Building an Impress Extension for Interactive MPEG-4 Video Conversion

BRUNO CARPENTIERI and ROBERTO IANNONE
Dipartimento di Informatica
Università di Salerno
Via S. Allende – 84081 Fisciano (SA)
ITALY
bc@dia.unisa.it roberto.iannone@gmail.com
http://www.dia.unisa.it/professori/bc

Abstract: In this paper we exploit the possibilities offered by MPEG-4, through XMT-A and XMT-O, by implementing an Impress extension that translates an electronic presentation to XMT-O, so to be finally compiled for MPEG-4 conversion. We have implemented this conversion tool and in this paper we describe our implementation and analyze its results.

Key-Words: - Data Compression, MPEG, Impress.

1 Introduction

In the MPEG-4 video standard (in particular the part 11 of this standard: the ISO / IEC 14496-11) we can describe the scenes of a motion picture directly through XMT-A and XMT-O: two high level languages XML based.

MPEG-4 allows and defines the opportunities for video streaming.

This makes this standard a good starting point for the conversion of multimedia presentations, such as Impress or PowerPoint presentations, and for other e-learning applications because it offers the possibility of publishing the converted presentations on streaming servers.

XMT-A is a XML based language used by MPEG4 to describe a scene of the BIFS where audio-visual object lies. XMT-O is an easy-to-use version of XMT-A that was created to maintain compatibility with the W3C SMIL (see http://www.w3.org/AudioVideo/).

In this paper we partially design an e-learning, web based, architecture that exploits the similarities between OpenDocument format, SMIL and XMT-O to buildup MPEG4 interactive videos that can be successively fed to a streaming server.

Our intention is to study the possibility of exploiting the similarities between XMT-O and the XML based OpenDocument specifications. To do so we have implemented a coverter that translates Impress multimedia presentations to MPEG-4.

Preliminary results were presented in Iannone, Carpentieri and Annunziata [1].

We devote our attention primarily to the Impress extension and, differently from [1], we do not consider the possible implications of a streaming architecture for E-learning.

MPEG-4 interactive authoring has been widely studied.

For example, Kyungae Cha and Sangwook Kim [2] implement a comprehensive set of facilitative editing tools for composing multimedia scene. They also present a tool for automatic generation of XMT documents and MPEG-4 contents in which the users can create their MPEG-4 scenes by using a graphical editor to put objects in the MPEG-4 video and also a timeline interface for animations and transitions. Chih-Chun Lai and others [3] implement three typology of learning contents by using XMT-O authoring.

2 MPEG-4 Authoring and ODF

MPEG-4 is one of the most widely used multimedia standards.

In MPEG-4 it is possible to deal with multiple audio-visual objects.

The core of the MPEG4 scene composition system is the BIFS (Binary Format for Scene) that arranges the scenes in a structure that is represented by a directed acyclic graph having as its root the whole scene and as its leaves the objects in the scene. This graph is an extension of the VRML scene graph.

BIFS enables a powerful event management system which allows the structure of the scene to be manipulated and to be driven by user interaction.

As we indicated in Section 1, in the MPEG-4 video standard we can describe the scenes of a motion picture directly through XMT-A and XMT-O: two high level languages XML based.

XMT-A (the “A” stands for Alpha) is an XML-based version of MPEG-4 BIFS content that provides a deterministic, one-to-one, mapping between the textual and the binary formats.

XMT-O (the "O" stands for Omega) is a high-level abstraction of the MPEG-4 features based on the W3C SMIL language. The XMT-O format can be parsed and played directly by a SMIL player or it can be compiled to an MPEG-4 binary file that can be played by an MPEG-4 player.

XMT-O defines a document structure that is similar to the SMIL structure.

The <XMT-O> tag contain a single <head> and <body>. The XMT-O <head> tag can contain <meta>, <customAttributes>, <metadata>, <layout>, <transition>, <defs> and <macros>, while the <body> tag is the content itself.

The OpenDocument format (ODF) ("OASIS Open Document Format for Office Applications"), is an open format for saving and exchanging electronic documents for office productivity, such as text, diagrams, and presentations.

This standard was developed by the OASIS (Organization for the Advancement of Structured Information Standards) consortium of industries and it is based on a version of XML created originally by OpenOffice.org.

This standard was developed by various public organizations, it is publicly accessible and can be implemented by anyone without restrictions.

The OpenDocument format is designed to provide an alternative to proprietary formats including the popular formats DOC, XLS, PPT, etc..

Organizations and individuals who store their data in an open format, such as the OpenDocument, avoid to being tied to a single software vendor, and are free to switch software if the manufacturers of their current software come out of the market, or raise prices, or change the software or their licensing terms to something less favorable.

OpenDocument has been adopted by several producers, and can be adopted by any provider (including vendors and developers of proprietary software using the GNU GPL).

Since a goal of open formats like OpenDocument is to ensure long-term access to data without legal or technical barriers, public administrations have become increasingly aware of open formats as a solutuion to issues concerning public policies.

OpenDocument has been adopted by the European Commission.

The European Union has recommended OpenDocument as the basis for file formats and as a standard for the exchange of electronic documents.

OpenOffice Impress is a presentation software program that is part of a suite of programs from OpenOffice.org.

OpenOffice Impress is available as a free download.

Unlike other proprietary presentation software, Impress, and all the suite of OpenOffice, are licensed as open-source so they can be studied, modified, and enhanced freely.

In educational environments this is the software that is frequently used to deliver knowledge to the audience.

3 Building an Impress Extension for Interactive MPEG-4 Conversion.

Given our intention to develop a plugin (or more precisely an extension) for Impress, which realizes the conversion from an Impress presentation to an MPEG-4 movie, we had to set a development environment suited to this type of development.

It is possible to develop extensions for ODF in several programming languages, as for example: Python, Basic, Java and C ++, etc..

We decided to proceed by using the Java language, therefore our first step has been to install a JDK11, and we have used Sun version 1.6.

OpenOffice.org allows the creation of third-party tools through the UNO package.

Once the UNO package has been created it can be included in the repository of extensions and it can be installed by the final user in a simple way.

To allow the creation of extensions it has been issued a special SDK13 of OpenOffice.org and in the development of the conversion tool we have used the latest version available at the moment that is 2.3.0.

Another key component for the realization of our project is the "compiler" from the XMT-O format to MPEG-4 reproducible files.

We have used the IBMToolkitforMpeg-4 (http://www.alphaworks.ibm.com/tech/tk4mpeg4/). Actually, this toolkit is still an alpha distribution developed by Composite Media Technologies Group at the T. J. Watson IBM research center.

This toolkit consists of several parts:

- *AVgen*: a tool for creating audio / video ISMA or 3GPP-compliant devices
- *XMTBatch*: tool that allows file conversion from XMT-O or XMT-A to different formats that are conform to the MPEG-4 standard.
- *M4Play*: an MPEG-4 player

- *M4Applet for ISMA*: a Java applet capable of reproducing MPEG-4 contents for ISMA.
- *M4Applet for HTTP*: a Java applet capable of reproducing MPEG-4 contents via Http.

The ODF presentation is first converted into XMT-O and after that it is compiled into an MPEG-4 video.

This is done, as in Iannone, Carpentieri and Annunziata [1] in eight steps:

1. The path of the presentation file is retrieved by using a query to the UNO Component; it is created a temporary folder with name TemporaryX (where X is a progressively incremented integer); the files contained into the .odp archive are then extracted into this temporary folder.
2. The styles.xml file is parsed. The general information about the style of the presentation are retrieved: in particular the name of the default style, the height and width of the slides. The dimension are therefore scaled accordingly to the value selected for the video format, and the information for the visualization of the default background (color or image) are extracted.
3. The file content.xml is parsed and an output file with name [presentation_name]presentation slideX.xml is opened for each slide of the presentation (X will be incremented progressively). This file contains the instructions, in XMT-O, that define the aspect and behavior of the slide.
4. The method gettransition is invoked. This method recovers the data on the transition to the current slide and restores the necessary instructions to play the transition.
5. The method convertislide is invoked. This method process, one by one, all the elements of the slide and takes care of their translation into XMT-O. This method coverts all the graphics by first collecting the information about size, location, attributes, etc. (scaling and translation operations might be needed for the translation of size and positioning information, depending on the size of the video). Then, in the final step, by using the information collected, the method generates XMT-O tags that are needed to create and place the slide items.
6. When all the graphics have been prepared and positioned, then an area is defined, as footnote to the scene, containing two interactive arrows that indicate two possible movement directions: to advance to the next slide or to return to previous one
7. The XMT-O document is closed with its closing tag. It is called the constructor to create an object of type XMTBatch, which is invoked via the run method for the conversion of the XMT-O files generated into an MPEG-4 video. The name of the MPEG-4 file generated here is [presentation_name]presentation slideX.mp4.
8. After the conversion of all the slides, the temporary folder is deleted and the execution ends.

At the moment of writing, our new implementation can be freely downloaded at:

www.dia.unisa.it/professori/bc/Ivideo.tar.

The conversion process needs to compromise by accepting some adjustments that cover all the graphic aspects: there are situations in which compromises are more visible and other areas in which they are imperceptible.

With respect to the first version of the tool that was presented in Iannone, Carpentieri and Annunziata [1] we have solved the problems related to Background and Transitions.

If we analize the conversion results obtained by our new tool and compare the original slides with

ISBN: 978-1-61804-134-0

their conversion this reveals where the conversion compromises act.

The two screenshots in Figure 1 show that for the low impact compromises, the results obtained are very similar to the original (Figure 1, Figure 2).

For the text, the compromises have a relevant visual impact (Figure 3, Figure 4).

Text is were more compromises are needed. This is, on one side, because of the poor support given by XMT-O and, on the other side, because of the large capacity of the text formatting provided by Impress. Anyway the overall visual effect of the converted presentation is good.

From the point of view of the content the slides express the same semantic concepts, spirit and shapes that the authors have put in the Impress version.

4 Conclusion and Future work

In this paper we have showed how, by exploiting the similarities between SMIL, XMT-O and OpenDocument format it was possible to build-up an OpenDocument to XMT-O converter.

We are currently working on enhancing the converter.

Further studies are needed to incorporate MPEG-J functionalities for a richer interactive experience.

Acknowledgements

We would like to thank Domenico Nunziata for carrying out some of the earlier experimental work.

References:

[1] Roberto Iannone, Bruno Carpentieri, Domenico Nunziata; “Interactive MPEG-4 Videos: An Impress Extension for MPEG-4 Conversion and a Streaming Architecture for e-Learning”, ISCIS 2009, 29-34 (2009).1949.

[2] Kyungae Cha and Sangwook Kim, “Interactive Authoring Tool for Extensible MPEG-4 Textual Format (XMT)”, Workshop Notes of Semantic Authoring, Annotation and Knowledge Markup, 15th European Conference on Artificial Intelligence (ECAI 2002), Lyon, France, July 22-26, 2002, pp. 71-75.

[3] Chih-Chun Lai, Chihwei Pan, Chia-Hung Tsai and Yu-Chen Tsai, “Authoring and Presentation of Interactive eLearning Content by Using MPEG-4 BIFS Technologies”, 16th IPPR Conference on Computer Vision, Graphics and Image Processing (CVGIP 2003).

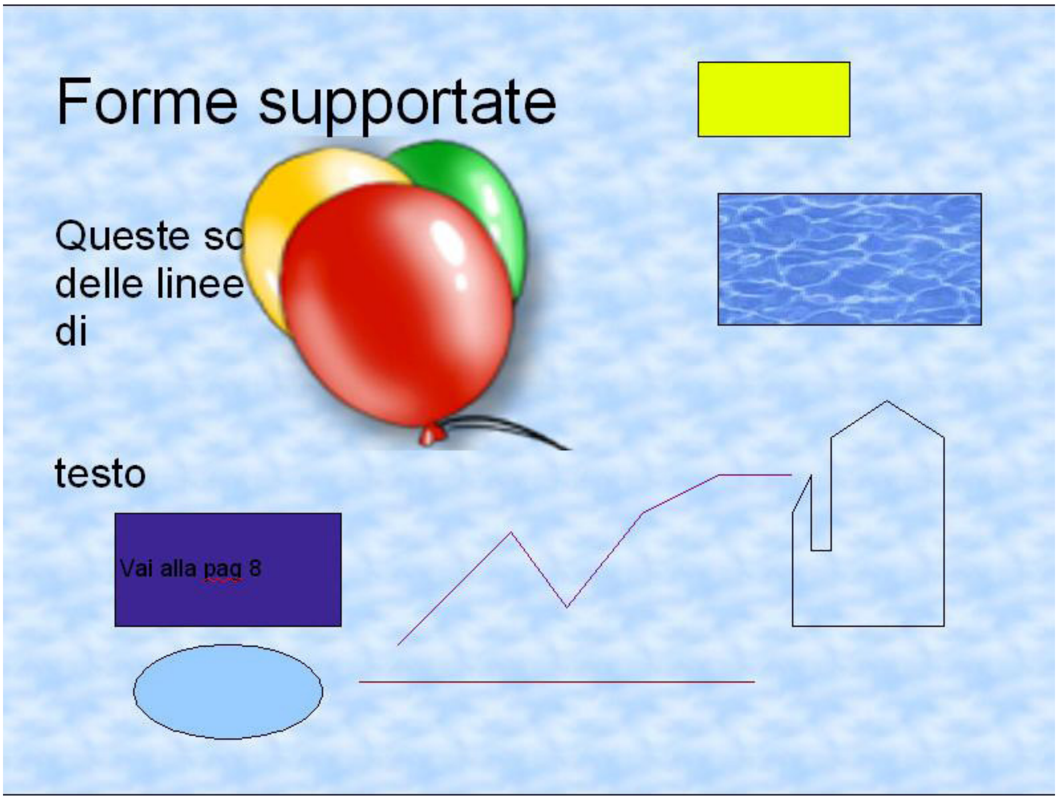

Figure 1. Original .odp slide

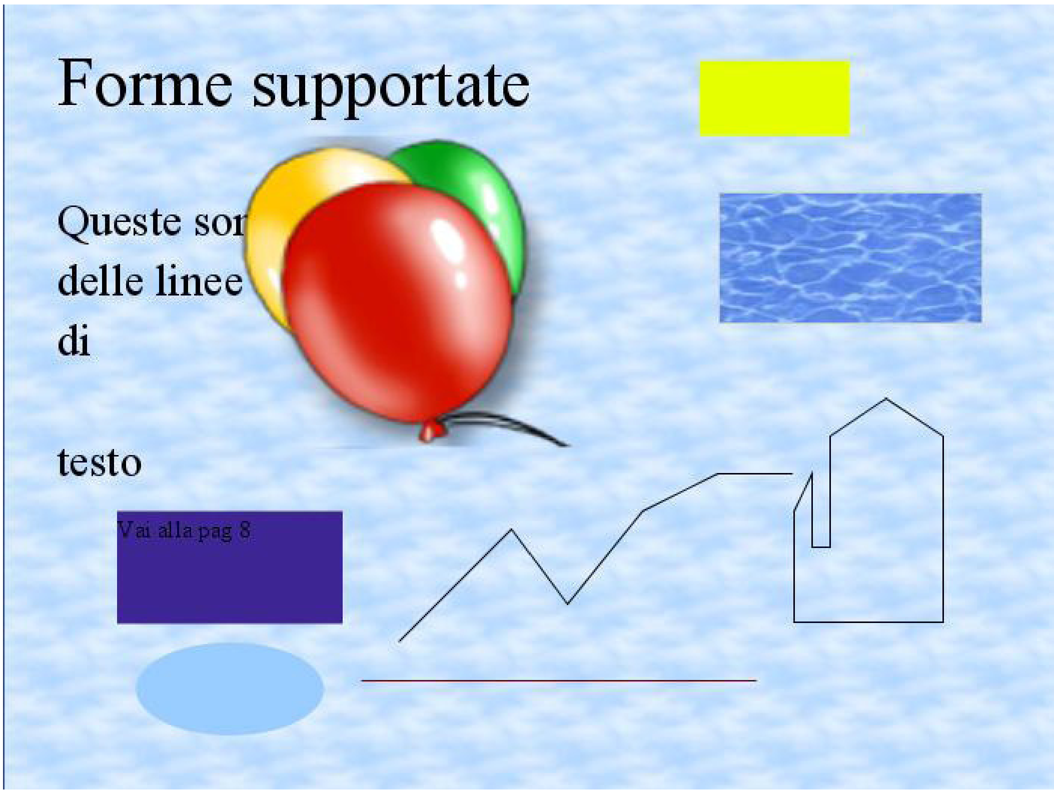

Figure 2. MPEG-4 converted version

ISBN: 978-1-61804-134-0

Figure 3. Original .odp slide

Figure 4. MPEG-4 converted version

ISBN: 978-1-61804-134-0