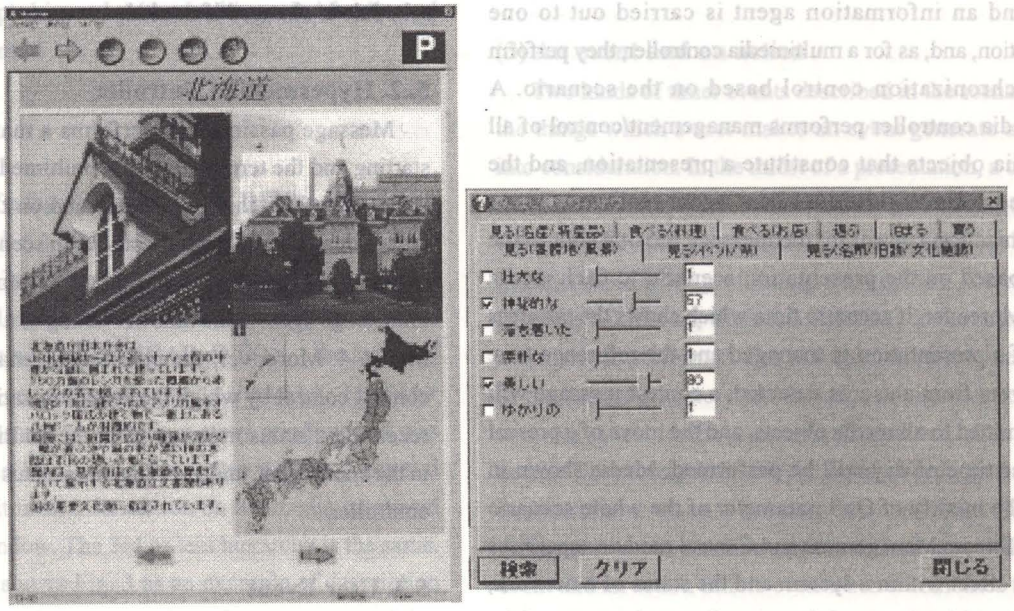

Fig. 5. Prototype System

quit: end a multimedia presentation,

select: navigation by dynamic linking,

these defines as a control message of the HMML. As for "select", a user works upon the media data (objects, such as a button, are also included) of a certain multimedia architecture directly in a hypermedia architecture. And this serves as a trigger and performs a navigation from the embedded support dynamically to the Reference Time Point (RTP) or the new multimedia architecture with the multimedia.

6. Conclusion

The language for controlling the multimedia controller and the hypermedia controller which are a presentation control module by this paper was described. The functional validation of HMML using the original browser is completed now, as Shown Fig5., and it is transplanting to a general purpose browser.

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