# Multimedia approach to e-lectures in Flash environment

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#### ABSTRACT

The paper describes an multimedia approach to distance lecturing. The authors present methods for enriching traditional way of teaching by a usage of Internet. A substitution of a traditional lecture with video records is presented. Student is able to see and hear recorded fragments of lectures. Furthermore, he or she can observe lecturer presentations (slides) synchronized with video and audio stream. The presented approach is cheap and easy to use, due to new technologies available with Flash 8 environment.

Key Words: e-learning, multimedia, internet technologies

#### **1. Introduction**

Education in nowadays fast changing world is a very important aspect. The need of gaining more professional knowledge, shortening the time available for stationary methods of learning (esp. when somebody works) resulted in the development of distance learning methods [1].

E-learning is being more willingly and widely employed [2],[3]. Therefore, in an effort to diversify this form of sharing knowledge, it is common to use various available tools given by the available technology. We can safely say that Internet is at present the most interesting and dynamically expanding medium for providing educational contents in a truly distributed fashion for different actors.

E-learning becomes also very important for traditional universities. On one hand development of e-learning gives universities opportunity to reach potential wider audience. On the other there is a large need from students for supporting traditional way of teaching by a internet based one (so called blending learning).

One of more important ways of teaching are lectures. Today, most of lecturers uses slides presentations as a form of their lessons. Only additional notes are made on whiteboard, if any.

#### 2. Distance learning techniques

Generally, there are two categories of distance learning ([2],[3]): synchronous and asynchronous. Synchronous learning requires simultaneous participation of students and teachers. Main advantage of this method is that contact with other participants is possible in real-time. Example forms of synchronous learning can be: interactive TV, teleconference, internet chat. Asynchronous learning doesn't need simultaneous participation of students and teachers. There is no need to meet together at a certain hour. Students can choose a learning place, time period and the amount of material desired to learn. Asynchronous learning is more elastic than it's synchronous equivalent. Various forms of asynchronous learning can be: e-mail correspondence, video, audio contents or WWW pages. Main negative aspect of this learning method is that a student can accumulate too many undone tasks.

In this paper we focus on asynchronous distance learning methods. It is assumed that a course is available for every user equipped with a computer and internet access. All materials are delivered by the internet. Tests proved that ordinary cable modem access is sufficient for effective course usage. Most of the compatibility arises from adopting a web delivery environment. This gives wide accessibility and matches standards.

One of aims was to integrate various techniques of learning. We substituted a traditional lecture with a video record. User is able to see and hear recorded fragments of lecture. Furthermore, he can observe each slide shown on the lecture, lecturer activities on virtual and whiteboard (if recorded). Next advantage is, multimedia that all materials. animations, and live software presentations or simulations can be recorded and trough our application. presented Traditional boring book was substituted by dynamic multimedia presentations. The effectiveness of this form of learning was much enhanced by animations and forcing the user to interact with the presentation.

In papers [2] and [4] a similar approach to distance learning was taken, but here simpler solution is considered. None streaming server and neither commercial application are needed. Although to build the Viewer Application commercial Adobe Flash 8[5] environment was used, but there is no need to use it to modify, neither to watch, the content of the Viewer.

## **3. Internet lectures**

One of the most important way of teaching is a lecture. In the case of distant learning usually TV transmission or video tape is used. Nowadays DVD discs or internet transmissions using streaming servers are rather more common. In this paper we propose another method, that makes possible distribute once prepared lecture on CD/DVD discs or via Internet without any streaming servers, witch are usually very expensive.

When producing an internet lecture it is necessary to transfer audio and video recordings to computer using special video equipment (camcorders, FireWire cards). When whiteboard recordings are needed, it is recommended to use equipment dedicated for this (i.e. MIMIO system, presented in [2003Kunovice MBTW] ). After video data is transferred to the computer, it must be prepared with some video editing software.

Currently most popular form of lecture is slide presentation, where whiteboards, or multimedia animations are very rarely present. So to make from such lecture multimedia e-learning material, only the lecturer has to be recorded. Presented slides can be taken directly from ppt or pdf (or nay else) files.

After all materials are collected, they must be connected and synchronized witch each other. Then all is ready to publish in Viewer application.

# 4. Used techniques

#### 4.1 Adobe Flash 8 environment

Adobe Flash 8[5] is an programming environment, designed to build multimedia and interactive applications available via internet. Flash provides rich graphical interface, witch makes easy to build object's animations. It also provides ActionScript 2.0 language, witch makes available any kind of synchronization animations witch each other and to make available to put interaction with the user to the application.

Everything in Flash is treated as an object. There are three basic object types which differ in the manner of interaction with the user. First of them is a movie clip object. the second one is a button and the third one is graphics. Each of those objects can contain others (e.g. in a button object we can put an animation object and this results in an animated button). A Flash movie consists of several scenes which are animated compositions showed in sequence defined by the designer. Every scene is built of graphical objects placed on one or more layers and has its own timeline which describes each object's

behavior in time. Distribution of objects in layers is very helpful when manipulating scene contents and controlling visibility of object groups (lower layers are covered by the higher ones).

The flash animation can also consist of external movie clips. There are also a couple of elements that allows us to control and place in animations multimedia content as sounds, images and video movies.

All elements in flash animation, as it was presented, can be simply synchronized witch each other, thanks to ActionScript 2.0 language. Furthermore Flash environment is designed to build applications for internet usage.

Another advantage is, that it is possible to distribute the flash multimedia applications not only online, but also offline, for example on DVD discs.

Therefore the Adobe Flash 8 environment is ideal choice for multimedia e-lectures.

#### 4.2 The Adobe flv video format

The Adobe flv video files standard uses Sorenson Spark and newer Sorenson On2VP6 compression methods to encode the video (the same encoders are used in Apple OuickTime .mov files). Uncompressed avi movies, recorded and imported from camcorder can be encode to flv format through Adobe Flash 8 encoder, or with open source FFMPG command line video encoder. We recommend to use freeware and available in Internet RivaFLV encoder, because of its simply graphical interface (it uses FFMPG as an encoding engine).

Adobe flv standard provides the advantages of streaming video formats (can be played when partially downloaded) and has the properties of standard video files: it don't need any streaming server.

In the flash animation, flv video is controlled through FLVPlayback component. This component has an clear and easy to use interface, what allows us to completely control current video state. We can i.e. set various kinds of listeners, witch are functions that will be executed only when assigned to them event occurs.

Using Action Script language it is also possible to seek, pause, stop, play, and even change the FLVPlayback video content.

Putting all these aspects together flv video standard was selected as video standard in our project.

#### 4.3 User requirements

Due to use of Adobe Flash 8 environment, the Viewer application is working on all operating systems on witch the Flash Player 8 or higher is available. So the MS Windows and MacOSX systems are supported, Linux and Unix systems are supported only with new Flash Player 9.

The hardware requirements are compatible with the standard PC computer nowadays. All should work on computer with 256 MB of RAM and 600 MHz processor (that's the lowest configuration on witch tests was successfully performed).

# 5. Proposed solution – viewer application

#### 5.1 Viewer application

The result of described approach is Viewer application, written in Adobe Flash 8 environment. The application uses the FLVPlayback component, witch provides all the functions needed to work with fly video files. No commercial applications neither streaming servers are needed to work with Viewer application. The XML hypertext language was used to create configuration files for the Viewer, and the application was written to allow as many as possible features to be reconfigurable trough XML configuration files. So it can be configured to the user's preferences even through the simplest text editor, i.e. popular Notepad.

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Fig. 1. Viewer Application - lecture screen

Viewer can be set as application with menu allowing to choose one from multiple lectures, or as application presenting only one lecture.

The main part of Viewers lecture screen (Fig. 1) takes slide image. Slide image can be static (then it is just an jpeg image object) or dynamic. Dynamic slide image is a *FLVPlayback* component plaing flv video file. One can put there anything he want – from recorded whiteboard writings to multimedia animations or just another video clips, i.e. with recorded discussion. In the bottom left corner *FLVPlayback* element with recorded lecturer video is placed. This is important part of Viewer's idea. The lecturer is talking about currently

projected slide, witch makes the slide content easy to understand. Furthermore, the lessons becomes less boring because of instantly playing video with lecturer.

Above the lecturer video (Fig. 1) one can see slide thumbnails bar. It allows user to easily choose the slide, with he wants to listen about. This is as simple as clicking on proper thumbnail.

Under main slide image an control bar is placed. This allows user to control watching lecture. He can pause the video, change currently playing slide by clicking on previous and next buttons. He can also quit watching the lecture from here. Information about current slide number and total amount of slides are also placed here, as well as information about lecturer name and institution.



Fig 2. Example of the main menu

All these element are connected and synchronized witch each other. It means, that when user change currently watching slide, lecturer's video will seek to the moment assigned to chosen slide, proper thumbnail will be highlighted, and slide information in control bar will be updated. The same is happening when lecturer's video reaches moment when lecturer starts talking about next slide.

# 5.2. Viewer application configuration, adding content, synchronising

The Viewer application was written in a way allowing user to make as many changes as possible simply by using XML configuration files without running and even installing Adobe Flash 8 environment. All contents can be assigned to this application through XML language as well as all synchronization between video and slides is done.

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Fig. 4. Lecture without slides

In a first place one has to configure main menu screen (when putting application more than one lecture) or simply to save information about lectures title and lecturers name. For this an single XML file will be created.

To prepare a single lecture one has to have prepared slide images and thumbnails (jpeg images if static, flv files if video content). He also has to have prepared video with recorded lecturer, compressed to flv format. Next he creates an XML file, where he writes down all needed synchronization data. After this steps lecture is ready to publish.

Of course there are some cases when there is nothing but one video file to create an lecture, or when camcorder is not accessible and only sound is recorded. In both these cases Viewer application will be useful. In first case the lecture screen looks a little bit simpler (this is configurable through xml), in the second case there was some animated image added to the sound recordings, and all together putted as normal flv video file into Viewer application.

#### **5.3 Viewer application usage**

As it was mentioned, the only what user need to enjoy the Viewer application is a computer on witch operating system supported by Adobe Flash 8 or higher player is installed.



Fig. 5. Lecture screen where only sound was recorded

For users who will distribute their lectures in internet using Viewer application, the requirement is to have installed and working even simplest HTTP server (it was successfully tested on Apache server). Furthermore there is a possibility to distribute Viewer with lectures in some offline ways, i.e. on DVD discs. This eliminate problems in case, where internet connection is to poor to watch video files.

#### 6. Conclusion

The low-cost and universal approach to distance learning, especially multimedia internet lectures, was described in this paper. In some aspects it is similar to the approach taken in [2,4], but it does have more functionalities, and don't need any, especially commercial, streaming server. It uses new technology: Adobe Flash 8 environment.

We assumed that the internet lecture should be available for every one who has internet connection, without any additional software.

Due to Adobe Flash 8 environment Viewer application was created. It meets requirements, and is easy to use. Even adding new content to Viewer application, or configuring it to users preferences is very simple and fast due to XML based configuration files.

Thanks to Adobe FLV video format we avoided using streaming servers and any

commercial applications that would have been possible needed to convert standard avi video files to streaming formats. FLV video files can be placed even on simplest HTTP server, and play in flash application on user side while downloading. Viewer application uses this feature. Furthermore, no commercial application is needed to convert video files to FLV format.

Summarizing, the Viewer application, written once in Adobe Flash 8 environment, can be used to present a lot of different contents, thanks to built-in configuration engine based on xml files, editable by simplest text editor.

The contents of Viewers single lecture are slides images, witch are simply jpeg files or flv movies, slides thumbnails, witch are jpeg files and flv video file witch recorded lecturer. To record the lecturer one need digital camcorder. All the rest, could be done with free software. Adding to this open source HTTP servers needed to distribute lectures online, the total cost of preparing such lecture is very low.

Furthermore, the same application with the same content can be placed both in HTTP server, what makes it available in internet, or on DVDs or CDs. That allows to distribute the lectures to places where good internet connections are not in common yet.

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