An Experimental Methodology for Teaching Multimedia

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OVERVIEW

This paper describes a methodology developed for teaching fundamental aspects of multimedia to third year Computer Science students. The methodology and how it has been applied to the subject areas of audio, image, and video are described with examples. Lastly, student reaction to the approach is considered using data derived from anonymous end-of-semester feedback.

INTRODUCTION

When COMP343 Fundamentals of Multimedia Computing was first taught, a 'traditional' approach to course delivery was used. The course tried to teach multimedia concepts through the use of textbooks, hand-outs, and several paper-based questionnaires and exams. After two semesters of teaching using this method, it was clear from informal comments and observation, together with end-of-semester feedback, that students were not stimulated by this approach, with their lack of interest resulting ultimately in a low level of knowledge about the subject.

A NEW COURSE PEDAGOGY

The way in which the course was taught was therefore re-designed. From the Spring 2000 semester onwards, the new course pedagogy was to enhance student learning through

- ***Creativity***, coupled with
- ***An immersive learning*** methodology

The primary domains of the course are audio, image, and video. In terms of actual application, the new course pedagogy was implemented such that for each of the three domains, students

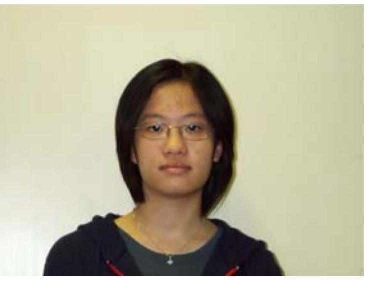
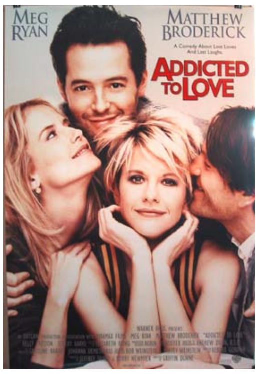
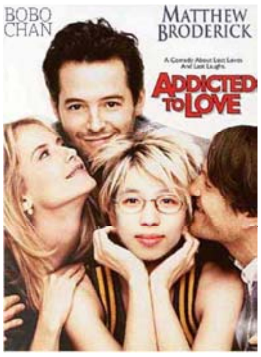
- were required to build creative programming projects which operate in that domain
- were required to use their programs to process sounds/ images/ videos of themselves

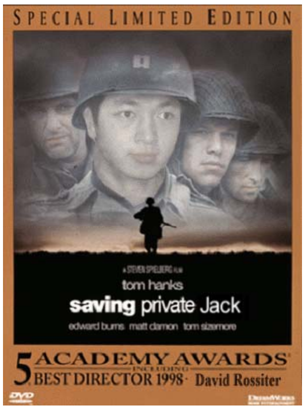
The latter requirement greatly enhances the sense of accomplishment and level of interest generated by the former. Students experience creativity in the development of advanced programs; then they experience creativity *using* their programs.

Audio - For the audio component of the course, a microphone was used to record every student. Directly after being recorded, the sound files were placed on the course web site for downloading by the students themselves. Students then undertook a lab session that involved using high-end software as an introduction to handling audio information. Students then designed algorithms to process digital audio in a number of different ways, building the algorithms into a single program. During program development they were encouraged to develop and check the performance of their algorithm by using the recordings of themselves and their friends. After the program was complete, students had to create a short audio composition using *only* the program they had developed, based on the single sound-file recording of their voice. An example of the brief instructions for the target composition is: 'Create a composition to accompany an imaginary film in which an actor (played by you) goes mad'. This task requires that their voice recording be processed in many different ways by their program, thus encouraging students to experiment and explore the behavior of the algorithms implemented within their program.

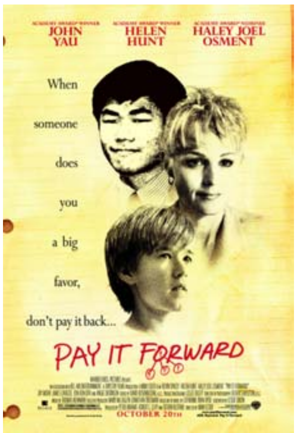
Image - When students came to study the image component of the course, a photograph of each student was taken using a digital camera and immediately placed on the course web site where they could be viewed, downloaded and manipulated. Students then undertook a lab session that involved using high-end software, as an introduction to handling image information. Students then developed innovative algorithms and implemented them in a program. They were then required to use their program to process their own image in a number of different ways, resulting in a portfolio of processed versions of their face. In this way students were required to use the image-processing algorithms they had developed, exploring algorithmic behavior over a range of parameters.

Examples of student work using high-end image processing software are given below.

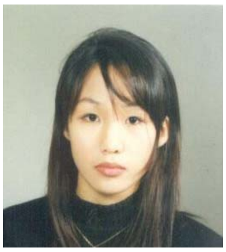
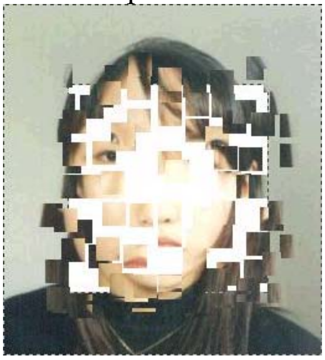
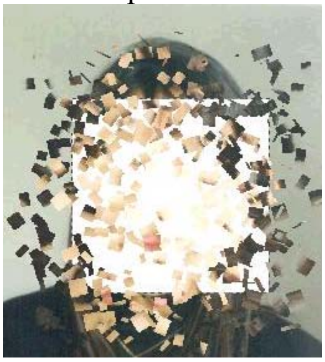
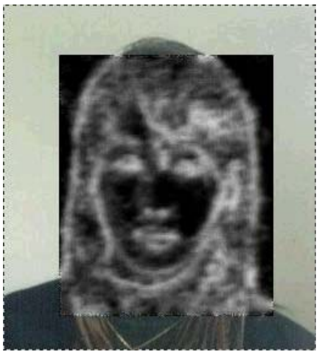
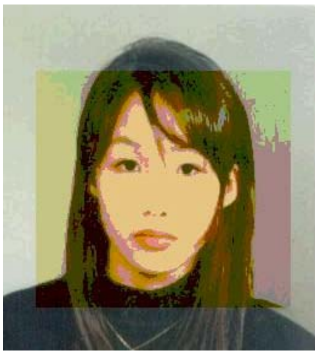
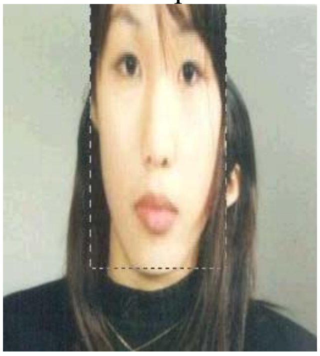
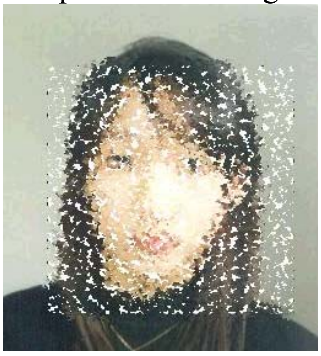
<table>
<tr><td colspan="3">Introductory Image Session – Examples
<em>Examples from Fall 2000 Semester</em></td></tr>
<tr><td>Student Image
Taken with Digital Camera</td><td>Original Poster Image</td><td>Result</td></tr>
<tr><td></td><td>
</td><td>
</td></tr>
<tr><td> </td><td>
SPECIAL LIMITED EDITION
tom hanks
saving private ryan
5 ACADEMY AWARDS
BEST DIRECTOR 1998 Steven Spielberg

</td><td>
SPECIAL LIMITED EDITION
tom hanks
saving private Jack
edward burns matt damon tom sizemore
5 ACADEMY AWARDS
BEST DIRECTOR 1998 David Rossiter

</td></tr>
<tr><td> </td><td>
KEVIN SPACEY
HELEN HUNT
HALEY JOEL OSMENT
When someone does you a big favor, don't pay it back...
PAY IT FORWARD

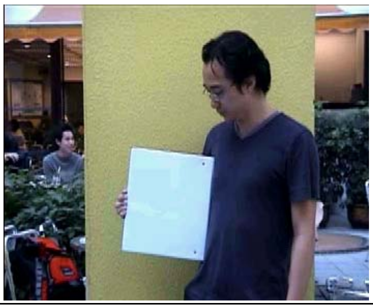
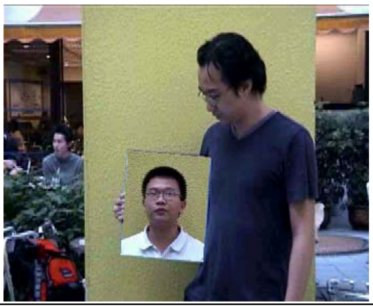
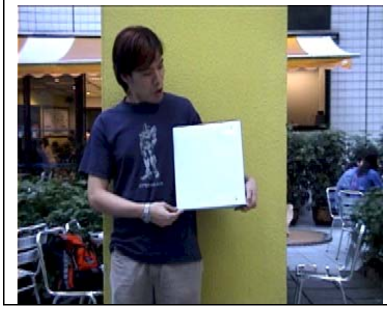
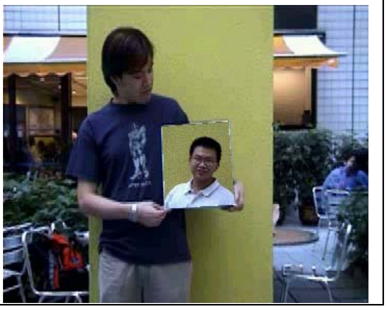
</td><td>
</td></tr>
</table>

Examples of the image processing operations developed and programmed by students are given below.

Image Processing, from the program created on the course – Examples *Examples from Spring 2001 Semester*		
Image of the student taken by digital camera: 	Image after processing, using *only* the program created by the student	
	Explode -1 	Explode -2 
	Ghost Effect 	Posterization 
	Stretch Upwards 	Special Mosaicing 

Video - The course has now been developed to apply the same approach to video. Video recordings of the students are made using a digital video camera and are made available via the course web site. Students undertake a lab session that involves using high-end software, to help the students move from the image domain to the video domain. Students are then required to develop their own unique software to handle video processing, and subsequently create new videos using their video recording as input.

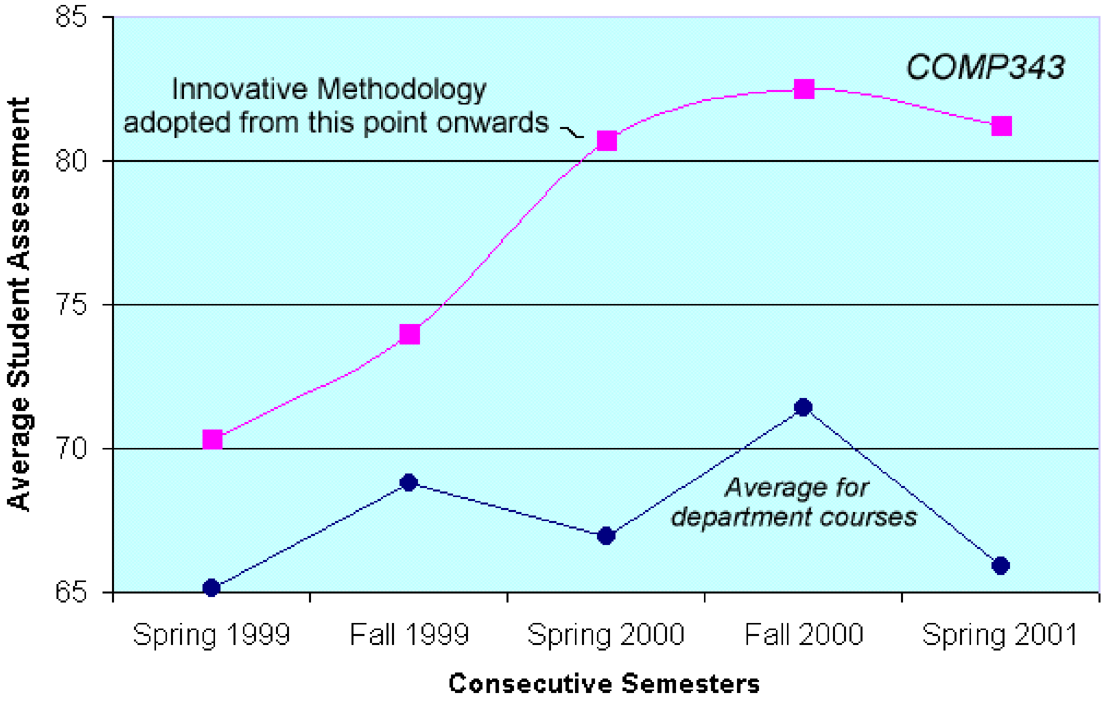
Examples of developed video processing operations from the course are given below.

Video Processing, from the program created on the course – Examples		
Input Video1 Teaching Assistant	Input Video 2 COMP343 Student	Resulting Video Effect, using only the software created by the student
		
Input Video1 Teaching Assistant	Input Video 2 COMP343 Student	Resulting Video Effect, using only the software created by the student
		

ASSESSING THE APPROACH

The success of the approach may be judged from at least the following two sources.

- **Comments from anonymous student feedback.** Comments from students both informally during the course and from end-of-semester anonymous feedback indicated a much greater level of appreciation of the course content.
- **Statistical assessment of anonymous student feedback**. End-of-semester feedback requires the students to rate each course on a scale. Feedback is completely anonymous. Analysis of this data shows a great improvement in course appreciation, as shown below.


Average Student Assessment
COMP343
Innovative Methodology
adopted from this point onwards
Average for
department courses
Spring 1999
Fall 1999
Spring 2000
Fall 2000
Spring 2001
Consecutive Semesters