

A Review on Video Streaming in Education

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Abstract— The multimedia streaming technology has been widely used now days for many purposes in education like classroom teaching, e-learning, educational conferences, distance learning, etc. Currently a growing number of new audio/video production and delivery applications are being developed for and presented to education. Also the use of multimedia streaming has become more common content of e-learning material. This paper has explores the multimedia streaming technology in education.

Keywords — multimedia streaming, on-demand, e-learning, Codecs.

I. INTRODUCTION

The development of new technology and electronic media can give students more control over their learning environments. Multimedia streaming technology has been under research now for many years because of the importance of this new tool in the delivery of information to students adopted now by many high schools and universities. Using streaming technologies, the delivery of audio and video over the Internet now reaches many millions of people using their personal computers offering live lectures, live sports, music, live conferences, news, entertainment and on-demand content. Streaming also is moving beyond the entertainment area into education and health care, among other areas [1]. Educators see documentaries and instructional videos as an important part of the learning process. Students like to learn through moving images and clips as compared to text alone and there have been tremendous advances in mobile learning. Teachers are incorporating educational apps onto tablets and mobile phones and helping students take responsibility for their own knowledge acquisition. With broadband networks being deployed in many countries and video/audio compression technologies advancing rapidly, the quality of audio and video services over the Internet is increasing rapidly. A variety of different user terminals can now be deployed, from office desktops to personal digital assistants (PDAs) and mobile phones.

Video Streaming refers to the real-time transmission of Stored Video. There are two methods for transmission of stored video over the Internet, namely the download and the streaming. In the download method, a user downloads the entire video file and then plays back the full video file. However, full file transfer in the download method usually suffers long and perhaps unacceptable transfer time due to the large size of the video files. In contrast, in streaming method, the video content need not be downloaded in full, but will be played immediately while parts of the content are being received and decoded. Also Streaming refers to

the ability of an application to play synchronized media like audio and video in a continuous way while the streaming data are being transmitted to the client over a data network. The term multimedia streaming means that there are more than one media type involved in the communication, e. g. text, graphics, voice, animations, video and audio. We define multimedia to denote the property of handling a variety of representation media in a collected manner. This means that the different sources of media types are integrated into a single system framework.

A. The Principle of Streaming

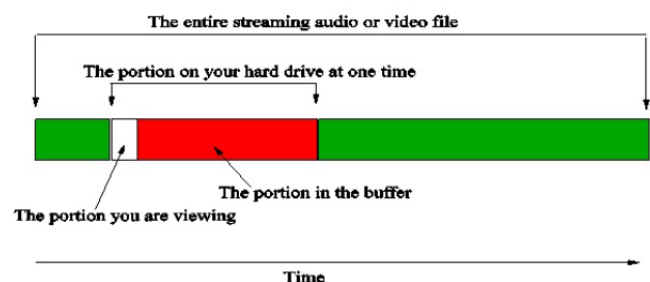


Fig. 1 The Principle of Streaming

B. Impact of Multimedia Streaming in Education

Although the impact of video and multimedia streaming technologies in educational outcomes is a field of ongoing research, the educational impact of video can be summarized by three main concepts as

- 1) *Interactivity with Content*: The learner easily relates to visual content, whether verbally, by note taking or thinking, or by applying concepts.
- 2) *Engagement*: The learner can connect to the visual content, becoming drawn in by video, whether on-demand or real-time.
- 3) *Memory and Knowledge Transfer*: The learner may remember and retain concepts better than with other instructional media.

C. Benefits of Multimedia Streaming

In comparison with the download-and-play approach, multimedia streaming provides a lot of advantages, some of them are summarized as

- Because video combines many kinds of data (images, motion, sounds, text) in a complementary fashion, learning can be adjusted more easily than with other tools to the diverse learning styles and individual learning of students.

- Lecture capture is one of the most common things in education today. Simply put, the recording of any type of lesson given by a lecturer (including slides and whiteboard notes) to various classrooms. These sessions are then made available for viewing or downloading at any time by any student.
- With video streaming, the learner has more control over the information he/she receives and an additional opportunity for deeper learning by being able to stop, rewind, fast-forward, and replay content as many times as needed.
- Live and on-demand video contents are automatically optimized for every viewer-desktop, laptop, tablet or smart phone, ensuring a lifelike viewing experience with minimal delays or buffering, even on the smallest devices.
- With the use of video conferencing streaming and recording technology in medical colleges, students all over the world can view live surgeries and see their professors demonstrate even the most advanced medical procedures. What's more, these students can then watch the videos afterward to review highly specific details they may have missed.

II. EDUCATIONAL APPLICATIONS

Streaming technologies can be used for several audio-visual educational applications. We have given five types of categories as

A. Streaming an Educational Event

Lectures or Events can be recorded and broadcast on the internet and/or they can be stored in an online archive where they can be viewed later as on-demand content. A sense of direct involvement and physical presence is built. Furthermore, guest lecturers from outside experts are possible regardless of time and other geographical constraints. A recorded video can be used in more interactive ways, for example, assigning tasks to the students that refer to certain fragments of it [2].

B. Streaming an External Life Event

In this situation, streaming video provide access and depth to real life events that happen, by their very nature, outside the classroom. The main purpose of this application is to be able to view an outdoor action that cannot be physically brought into the classroom: sports events, wildlife, political recordings, linguistic samples, dramatic performance, and different experiments carried out by experts. When these real life events are brought into the context of the classroom, they can be interestingly observed, analysed, interpreted and discussed. Live recordings of different outdoor educational events also belong to this category.

C. Streaming Explanatory Documentaries, Tutorials, Experiments

These videos are truly instructional, i. e. they indicate or validate the process of something sensible, detailed procedures, and the different stages. Examples include laboratory experiments, language learning materials where

there is a potential safety risk or role-playing situations where the students can experiment with different roles and behaviours. The main purpose of these materials is to make complex processes understandable, easy and/or to motivate students. The difference between the previous type i. e. "streaming an external real life event" is that here the materials are especially created for educational purposes whereas in the previous type the video materials witness events that would have happened anyway [2]. They both have in common is that they are used in the same way as traditional video has been used for many years in education. These videos can be integrated in a website with other sources of information such as animation, texts, and discussions so creating a virtual workshop.

D. Consulting an Online Library of Educational Resources

A collection or database of video streaming materials can be made available to different educational institutions and also used in courses. This is done using archived video materials produced by national broadcasters (news, documentaries, etc.) so they can be re-used.

E. Constructing and Using Ones Own Resources

Both the lecturer and the students can be creators of their own teaching and learning material. This is the most innovative way to offer content. Students can deliver the material themselves and distribute it in a probably self-designed learning environment. Other students can then watch these materials as well, and a community is born in which the educator acts as a guide and the students interact with each other and with the available learning objects [2].

III. METHODS

To better understand why streaming media looks the way it does, it is important to explain the whole process of production and distribution. This process begins with a concept as

A. The Concept

Before you begin to record the first images and sounds, you need to have a good idea of what format you want to use. This might be a report about a ceremony, a documentary about a famous person, or a lecture by a professor. It is very important to prepare well beforehand, to create a scenario perhaps and to organise the different equipment, lighting, sound and personnel necessary to do the job. At this stage it is also important to plan how you foresee using the media when it is streamed, are you planning to embed it in an e-learning website for example, or in a learning platform? You also need to decide whether the media be supported or complemented with other elements (texts, interaction, etc.) Good planning at this stage will not only save time at the end of the project but will also mean that the final product is of better quality [3].

B. The Recording

When you have a clear idea about what is to be recorded, then equipment needs to be set up and the shooting can begin. Start with the best possible recording set-up, use good quality cameras (for example a camera that records in

a digital format such as DV), good microphones, make sure that the scene is bright, avoid unnecessary background noise and always use a tripod. If possible seek professional help or advice; it will certainly pay in the end in less frustration, time gained, and a better quality end-product. Don't think that because of the small size of video, quality does not matter [4]. On the contrary, errors and faults will simply increase during the remaining stages of the process. Be careful with too fine detail, with low contrast pictures, with delicate colours, excessive movement, etc. because they may not pass through the compression stage as you would like them to.

C. Capture and Edit

Once all the raw materials are collected, they can be transferred (captured) to a workstation or PC where they will be assembled, polished, trimmed, titled, etc. i. e. edited. At this stage the media product begins to take its final shape, sound is added (music, voice-over, sound effects) as well as any necessary additional visual elements (graphics, titles, visual effects) until the product is as you envisaged it to be. Needless to say that the PC needs to be powerful and in good shape for this job, equipped with appropriate software and devices. Some editing solutions are rather high-performance and allow you create effects that you might normally only expect from Hollywood studios. Again, the better your original material, the better the edited output will be [4]. Note that if you want to transmit your media as they were recorded without modifying or editing (for example you may want to transmit a lesson exactly as it is recorded), then you can skip this stage and go directly to Compression.

D. Compression

The next step to delivering the video content is to compress it. Raw digital audio and video files are very large. One second of uncompressed video is more than 20 Mbytes. This means that a CD can hold less than a minute of uncompressed video. To get the video and audio down to a size that works for transmission over a modem or LAN, files need to be compressed. During compression data that are redundant or unnecessary are removed. This makes the file size much smaller, but it also degrades the image and sound. Smaller files usually require less memory to run, less hard disk space, and less bandwidth to play over networks such as the Internet. Codecs (or compressor/decompressors) work by identifying redundancy in audio and video and removing it. If you look at a recording of someone speaking in a typical office environment for example, sometimes called a 'talking head' image, the background image usually remains the same. A codec is designed to recognize this and to only save the parts of the image that change. In this way file sizes can be reduced by as much as 100 times [4]. Up to a few years ago, video compression was complicated and expensive and could only be successfully achieved by experienced people with special hardware and software. However nowadays tools are available that are easy to use and require no in-depth knowledge of the complexities of compression technology.

E. Storage, Management, Distribution

After compression, the media still needs to be stored, managed and delivered to its target audience. At a technical level there are three key components that need to be considered: hard disk storage space, the processing power of the streaming server, and the network between the user and the video server.

Depending on the file size or the level of compression used, files to be stored can be quite large: a one hour video encoded for modem speed (28.8 Kbps) takes up 9 MB of storage. The same video for ADSL at 300 Kbps is almost 100 MB or more than 10 times bigger. It is easy to see that storing large amounts of video will require storage management. Similarly it is important to estimate how much bandwidth usage streaming will consume: broadcasting a 300 Kbps stream 10 hours per week to 100 users will result in a transmission of 135 GB in one month. Depending on the number of concurrently connected users, the bandwidth capacity from the server to the Internet will need to be quite large; if, for example, all 100 users are streaming more or less at the same time, then the outgoing bandwidth needs to be $300 \text{ Kbps} \times 100 = 30 \text{ Mbps}$.

Two main modes of access to the media are on-demand or live: on-demand means that users can connect to the streaming server when they want and select the media that they want to display. This means that the server must be capable of transmitting several streams to different users at the same time: this will make the service much more expensive to run because it needs to be dimensioned appropriately.

IV. CONCLUSIONS

While there have been descriptive studies of the benefits and negative aspects of video streaming, there have been few studies of the effectiveness of video streaming on student learning. Some studies conducted on the effectiveness of video lectures that have shown an improvement in grades and satisfaction with a course. The literature on interactive videoconferencing varies depending on the application areas. Some of the educational researchers have found interactive videoconferencing to be an effective tool in teaching clinical examination objectives to students at remote sites. Other studies have demonstrated that video streaming has a neutral effect or no impact while others claim it to be as effective as traditional lectures.

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