# Teaching portfolio

**Fuhua (Frank) Cheng (Fall, 2008)**

## A. Teaching Evaluation

### 1. Reflective Statement

My teaching has three goals: (1) to make sure that students understand the course materials well, (2) to make sure that students know how to use/apply the materials they learn in class, and (3) to make sure that the students are evaluated fairly.

To achieve the first goal,

- I use a motivation-driven approach in my lecture, i.e., I give the background and applications of the result first, and then explain the theory that leads to the result.
- I give many examples in my notes (see, e.g., my CS535 and CS633 notes).
- I encourage the students to be involved and active during lectures. (However, for those who find it difficult to do so, I welcome them to ask questions or make comments after class.)
- I make all my class notes available on line so that, instead of copying my notes in class, they can closely follow my lectures on course materials. (My class notes such as CS633, CS631, CS535, and CS321 have been used by some of my students and colleagues in their own classes.)

To achieve the second goal,

- I give applications for each covered result.
- I provide students with sample programs to help them initiate their work (see my web pages).
- I encourage students to share their ideas.
- I award students with extra credit if they have new ideas on assignments.

To achieve the third goal,

- I always let the students know at the outset of the course exactly what is expected. I clearly specify the requirements of the course such as materials to be covered, grading policy, program requirements (see, e.g., my CS535 and CS633 Programming Requirements), late penalty, and numerical scale to be used in the evaluation, on the first day of class.
- I provide students with solution sets for all homework assignments and exams (see my webpages) so they would not only know the solutions to the questions, but also know if their works are graded fairly.

I have different expectations for graduate and undergraduate students though. For a undergraduate or programming-extensive course, the students are evaluated based on two subjects: programming assignments and tests. I usually put equal weight on both sides so the effort of the students can be evaluated fairly. However, I encourage students to do critical thinking and they get extra credit if they do so such as providing comments or improvement on existing techniques. For a seminar course or advanced topics, I evaluate the students mainly based on the quality of the work, i.e., I will follow the numerical scale, but a student with good ideas will get more extra credit than the ones who don't.

2. **List of Courses taught**

| Term | Course | Title | Enrollment |
|---|---|---|---|
| Spring 06 | CS633 | Computer Animation | 7 |
| Fall 06 | CS535 | Intermediate Computer Graphics | 27 |
| Fall 06 | CS275 | Discrete Mathematics | 29 |
| Spring 08 | CS633 | Computer Animation | 4 |
| Fall 06 | CS535 | Intermediate Computer Graphics | 9 |
| | CS335 | Graphics and Multimedia | 29 |

**Discrete Mathematics (CS275)**: This course covers topics in discrete math aimed at applications in Computer Science. For fundamental principles, we cover: set theory, induction, relations, functions and Boolean algebra. For techniques of counting, we cover: permutations, combinations, recurrences, and algorithms to generate them. This course will also do an introduction to graphs and trees.

Students will develop a knowledge of a variety of mathematical tools applicable in computer science. Specifically, students will be able to (1) construct inductive proofs, (2) apply set algebra, (3) apply elementary logic, (4) enumerate combinatorial objects, and (5) solve recurrence relations.

**Graphics and Multimedia(CS335)**: This course focuses on the graphical human-machine interface, covering the principles of windowing systems, graphical interface design and implementation, and processing graphical data. There is an emphasis on medium-scale programming projects with graphical user interfaces using an object-oriented programming language such as Java.

**Intermediate Computer Graphics (CS535)**: This course covers 2D graphics such as rasterization of lines/polygons/curves, clipping, anti-aliasing and 3D graphics such as modeling, viewing, lighting, shading, hidden line/surface removal. More advanced topics such as solid modeling, curves and surfaces, advanced raster graphics architecture and algorithms, advanced modeling techniques, and animation will also be covered. The supporting graphics system used in this course is OpenGL.

**Computer Animation (CS633)**:

This course presents algorithms and programming techniques for specifying and generating motion for graphical objects. It addresses practical issues and provides accessible techniques and straightforward implementations. It is not intended for animators using off-the-shelf animation software, nor does it address the issue of computer-assisted animation, i.e., the computerization of conventional hand-drawn techniques. This course is primarily concerned with 3D computer animation.

Motion specification techniques in two categories: interpolation and basic technique and advanced algorithm, are studied and discussed. The interpolation and basic techniques category consists of ways in which the computer is used to fill in the details of the motion once the animator specifies the required information, such as key framing and path following. Advanced algorithms generate motion using a set of rules or constraints that specify what is to be done instead of how is to be done. Model-specific applications are also surveyed. These are grouped into two general areas: natural phenomena and figure modeling. The graphics library used in this course is OpenGL.

3. **Course Syllabi**

(see attachment)

4. **Student Evaluation**

| | | 2007 | | | 2008 |
|---|---|---|---|---|---|
| | | Spring | Fall | | Spring |
| | | 633 | 275 | 535 | 633 |
| | Enrollment | 7 | 29 | 27 | 4 |
| | Number of answers | 7 | 23 | 17 | 4 |
| 1 | Material/grading outlined | 4.0 | 3.3 | 3.6 | 3.8 |
| 2 | Textbook | 3.6 | 2.9 | 3.4 | 3.6 |
| 3 | Supplemental reading | 4.0 | 3.3 | 3.6 | 4.0 |
| 4 | Exams reflection | 4.0 | 3.6 | 3.7 | 4.0 |
| 5 | Grading fair | 4.0 | 3.6 | 3.6 | 4.0 |
| 6 | Distributing assignments evenly | 4.0 | 3.5 | 3.8 | 4.0 |
| 7 | Assignments graded promptly | 4.0 | 3.7 | 3.6 | 4.0 |
| 8 | Grading including comments | 4.0 | 2.9 | 3.5 | 4.0 |
| 9 | presentation | 4.0 | 3.3 | 3.5 | 4.0 |
| 10 | Knowledge of subject | 4.0 | 3.6 | 3.8 | 4.0 |
| 11 | Availability | 3.8 | 3.5 | 3.6 | 3.8 |
| 12 | Answer questions | 4.0 | 3.4 | 3.5 | 4.0 |
| 13 | Stimulate interest | 4.0 | 2.8 | 3.5 | 4.0 |
| 14 | Encourage participation | 3.8 | 3.4 | 3.5 | 3.8 |
| 15 | Respect viewpoints | 3.8 | 3.2 | 3.5 | 3.8 |
| 16 | Ability to analyze | 4.0 | 3.3 | 3.5 | 4.0 |
| 17 | Solve problems | 4.0 | 3.6 | 3.2 | 4.0 |
| 18 | Understand concepts | 4.0 | 3.2 | 3.8 | 4.0 |
| 19 | Read further | 4.0 | 2.6 | 3.6 | 4.0 |
| 20 | Value of course | 4.0 | 3.2 | 3.6 | 4.0 |
| 21 | Quality of teaching | 3.9 | 3.3 | 3.4 | 4.0 |

5. **Class Notes**

(CS535, CS633, CS335 and CS275 can all be accessed from my website)

## B. Advising Evaluation

### 1. Reflective Statement

My goal in advising a project or a thesis is to ensure that the student knows how to set up a target and how to develop a strategy to reach that target. The target must be very specific and the strategy must be practical. The idea is to let the student know how to play a game by him/her-self and to what extent that he/she should keep trying before giving up. I help the student with the technical part initially after he/she has successfully performed background study, target selecting, and strategy design.

My advising in pre-registration meetings with the students will ensure that (1) students understand the requirement of a computer science major in addition to the college and university requirements, and (2) each student develops an appropriate course plan for each semester. This will be achieved by going through a checklist with the student and showing him/her the best combination for the semester.

### 2. Numbers of Students Advised

| | 2007 | | 2008 | |
|---|---|---|---|---|
| | Spring | Fall | Spring | Fall |
| Undergraduate Program Advisees | 32 | 29 | 21 | 27 |
| Graduate Program Advisees | 5 | 5 | 5 | 5 |
| MS Committees | 3 | 3 | 3 | 3 |
| PhD Committees* | 8 | 8 | 8 | 8 |

* Yun Lin, George Landon, Qi Zhuang, Ning Cao, Wensheng Shen, Liang Wang, Xianwang Wang, Xian Xiao (Nanyang Technological University, Singapore)

### 3. PhD Students

- **Fengtao Fan**

  Area of Research: *GPU-Assisted Rendering of Subdivision surfaces*

  Starting Date: August 2006

  Supported Period: August 2006 - December 2008 (supported by NSF grant DMI-0422126 and KSTC grant KSTC-144-401-07-015).

  Publication: 5 journal papers, 1 conference paper

  Graduation Date : May 2010 (anitcipated).

  Current Status: *preparing for qualify exam*

- **Jianzhong Wang**

  Area of Research: *C2-Smooth Subdivision Surfaces*

  Starting Date: January 2008 (joined our PhD program in August 2005)

  Supported period: June 2008 - August 2008, January, 2009- (supported by KSTC grant KSTC-144-401-07-015)

  Publication: *none*.

  Anticipated Graduation Date : May 2011

Current Status: *preparing for qualify exam*

- **Yong Li**

  Area of Research: *Corresponding points computation for STM based Imaging*

  Starting Date: August 2008

  Supported period: August 2008 - present (supported by KSTC grant KSTC-144-401-07-015)

  Publication: *none*

  Anticipated Graduation Date : May 2012

  Current Status: *passed no breadth and depth exams yet*

4. **MS Students**

- **Jiaxi Wang**

  Masters Thesis: *Parametrization and Shape Reconstruction Techniques for Doo-Sabin Subdivision Surfaces*

  Supervising Period: January 2007 - May 2008

  Supported Period: August 2007 - December 2007 (supported by NSF grant DMI-0422126).

  Publication: 4 journal papers, 1 conference paper

  Graduation Date : May 2008.

  Current Status: *programmer at AVnet*

- **Conglin Huang**

  Masters Thesis: *Applications of Loop Subdivision Surface based Matching and Reconstruction Techniques in Mouth Reproducing*

  Supervising Period: January 2007 - present

  Supported Period: January 2007 - present (supported by NSF grant DMI-0422126 and KSTC grant KSTC-144-401-07-015).

  Publication: 4 journal papers, 1 conference paper

  Graduation Date : May 2009.

5. **Student Activities Summary**

- **Summer project**

  Student advised: Levon Ter-Isahaky

  Advising period: summer, 2008

## Attachments

1. **Syllabi**

   CS275 - Discrete Mathematics
   CS335 - Graphics and Multimedia
   CS535 - Intermediate Computer Graphics
   CS633 - Computer Animation

2. **Materials prepared for teaching activities** (all can be accessed from my website)

   CS275 - class notes, programming assignments (with sample programs), homework assignments (with solution sets)
   CS335 - class notes, programming assignments (with sample programs), homework assignments (with solution sets)
   CS535 - class notes, programming assignments (with sample programs), homework assignments (with solution sets)
   CS633 - class notes, programming assignments (with sample programs), homework assignments (with solution sets)