

## Portable Critical Viewing and Analysis System

John Mateer, University of York

### Abstract

*Students enrolled on the BEng/MEng Electronic Engineering with Media Technology course take a mixture of technical and aesthetically-focused video production and postproduction modules. A key teaching need in both these contexts is the ability to demonstrate concepts with very high visual fidelity in order for students to build critical viewing skills. Few facilities on campus, however, have had the required capability. As a result, a portable critical viewing system was developed to meet these needs. This report discusses the design of the system and the results of trials with two cohorts to measure its effectiveness.*

### Background

In the teaching of media engineering we stress the importance of critical viewing skills for both aesthetic judgement and system calibration. These skills include the ability to recognize and identify visual anomalies (such as chrominance noise, luminance noise, compression artefacts, channel drop outs, synchronization issues, etc.) as well as apply specific image processing techniques to fulfil creative objectives (as in colour correction and grading). To teach these concepts effectively it is important that students see a range of examples with high fidelity so that they can begin to distinguish between perceptual, aesthetic and hardware-related issues.

Given the varying configurations of teaching venues and the impracticalities of equipping each with the necessary high-definition display hardware, an optimal critical viewing system was envisaged that would be highly portable, quick to set-up, and allow high quality visual media to be presented in a range of teaching and laboratory settings. Likewise the system should be able to accommodate a wide variety of common media formats. The goal is to effectively create a teaching resource that would free lecturers from the infrastructural constraints of existing facilities.

### Methodology

With these aims in mind a portable display system was designed in two parts: first, a projection system built around an Optoma H78 DC3 high-definition digital cinema projector linked to a Denon 3910 DVD player via HDMI with a Milori ColorFacts Professional 5.5 system for screen calibration and a modified production sound cart to carry all equipment; and second, a light control system utilising four C-Stands with Duvateen sheets to enable the blackout of windows. A trial was conducted in situ to gauge its impact in delivery (results are discussed in section 5 below). Absolute quantitative measurement of the effectiveness of using this type of system is difficult. However, we have looked to obtain data from two areas:

- 1) *Direct Student Feedback.* Students filled in short pre- and post-course surveys to determine their subjective assessment of the effectiveness of the system as a learning aid and their opinion of digital film projection in general.
- 2) *Student Marks.* Performance of students who had lectures that employed the new system was compared with those from previous cohorts to gain a sense of whether there is a significant difference in the effectiveness of teaching through use of the system. It is acknowledged that many factors might render such comparison difficult, however, any findings may help to reinforce evidence procured via the surveys.

### Issues

The time required to set up any teaching resource for delivery must be minimal. The original plans to have portable black-out drapes to control lighting were scrapped for just that reason. Although lighting control plays a large part in creating an effective viewing environment, the ten minutes required (total) to set up and tear down is prohibitive for a one-hour slot. Otherwise the system is quick to set-up. That said, it does require careful placement so a small learning curve is involved for new users. This, plus the need to physically move it from venue to venue, means that the system does have some logistical disadvantages. Anecdotally a few lecturers stated they felt it was

too much trouble to wheel the unit across campus and that, although the merits of the system were laudable, it was simply too time consuming to use for short sessions.

### **Benefits**

The system successfully provides high fidelity visual presentation that is superior to that available in many campus lecture venues. This enables critical viewing instruction to be delivered in a wider range of settings than previously possible.

### **Evidence of Success**

The system has been used in support of four media engineering courses over the last two years – *Videography and Lighting*, *Video Systems and Production*, *Advanced Postproduction* and *Advanced Media Systems*. It was trialed, starting in January 2006, by gathering formal student feedback from two courses – first year *Videography and Lighting* (with 9 students) and third year *Advanced Postproduction* (with 22 students). In total 31 students were surveyed.

In the initial survey students indicated they believed video clips definitely made concepts clearer (avg 5.4 out of 6) but that content was more important than the quality of presentation (avg 4.5). They also indicated that the University's existing projection facilities (at that time) were reasonably good at showing video (avg 3.7). In the final survey it was clear that the HD system did enhance delivery. Students indicated that the HD system had a higher overall image quality with better colour and contrast (avgs 4.8, 4.7 respectively) and that concepts being illustrated were very clear (avg 4.6). Anecdotally, a small number of students stated they were impressed with the quality of the system and wished such facilities were built-in. Standard course satisfaction surveys and feedback affirmed that students were very pleased with the modules overall but it was not clear to what extent the projection system contributed to this.

The other type of analysis undertaken involved the comparison of marks from previous years. Marks in *Videography and Lighting* improved by about 10%. It is impossible to conclude that the system had a direct impact on this although the ability to better see the nuances of lighting design may have been beneficial. The *Advanced Postproduction* marks improved by only about 2%, within the standard variance from year to year. Although it is very difficult to say with certainty, the system does appear to potentially have some effect on promoting deeper learning of the material.

### **How Can Other Academics Reproduce This?**

The system itself is straightforward to assemble and utilizes readily available components. The combination of components and the system's portability are what make the approach novel. In terms of the surveys used in the trial, the author would be happy to furnish these upon request to serve as templates for further studies.

### **Reflections**

This project was started in mid-2005. Display technology has advanced significantly since that time with the advent of more affordable 1080p projection systems, Blu-Ray and HD DVD disc formats and other innovations. As it stands most University venues have now been upgraded to nearly the same level of presentation capability as this portable system, however, they are not calibrated to broadcast specifications nor can they yet handle the emerging HDTV and digital cinema standards. We plan to upgrade the projection and playback components of this system to keep pace with the advancing technology. In doing so we hope to continue to provide a near state-of-the-art system that, given its portability, represents good value for money as a flexible and effective teaching resource.

## Background Information

<b>Discipline</b>	<i>Electronic Engineering for Media Technology</i>
<b>Participants</b>	<i>31 students in total for system trial</i>
<b>Level</b>	<i>System can be used for any cohort or teaching setting. Trials involved 1<sup>st</sup> year Videography and Lighting (9 students) and 3<sup>rd</sup> year Advanced Postproduction (22 students).</i>
<b>Pedagogical Approach</b>	<i>The system was developed to enhance critical viewing skills for both technical quality assurance (i.e. recognition of visual artefacts and their root cause) and creative application (i.e. colour grading of video).</i>
<b>Teaching Methods</b>	<i>The system was used in traditional lecture, laboratory and practical work sessions in support of delivery.</i>
<b>Materials Required</b>	<i>The system is built around a high-definition digital cinema projector linked to a high-end upscaling DVD player via HDMI with a professional colour calibration system (to ensure accurate reproduction) all mounted on an all-terrain cart for portability.</i>
<b>Assessment used</b>	<i>Two measures were used to assess the effectiveness of the system as a teaching tool: 1) Direct student feedback where students filled in short pre- and post-course surveys to determine their subjective assessment the system; 2) A comparison of student marks between cohorts who were taught using the system and those who were not.</i>
<b>Contact Details</b>	
<b>Author</b>	<i>John Mateer University of York Department of Electronics Heslington, York YO10 5DD <a href="mailto:jwm10@ohm.york.ac.uk">jwm10@ohm.york.ac.uk</a></i>
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