CREATION OF EDUCATIONAL VIDEO TUTORIALS AND THEIR USE IN EDUCATION

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Abstract

Educational video tutorials are currently modern teaching resources. They are primarily used as a guide when working with various software applications. The tutorials can be produced in high definition, including narration and subtitles. However, creating such a video tutorial is not easy. Students at the Department of Information and Communication Technologies are learning to create these video tutorials. The basis of a tutorial is the creation of a script. The next step is a high quality screen capture, sound recording and subtitle creation. The tutorial can be accompanied by several different audio tracks and subtitles in different languages. Such video tutorial can be then used by foreign students or hearing-impaired students. The tutorial is then exported into a modern format that ensures high image quality and can be played on most devices for video playback. At the Department of Information and Communication Technologies the tutorials are being created mainly for Informatics courses where students work in different and often special software applications.

Keywords

video, codec, video tutorial, screen capture, container

Introduction

The application of modern information technologies in education has risen increasingly. The use of educational video tutorials is an attractive form of education in ICT. The video tutorial, for example, teaches to work effectively with the software application or an educational program. Well-prepared tutorial, which is accompanied by an audio commentary or subtitles, is the most effective e-learning teaching resource in teaching students to work with software applications (Pavlíček, 2003). With the development of computer technology and consumer electronics one can create educational video tutorials in high resolution, with audio commentary and subtitles in different languages. The created video tutorial can be played on a computer, on

a modern TV via USB port or directly from the Internet in all sorts of devices, such as computers, netbooks, tablets, smart phones and smart TVs.(Bijnens, 2003)

Custom work lies in the screen capture, where all the action on the screen and the mouse movement in particular, are saved in the video file. This process is challenging in both the technical (quality recording software, a powerful computer, suitable codec), and content aspects (to properly carry out educational activities according to quality scripts). Often, both the content and technical aspects of the video tutorial are of a low level and therefore the educational video tutorial is useless.

The finished and edited video tutorial is to be supplemented with audio commentary. Without audio commentary only watching the screen is often not easy to understand. And the commentary can be performed in various languages. During playback, it is easy to switch between different audio tracks. Because a video tutorial can be used for hearing-impaired students, or it can be viewed on a computer that does not have speakers or headphones, it is possible to add subtitles. If there is a pre-built script that contains all the voice commentary, it is not difficult to save the text as subtitles, and again this can be done in different languages.

To create these video tutorials one can use special commercial software, but also a freeware application. Emphasis must be placed on both the technical aspects and the quality of the content. Students at the Department of Information and Communication Technologies learn to create such video tutorials, and their work is often used when completing the practical part of their bachelor's or master's work. The created video tutorials are then used in the teaching of Informatics courses at the Department. Currently, video tutorials for students with special needs are being developed.

Creation of Educational Video Tutorials

It is not a matter of a few minutes to create a high-quality video tutorial. It is a complex process in which a number of different software applications are used. The creator of a tutorial should be very well versed in the field in which he or she produces the video tutorial. On the Internet, especially on YouTube, we can find an enormous number of created video tutorials, but only some of them are created by an author who has appropriate technical equipment and is an expert in the field in which a tutorial is created. Such video tutorials have shortcomings in various areas of production, such as:

- image quality – low resolution video, low quality video due to the usage of the wrong codec, mouse cursor that is difficult to see, mouse movements that are too quick,

- sound quality – usage of a poor-quality microphone, recording in high noise, poor recording sound intensity – too weak or overexcited sound,

- content aspect – fragmented tutorial with non-continuous record, confused mouse movements and mouse clicks, incomprehensible and vaguely described problem without the use of scripts, key search words, slip of the tongue, repeating words and phrases, incomplete or inaccurate information, creation without thorough prior preparation.

To avoid these shortcomings, a thorough preparation is essential before the creation of a tutorial. It is important to think about the content in advance. The description of working with advanced software is often a content of a tutorial, and therefore it must be divided into several individual parts. A tutorial that is too long and contains a lot of new information can be difficult to understand. In this case, it is vital to accurately lay out the overall structure and content of the individual parts with a logical sequence. It is important to maintain this structure, because it happens often that the various functions of the described software applications are closely linked. The creator of a tutorial can forget easily, and then he starts to enrich the content with additional functions or features, gets lost in the topic, and finds himself explaining a completely different issue than he originally intended.

Before the creation itself, it is common to prepare all the video tutorials being created with their titles and especially with their brief content. If text subtitles will be included in the tutorial, it is advisable to prepare all the texts in advance and then they will be transformed to the subtitles. To create subtitles by the transcription of the spoken word is a much more complex process.

As during the creation of the video tutorial, we are working with the software that processes certain data and imports files Therefore, it is necessary to save all needed files into a folder and set up a path to them in the application being described before the screen recording itself. While recording the tutorial, it often happens that the author is searching the whole hard drive for a certain file he or she wants to open, the result of which are confused mouse movements and scanning his or her computer for an inordinate amount of time.

Script Development

The first step before creating a video tutorial is a script development. There are several ways to create a tutorial and this is also linked to the form of the script. The script may be only made of keywords or phrases; the activities that will be recorded in the video are described in a bulleted list. This is a brief outline that provides the creators with focus reminders in order to prevent deviation from the topic of the tutorial.

The keywords and phrase entries are useful when the video is being recorded along with audio commentary. As for additional subtitles, the subsequent transcription of spoken words is necessary for the subtitles to be created. Subsequent audio commentary in different languages also presents a problem. It is possible to add the audio commentary later using the already created subtitles.

Another option is to create a script that will contain the complete audio commentary. These comments are usually created by a separate recording of a text being read. The advantage is that it is not necessary to watch the video during the audio recording, because the timing of individual sentences is set during editing. The advantage of a script such as this is the easy creation of subtitles and simple recording of audio commentary in another language. The complete script is not suitable when the video is being recorded along with the audio. The author of the tutorial would be more devoted to reading the text than what is happening on the screen and the content aspect of the video would be degraded.

Video Recording

It is necessary to select the resolution of a video tutorial or the area being recorded before the video recording itself. If the tutorial was played only on a computer, the video player can handle any resolution without any problems. Because the tutorial is primarily intended to be placed on the web or played in different devices (tablets, mobile phones, television), it is essential to keep the standards used in digital video (Beránek, 2003).

Current standards are high-resolution HD (1280×720) and fullHD (1920×1080). The advantages of the HD option are lower requirements for computer performance while video recording (the computer must have sufficient power for video recording and work seamlessly with any application that is being described in the tutorial). Some applications have a variety of functions, buttons, their working environment is complex, and therefore HD resolution is usually not sufficient because the entire application does not even fit in the working window in HD (1280×720). Therefore, it is necessary to use fullHD resolution. Most computer monitors at this time are using fullHD resolution.

A wide variety of applications that are used for screen capture is available on the Internet. Those are both commercial and freeware products. Among the most famous freeware applications is CamStudio with excellent functional features. In commercial applications, Camtasia Studio is among the best ones as it includes a custom video editing room, own codecs for video recording and sophisticated work environment with an intuitive interface.

CamStudio

It is an excellent freeware application. It enables any settings of the recorded area from the custom setting in pixels, to the capture of the whole screen. Other features include:

- to highlight the mouse cursor in the recorded video;

- to record sound from microphone while capturing the screen;

- the choice of codec for video compression;

- the possibility of setting frame rate video.

- the export to AVI (with selecting the codec) or export to the SVF (flash animation).

The disadvantage of this application is that its own codec (Lossless Codec v1.5) offers excellent picture quality, but some additional editing applications (e.g, Adobe Premiere Pro) are unable to work with this codec. The selection of another codec (such as XviD) brings greater requirements for computer performance, because this codec uses high compression and is designed more for the finalization of video after editing. And choosing other codecs can greatly affect and primarily degrade the quality of the resulting video. It is important to be careful with codec (XviD, etc.) adjustment for the highest video quality and lowest compression ratio. Working window CamStudio is shown in Figure 1.
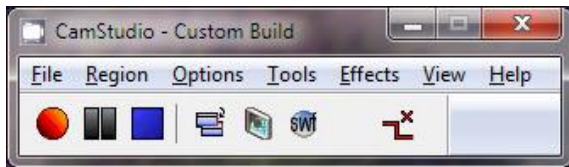
Fig. 1: Working Window of CamStudio Application

Despite some shortcomings, the CamStudio application can be used to create video tutorials and it also brings excellent visual results. However, the application is only for screen capture. It is necessary to subsequently edit the recorded video in one of the video editing rooms.

Camtasia Studio

Camtasia Studio is professional software for screen capture. Although it is a commercial product, it is possible to use the 30 day trial version that has no functional limitations. The application also contains its own video editing room and therefore it is possible to edit the recorded videos instantly, edit them, add the subtitles, and link them with the spoken audio commentaries. For recording, the application uses its own codec with the excellent image quality. Recorded video tutorial can also be exported to a standard video format and be edited in another video editing room. Basic working window of this application is shown in Figure 2.
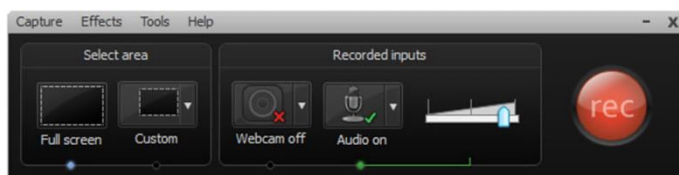

Fig. 2: Working Window of Camtasia Studio Application

The application enables the final edited video and sound to be export in several ways:

- a standalone video file;
- export to Flash player;
- export videos directly to YouTube.

Sound Recording

When a high-quality video tutorial is accompanied by poor audio commentary, it degrades the entire video tutorial. However, a sound recording is often underestimated and its poor quality in the tutorial is very common (Kopecký, 2008).

In terms of the technical aspects of a sound recording, the key element is to use a quality microphone. Cheap microphones or microphones integrated in laptops are not built for a quality sound recording. Therefore, it is necessary to use a good quality microphone. High-quality sound recording can be achieved with a quality microphone connected to the microphone input

of the computer. Consequently, it is possible to edit the record and remove noise. Another solution is to rent a studio condenser microphone. This is then connected with the microphone input in the computer, because such microphones cannot be connected directly to the computer, and on top of that they require their own special power. In this case, it is necessary to use an A/D audio converter connected via USB port (e.g. M-AUDIO Fast Track) or a mixing console that connects to the computer via line input (laptops usually do not have this input).

Before recording the audio, it is necessary to set the audio format (e.g. MPEG Layer-3 with attributes of 44.1 kHz, 320 kbps CBR). It is also necessary to set the proper intensity of the recorded sound so that it is not too weak or overexcited. Further, it is necessary to take into account the level of noise, which increases with the higher volume of input on the sound card in the computer. To avoid emphasizing of strong consonants "p", "b" and sibilants "z", "s", it is vital to use a pop-filter.

In terms of the content aspect of a sound recording, understandable speech is vital. It is important to use short sentences, because long sentences may be incomprehensible. An important element is the intonation. Too monotonous voice can be boring, while exaggerated intonation distracts from the action on the screen.

For simple video tutorials, it is possible to record audio directly during video recording as applications for screen capture enable this feature. Any slip and errors in the commentary must be cut out along with the video. For more complex and more comprehensive tutorials, it is a must to record the audio comment separately with the possibility of re-recording and subsequent editing of bad passages.

The creator of a tutorial does not necessarily need to be the one who narrates the audio commentary. It is usually better to find a person with a pleasantly modulated voice, with good pronunciation and rhetorical skills. Comments can be prepared by the script and narrated without watching the recorded video. During video editing, the individual narrated sentences are assigned to the scenes in the video.

Audio commentary can be done in different languages and stored separately as mp3 files. Subsequently, all audio tracks in different languages will be encapsulated with the video and subtitles into one file.

Edit and Export

The recorded video requires editing and adding of subtitles, transitions, and audio commentary. If the Camtasia Studio application is used, it is possible to edit the video completely in the editing room that is included in this application. In case of the CamStudio application being used, it is necessary to use a different editing application. One can use Windows Movie Maker, which is free and is part of the Windows operating system, but for HD video processing, an additional installation of a special plug-in is necessary.

During video editing, the following operations are carried out:

- editing of bad scenes;
- adding subtitles at the beginning and end of the video tutorial;

- adding audio commentaries (if the sound was recorded separately);

- adding video transitions (usually only a blend into the black screen is used).

After the video editing is finished, export needs to be done. An H.264 codec is commonly used in high resolution HD video or fullHD. Because it is a video that does not contain dynamic scenes, bitrate of 2 Mbps is sufficient. The resulting file will have the MP4 extension. If the editing system does not support this format, it is possible to select a different format and then convert the video in one of the many freeware applications for video conversion (Dancyger, 2007, Wallace, 2013).

Subtitles Creation

It is suitable to add subtitles to the finished video tutorial. The subtitles can be in any language and it will be possible to turn them off at any time during playback. Such video tutorial can be then watched by foreign students or students with impaired hearing. For these students, the subtitles will replace the audio commentary.

Because the narration was created by the script, this script can be used to insert individual sentences into a special application for creating subtitles. Only timing has to be assigned to the subtitles. A freeware application called Subtitle Workshop can be used for the creation of subtitles.

The application can open the created video. Individual subtitles will be copied by rows into the working window. When playing videos and listening to the narration, the beginning and end of each subtitle is created with the mouse in real time. When playing the video next time, it is possible to put the finishing touches and time the subtitles exactly. The resulting subtitles are exported to a file with the SRT extension. It is a universal subtitle format, which usual video players do not have any problems with.

In the same way, one can create subtitles in foreign languages such as English or in other languages. All sets of subtitles will be encapsulated together with video and audio into one file.

Encapsulation

Since the created video tutorial may contain also a number of audio tracks and subtitles for the foreign-language versions, it is suitable to encapsulate all files into one file. Video player then starts the first audio track and first subtitles simultaneously with the video. During playback, it is possible to freely switch the audio tracks and subtitles.

The modern Matroska container is suitable to use for encapsulation. The resulting file will have the MKV extension. A convenient freeware application for encapsulation is MKVToolnix. Working with this program is intuitive. The working window is shown in Figure 3.
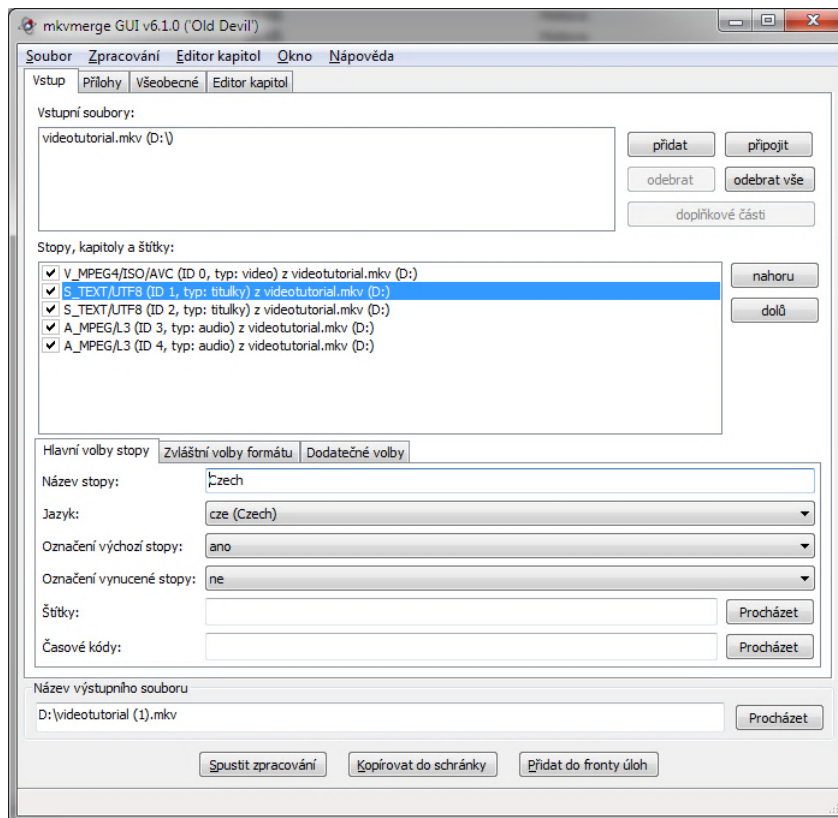
Fig. 3: Working Window of Subtitle MKVToolnix Application

The subtitle settings are important because the language needs to be set (e.g. Czech) to ensure the use of the appropriate character set in order for the subtitles to be displayed properly. "Add" button adds our own video tutorial and then the individual audio tracks and subtitles. "Start processing" button then encapsulates all the added files into one with the MKV extension. Into this file, one can later add additional audio tracks or subtitles, or remove some if necessary. The video file can be played on a computer, tablet, in a cell phone or on TV if they support HD video and playback of MKV files.

When playing the video on a computer, it is appropriate to use, for example, a portable version of the VLC Media Player that can be used without installation, is free and has the support of switching audio tracks and subtitles in various languages.

Video tutorial can also be placed on the website or on YouTube.

The Most Common Deficiencies

This chapter describes the most common deficiencies which students make when creating video tutorials.

Visual deficiencies

- Low video resolution – currently is considered standard HD resolution (1280 × 720 pixels).

- Low bitrate – related to the low resolution video – text is difficult to read.

- Screen capture is acquired at high resolution (1920 × 1080 pixels), but subsequently reduced to 1280 × 720 pixels. Readability is poor.

- Low frame rate – usually 15 to 30 frames per second is sufficient. Lower frame rate leads to jerky movements of the cursor.

- Fast cursor movements – during fast movements of cursor, viewer loses track of what is happening in the recording

- Confused cursor movements – the creator does not know where to find a particular function, the cursor moves too fast.

Sound deficiencies

- Cheap microphone – a microphone does not provides a sound quality as the more expensive models. Usually associated with high level of noise in the audio.

- Inadequate volume - the creator of the tutorial speaks into the microphone from a great distance or he is too close to microphone (overdrive volume).

- Variable volume – creator of tutorials is moving away or towards from the microphone and the voice is variably too quiet or too loud.

- Loud breaths or munching tongue – very distracting.

- Too frequent repetition of certain words - if not pre-prepared scenario, the creator often uses certain words to fill the silence (perhaps we will see... Perhaps about ... Perhaps ... Maybe ...).

- Loud thinking accompanied by the sound of "eeee" (now is how you how… eee... We can... Eeee...)

- Unbalanced volume of the microphone and application – volume of sound from application is too loud and it is hard to understand to creator´s voice and vice versa.

- Slips of the tongue and repetition of sentences – mostly due to lack of preparation.

Content deficiencies

- Sudden changes in topics, lack of continuity.

- Information is given in fragments.

- Too lengthy explanations of simple functions.

- Incomplete or false information – mostly by young creator who teach them self and still not fully understand how it works.

- Creator cannot include the described functionality (or part of the process) to the real workflow.

- Creator is not able to clearly and unambiguously describe the problem in simple sentence.

- Creator often neglected preparatory stage – with the preparatory phase, the creator can avoid most of the problems described above.

Use of Video Tutorials in Education

Students at the Department of Information and Communication technologies will become acquainted with educational video tutorials during their studies and they will also master the technique required for their creation. They are then expected to create such tutorials as part of various projects and concluding essays. These tutorials are then used as teaching tools in Informatics courses to work with different and often special applications for which there are no educational materials.

One of the specialized courses is called Digital Video where students learn to work with Adobe Premiere Pro – the professional video cutting room. This application is only available in English version and there are no official educational materials in Czech. Therefore, educational video tutorials have been created that completely cover the working process in the above mentioned cutting room, including the use of its advanced functions. Total time of video tutorials is approximately 6 hours. Tutorials are primarily meant for students of combined studies but because of their content and technical qualities they are used also by full-time students.

Another specialized course is called Digital Photography. In this course students learn to work with the Adobe Photoshop application. Although this application has its full Czech version, some work techniques and processes are so complex that video tutorials are a fundamental part of education – mainly for students of combined studies who do not have enough chances to work with this application.

Students with Special Needs

Currently, educational video tutorials for the Audiovisual Means 1 course are being created as part of the project of the Department of Social Pedagogy. Their content covers the syllabus of the course (computer graphics, computer sound, digital video). This course is meant for full-time students at the Pedagogical Faculty of University of Ostrava. Because the tutorials will be used also by students with special needs, in this case hearing-impaired students, they contain Czech subtitles.

The created video tutorials have two parts. In the first part, educational presentations with audio commentary and subtitles are created. These presentations cover the theoretical part of the course. In the second part, video instructions for working with different applications, which also contain audio commentary and subtitles, are created. These video instructions cover the practical part of the course.

Foreign Students

The Audiovisual Means 1 course is also taught in English and foreign students frequently sign up for it. Therefore, the translation of Czech subtitles into English is scheduled to provide foreign students with better education related opportunities.

As part of the Department's plan to add more courses taught in English, the creation of English subtitles for other, earlier created video tutorials, is planned. This applies mainly to the Digital Video and Digital Photography courses.

Conclusion

T Educational tutorials are a popular form of learning to work with software applications. The Internet is flooded with a large variety of video tutorials for all possible applications. Unfortunately, most of these tutorials are of a very poor quality and they are created not only in amateur conditions, but also by authors who ignore both the quality and the technical or content aspect.

Students of the Department of Information and Communication Technologies learn to create high-quality video tutorials during their studies. They often create them within their bachelor's or master's theses. In the course of their studies, they are introduced to a variety of technical and software features and they learn to use them effectively and apply them in their work.

At the Department of Information and Communication Technologies educational video tutorials are used in the Digital Video and Digital Photography courses. In these courses special applications such as Adobe Premiere Pro and Adobe Photoshop are used. It is difficult for students of combined studies to learn to work with these applications when they do not have a quality educational material at their disposal (in this case the created video tutorials).

In the final stage, high-quality video tutorials with sound are created, which are subsequently used in the classroom at the Department, and also in elementary and secondary schools, where students apply them.

For foreign students, the created video tutorials can be easily accompanied by audio commentary or subtitles in a foreign language. The Department plans creating English subtitles for several courses where video tutorials are applied. Consequently, the Department will be able to widen the number of courses taught in English for foreign students.

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