PDA 환경에서의
인터렉션 기반의 MPEG-4 재생기

김남영°, 김상옥, 이현주, 김상욱

경북대학교 컴퓨터과학과

An Interaction-Based
MPEG-4 Player for a PDA

N. Kim°, S. Kim, H. Lee, S. Kim

Dept. of Computer Science, Kyungpook National Univ.

Abstract

The rapid proliferation of mobile device such as PDA allows users more ubiquitous access to multimedia information. The user mobility provides users a uniform vision of their preferred working environment independently of their current points of attachment. Supporting the user mobility requires the Player capable of efficiently presenting the multimedia contents. MPEG-4 provides not only the description for coding audio and video (as its predecessors MPEG-1 and MPEG-2), but also for coding images, animations, interactivity and protecting content. With MPEG-4, we present interactive media using multiple objects - audio, video, image, 2D geometry, and text - in a single format. Therefore we propose the MPEG-4 Player for PDA. The proposed MPEG-4 Player for PDA supports mobility, portability and personality.

1. Introduction

The MPEG-4 (Moving Picture Experts Group) standardization phase has the mandate to develop algorithms for audio-visual coding[1]. It allows for interactivity, high compression, universal accessibility and portability of audio and video content. Multimedia applications play an important role in various areas. We have recently witnessed a phenomenal growth in the development and deployment of wireless services, evident from the proliferation of cellular data services and the emerging wireless multimedia applications. Therefore we developed the MPEG-4 Player for PDA which is a hand-held and mobile computing device.

The proposed MPEG-4 Player for PDA supports mobility and portability, because mobile device such as PDA is small and supports wireless[2]. And whenever PDA can provide each user with contents that they want to play. Therefore PDA support personality.

MPEG-4 models audiovisual elements with a rich set of

representations called audiovisual objects. In order to play such object-based contents that consist of various multimedia objects, we design an architectural model on the respective of considering media data as individual objects. Therefore the proposed MPEG-4 Player for PDA can display the MPEG-4 Scene which is composed of audio-visual objects as well as the event object. In summary, the main contribution of this research is in the implementation of MPEG-4 Player for PDA. In the rest of this paper, we describe the Related Works, a development of an MPEG-4 Player for PDA and development result. Finally, we conclude the paper.

2. The Related Works

We introduce the related work and some comparison with our work. The related issues is the MPEG-4 Player for a desktop. In Desktop's environment, there are many MPEG-4 Player. And there has been much discussion regarding research related to play the MPEG-4 contents.

IM 1-2D that receives a complete MPEG-4 Presentation (systems, audio, and visual streams), decodes the corresponding streams, synchronizes them, and renders the complete composition. This will display two-dimensional content. It can display full screen MPEG-2 and MPEG-4 video as well as H.263 sequences and JPEG images. It can support DMIF using TCP and UDP, also MPEG-4 file format and can read from MPEG-2 transport streams. It also provides MPEG-4, MPEG-2 and MPEG-1 Audio/Visual content decoders in real-time. It uses DirectX for audio and video rendering.

The CLM Player for a Desktop developed in our lab dynamically plays local MP4 file according to user event information. It simultaneously supports various interactions like the time event and user event in the user interface. And it can play various multimedia data defined in the MPEG-4 Spec such as video, audio, image and 2D. This technology is applicable to VOD, Web TV, Educational Application and Intelligent TV with higher QoS and user interaction. It

supports the Complete2D Profile. And it supports the interaction among objects.

3. A Development of an MPEG-4 Player for a PDA

3.1 The Structure of the MPEG-4 Player for a PDA

The proposed MPEG-4 Player for PDA is greatly composed of the File Format Decoder, the System Decoder, Scene Compositor, Presenter and User Interface. Figure 1 shows the structure of the MPEG-4 Player for PDA.
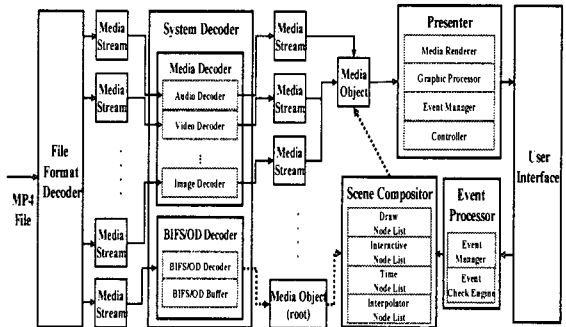

Figure 1. The Structure of the MPEG-4 Player for a PDA

The File Format Decoder analyzes MP4 file. It separates BIFS and elementary streams. Elementary streams are composed of video, audio, and image object. The System Decoder consists of the media decoder and BIFS/OD Decoder.

The System Decoder decodes BIFS (Binary Format for Scene), OD (Object Description) and each of media streams.

Scene Compositor creates the Internal Data Structure. The Internal Data Structure consists of Draw Node List, Interactive Node List and Time Table.

The Presenter searches the Draw Node List, the Interactive Node List and Time Table that is created by BIFS System Decoder. And it renders each object in the user interface.

3.2 The Process of the Interactive Scene Updates on a PDA.

A scene is set of objects or nodes with specific behavior and an optional list of routes to propagate events between objects. A scene is represented by a graph structure in which leaves are nodes. We describe the scene compositor and then the event manager for processing the interaction.

3.2.1 Scene Compositor

The MPEG-4 System handles the composition of audio, visual, and synthetic objects as well as the user interaction with such objects. Combination of these media into complete presentations requires a scene description capability. The scene description is mapped into a parametric form called Binary Format for Scenes (BIFS). The proposed MPEG-4 for PDA supports the complete 2D profile. The Complete 2D profile contains all the two-dimensional scene graph nodes from MPEG-4 Version 1. Figure 2 is the process of the BIFS Parsing.
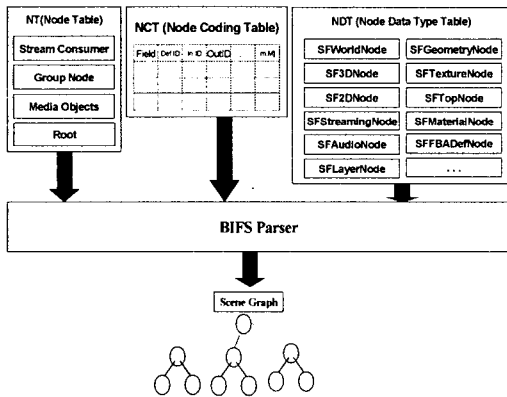

Figure 2. The Process of the BIFS Parsing

The BIFS Parser reads BIFS streams. The BIFS Parser decodes them using NT, NCT and ND[3]. The result of parsing BIFS is that the scene tree is made. The scene tree is structure that is needed in order to render contents. The BIFS Parser parses the SFTopnode at first. It creates the root node. And it searches the field by parsing the stream for creating the field of node. Then NodeFieldParse parses the field. In this case, if the attribute of the field has one of the

unique value or unique node, SFFieldParse operates. The other hand, if the attribute of the field has one of the multiple values or the multiple nodes, SFFieldParse parses. If the field has the node, the NodeParse repeats the processing. Figure 3 is the Example of the Scene Update. Therefore, the BIFS Parser creates the Scene Tree. The Scene Tree is referenced to composite internal data structure; the Draw Node List, the Interactive Node List.
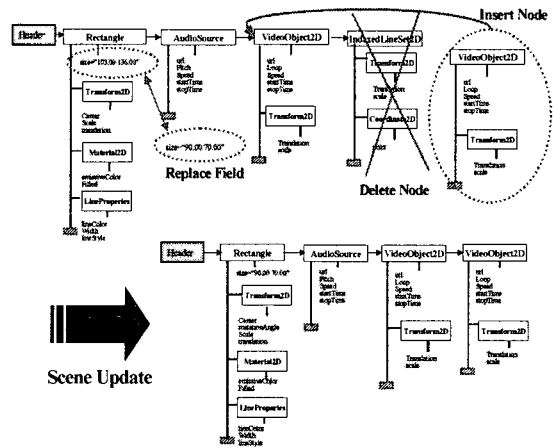

Figure 3. The Modification of the internal Data Structure

The Draw Node List is the data structure constructed the linked list nodes after extracting the node of being able to draw at that time from scene tree[4]. When the occurred time/user event is valid, the Event Manager searches the Interactive Node List using the occurred Object ID and the kind of event.

3.2.2 The Event Manager

Event manager is the module that takes charge of processing about all of the events happened by user interaction in MPEG-4 player for PDA[4]. In MPEG-4 standard, various events are defined to offer active data service with general users.

First, the player checks rapidly the event's validation using event layer. If the event occurs in the valid object's area of MPEG-4 scene, it is stored to event queue. And then, the player examines whether the event's information of

current source object and event type is in routing table or time's table. If some information exists, the player uses event filter in order that knows the event really changes current scene.
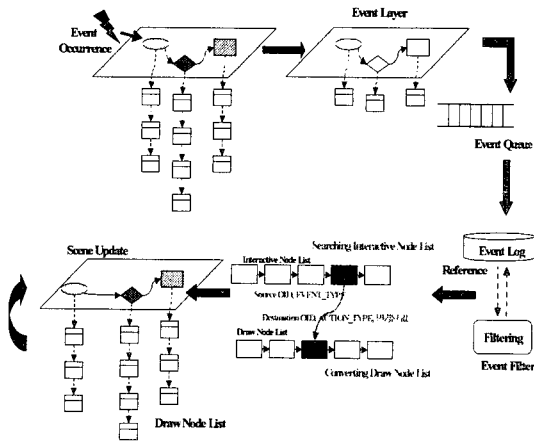

Figure 4. The Event processing mechanism

If the event isn't filtering event, the player converts the properties of destination object and then finally updates current scene.

4. Implementation

The proposed MPEG-4 Player for PDA in this paper is implemented using the Sharp Zaurus SL- 5500 based Linux.
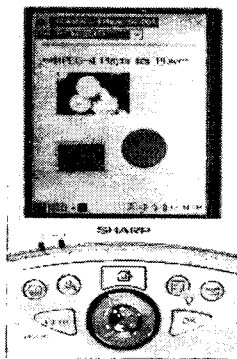

Figure 5. The MPEG-4 Player for a PDA

Zaurus supports the StrongArm Processor, 16M RAM, Color TFT LCD and etc. The OS is embedded the linux kernel. The embedded kernel is the Kernel 2.4.6—rmk1-np2-embedix. And we use the Qt/E and Qtopia by Trolltech. The Cross Compiler is the gcccross-armv4l-gcc-c++-2.95.2-10mz.i386. Figure 5 is the result of the implementation and is composed of the scene by 2-dimension geometry objects. It is rendering after parsing the audio, text, rectangle, circle, line and GIF image streams. When authoring the scene, the author set up the event of rectangle. So if the user clicks the rectangle, the circle is moved.

5. Conclusions

The proposed MPEG-4 Player for PDA play various multimedia data defined in the MPEG-4 Spec such as video, audio, image and 2D. The proposed MPEG-4 Player for PDA support MPEG-4 AAC, GIF, JPEG, BMP, Line, Rectangle, Circle and Text. And it supports various interactions in the user interface. We can display the object-based multimedia contents that consist of the various objects and support interaction on PDA.

[Reference]

[1] ISO/IEC 14496-2:1999 Coding of audio-visual Objects – Part 1: Systems ISO/IEC JTC1/SC29/WG11 N2501, 1999.

[2] K. Cha, "A Scalability for Adaptive MPEG-4 Contents," Dissertation for The Degree of Doctor of Philosophy, June 2003.

[3] MPEG home page, http://www.cselt.it/mpeg.

[4] H. Lee, "An Implementation of the MPEG-4 Scene Compositor," Dissertation for The Degree of Master of Science, December 2003.

[5] D. Lee, N. Kim and S. Kim, "The Event Manager for Efficient Event Processing in MPEG-4 Player," Proceedings of the Seventh Iasted International Conference on Internet and Multimedia Systems and Applications, August 13-15, 2003 Honolulu, Hawaii, USA, pp 540 – 544.