

Educational Multimedia

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Making education more engaging, more enjoyable, and, in the end, more effective through the use of multimedia technology has been the goal of many researchers during the past few years. Encouraging results have been achieved so far. There are many examples where multimedia is used in educational scenarios with extraordinary benefits. Because of these achievements, some people actually consider computer-supported teaching and learning not to be an interesting area of research anymore; they claim that most of the important questions have been solved. We think that this isn't true and we believe that now is actually a perfect time to address and refocus on this application area. Here, we will discuss why.

Why study e-learning

First, we are currently observing a new wave of e-learning. In the mid and late 1990s, the growing popularity of the Web triggered the idea of using related technologies for educational purposes, which not surprisingly resulted in the typical hype cycle: a peak of inflated expectations, followed by a trough of disillusionment, and finally a plateau of productivity that we are currently facing. However, the next generation of Web technologies and applications, popularly summarized as Web 2.0, is serving as another trigger for this area, which is often and rather uninspiringly called *E-Learning 2.0*. Although it will most certainly lead to another trough of disillusionment, this new

trend should be taken seriously. There is no reason to believe that there will not be another plateau of productivity as a result of this second wave as well. In addition, and particularly relevant for multimedia researchers, Web 2.0 phenomena such as YouTube leads us to suspect that multimedia now will play an even greater and more significant role than it did in the outcomes of the first hype cycle.

Second, the routine use of tools developed as part of the first e-learning hype resulted in new research opportunities. For example, all three guest editors for this special section have been involved in projects related to automated lecture recording. The idea of creating multimedia learning material from automatically recording classroom lectures has been investigated since the late 1990s. Today, this problem can be considered solved—a statement that is confirmed by a remarkable number of commercial systems now available for this task. However, the routine use of such tools opens up new questions, such as how to store, archive, and manage the resulting amount of data. One of the guest editors of this special section, for example, is now involved in a project focusing on approaches for indexing and retrieval of lecture recordings.¹ Other research in this context includes, for example, the semantic annotation of such learning material.²

Finally, the next generation of devices and technologies not only gives us new opportunities but also poses new problems. For example, with the increasing performance of smart phones and PDAs, replay of lecture recordings is no longer limited to PCs and laptops, thus offering great perspectives for mobile learning. However, such use results in a new problem, namely how such educational material should be presented on the screens of handheld devices, which usually have a low resolution and a small size. In this context, two of the guest editors, for example, are involved in a research project where new visualization algorithms are used to increase the readability of an electronic whiteboard recording on handheld devices by dynamically zooming into areas of particular interest.³

Motivated by such arguments about the timeliness and relevance of research in this area, we organized the workshop "Educational Multimedia and Multimedia Education" at the 2007 ACM Multimedia conference (see <http://emme2007.informatik.uni-freiburg.de>). The

goal of this workshop was to identify current and evolving trends, specify open problems, and discover challenges and prospects for new research in the broad topic of multimedia-based education. Its call attracted a broad variety of submissions. In addition to articles on new technologies and applications, we also received contributions on softer and more conceptual issues, two of which have been selected for publication in the ACM e-learning magazine.^{4,5} An overview and further comments on issues related to the more conceptual side of the workshop can be found elsewhere.⁶ In addition, the workshop also addressed questions about the status and future prospects of multimedia education.⁷

Special section

For this special section on educational multimedia, we invited the authors of three outstanding technical contributions to submit their work for a showcase illustrating the current state of the field.⁸⁻¹⁰ All of these contributions are ongoing projects that achieved impressive results and offer great perspectives for the future, thus providing a good idea about where the area is heading.

In their article “A Virtual Camera Team for Lecture Recording,” Lampi, Kopf, Benz, and Effelsberg describe their current work on designing and implementing a virtual camera team for lecture recordings. This research is another example of the many new projects that evolved around the work done in lecture recording in the late 1990s and early 2000s. It’s also interesting because it represents a common trend in current educational multimedia-related research: to automate existing approaches and make the involved processes even more intelligent. In this case, the goal is to use a distributed computer system to produce lecture recordings that look like the result a professional human camera team would produce, that is, a video that is more lively and interesting than current single-camera recordings that don’t cut away from the lecturer’s talking head.

The second article, “Toward Next-Generation Intelligent Tutors: Adding Natural Handwriting Input” by Anthony, Yang, and Koe-dinger, explores the use of handwriting-recognition-based interfaces in intelligent tutoring systems for students learning algebra. Although it focuses mainly on single-media,

handwritten input, it’s an important contribution because, in our opinion, handwriting as a media type offers great potential for educational multimedia applications, which hasn’t been exploited yet completely. In addition, it’s a good example of the beneficial use of new technology in the classroom because pen-based interface use is getting increasingly popular in many educational institutions. It also represents a certain trend of researchers seeming to consider the actual benefit of newly introduced approaches more than focusing on pure technological advancements—which unfortunately was often the case in earlier e-learning-related projects.

Wang and Zhang’s article, “Application-Specific Music Transcription for Instrument Tutoring,” introduces a new approach for music transcription. On the basis of their existing research results in automatic music transcription, the authors propose a framework for the development of much better and more useful systems by integration of application-specific aspects into the development process. Combining rather theoretical results from traditional approaches on automatic music transcription with application-specific issues and aspects from human-computer interaction reflects another common trend we are currently observing: a higher level of multidisciplinary. In addition, the application area discussed here—home training for violin players and singing students—isn’t particularly targeted toward learners in educational institutions but addresses other users as well. We generally expect that the second e-learning wave actually will produce much more multimedia-based learning tools for the average user. The system proposed by Wang and Zhang is a good example for this.

We selected all three contributions purely on the basis of the quality of the existing results and their prospect for future research. Hence, the fact that they are from different continents—Northern America, Europe, and Asia, respectively—is coincidental. Nevertheless, this somehow reflects the broad and growing interest in educational multimedia. Another interesting fact about these projects is that all three are truly multidisciplinary. Traditional camera teams and computer scientists; pedagogues, math teachers, and handwriting-recognition experts; and music teachers, students, and experts on signal analysis are working

together to build systems that not only present technological achievements but also provide a real benefit for the actual end user.

Conclusion

We believe that the projects presented in this showcase illustrate the huge potential of educational multimedia and also the tremendous challenges and opportunities researchers in this area are still facing. We thank everyone who contributed to this special section and helped us in compiling it. We thank the authors for their contributions and the reviewers for their helpful comments and support, the *IEEE MultiMedia* editorial team, Lindsey Buscher from Allen Press, and Kofi Agyeman Boakye and Sherry Zhao for their valuable help and support.

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