CSU0021: Computer Graphics

CSU0021: Computer Graphics

- These are probably something you can do at the end of this semester




國立臺灣師範大學 National Taiwan Normal University Visual Data Analysis Lab.

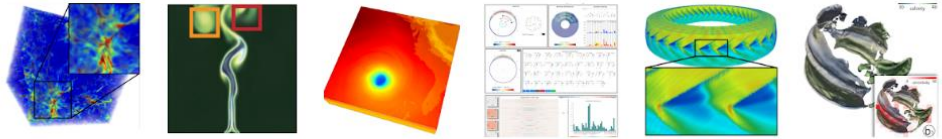
Home People Research Publication

VIDA

Visual Data Analysis Laboratory

News:

- Our laboratory is looking for new talented students. **[more]** (2019/07/11)



Visual Data Analysis (ViDA) Laboratory is a research group at Department of Computer Science and Information Engineering, National Taiwan Normal University (NTNU) and led by Ko-Chih Wang (王科植). The main research directions of ViDA are **large-scale data analysis & visualization**, **high-performance computing**, **computer graphics,** and **machine learning**. We conducts cutting-edge research in data visualization for scientific and information data analysis. Visualization research is at an intersection of data analysis, computer graphics and large-scale data handling, and has been playing increasingly important role in many applications. Our research has two main branches. One is scientific data visualization and the other one is information data visualization. Scientific data visualization focuses on visualizing data from scientific simulation and solving the large-scale data problem in computational science. Information data visualization builds visual tools to facilitate applications such as social network, machine learning, questionnaire, transaction, and traffic data analysis. For more details of ViDA's research, please check the Research page.

Location: Applied Science Building, No.88, Sec. 4, Tingzhou Rd., Wenshan Dist., Taipei City 116, Taiwan (R.O.C.) (台師大公館校區(師大分部) - 台北市汀州路四段88號 應用科學大樓)

About Me

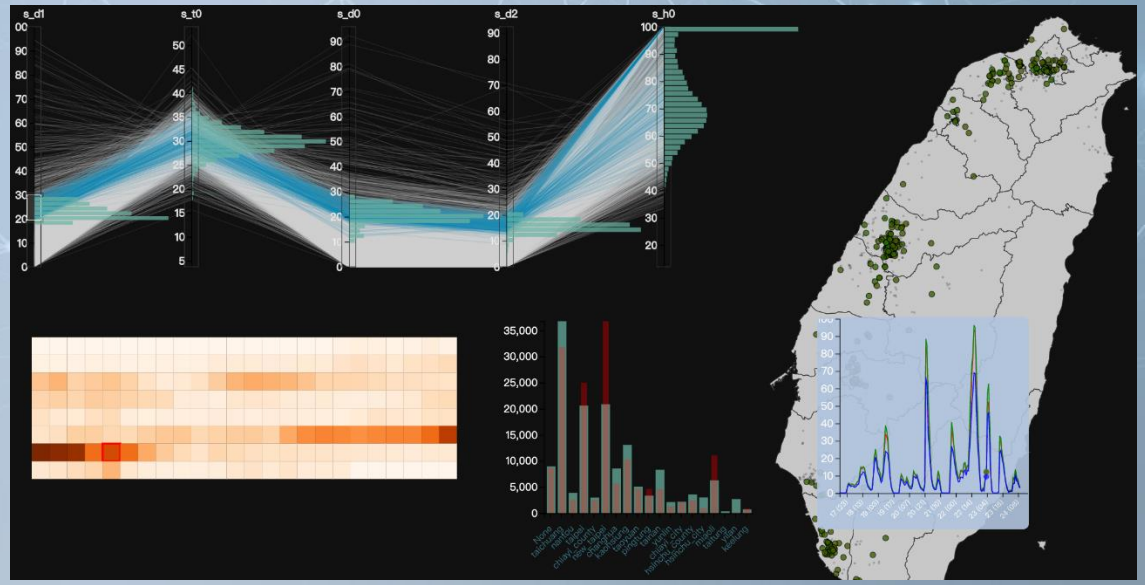
- Assistant Professor, CSIE, NTNU (2019 ~)
- Visualization research
- Direct ViDA Lab.
- Primarily focused on large scale scientific visualization research and information visualization

My Courses at CSIE, NTNU in 110

- Computer Graphics (110-1)
- Data Visualization (110-2)







CSU0021: Computer Graphics

- Instructor: Ko-Chih Wang (王科植)
  - Email: kcwang@ntnu.edu.tw
  - Office hours: 4:00~5:00 PM Wednesday or **E-mail to schedule with me (better)**
  - Office: 515 應用科學大樓
- TA: 孫靖茹
  - Email: sunnu06444@gmail.com

Purpose

- You will learn
  - fundamental concept of computer graphics
  - Open Graphics Library Shading Language (GLSL)
  - WebGL
  - Concept of data parallel programming

- At the end of this semester, you should be able to render beautiful 3D image using WebGL

Prerequisite

- This is a **low-level** graphics programming class, where you will learn how to directly control GPUs by writing **GLSL shader code**
- You need to be fluent in programming
- We will use **WebGL**, which is in Javascript. But prior experience with C/C++ should allow you to learn quickly
- You need to be comfortable with linear algebra (vector and matrix calculations)

Grading

- 4~6 programming homeworks: 50%
- Midterm exam: 20%
- Quizzes: 10%
- Attendances: 5%
- Final project: 15%

Homework

- We will have around 5 programing homeworks in this semester.
- According to the difficulties, you will have one or 2~3 weeks to finish the homework.

- **Grading of homeworks:**
  - For every homework, you suppose schedule with TA, demonstrate, and explain your homework to TA

- **Late homework is penalized**
  - Your maximum possible score on late homework is 60%
  - You can turn it in at any time (before the final exam week starts)
  - And, schedule with TA again to demonstrate to her

Quizzes

- You will have about 10 programming quizzes during this semester.
- You usually have the quiz in the last hour each week.
- The purpose of the quizzes is to help you to be familiar with the what we teach immediately

- Do not worry, the quizzes should be easy. You just follow the instruction to finish it.
- You can discuss with your classmate or me to complete the quiz.
- The submission deadline of the quiz is the end of the class.

Quizzes (discussion)

- You may not want everyone knows the discussion between you and me.

- I suggest that “you” can create a Google meet session and post link in the main Google meet session. Then, I will join your session to discuss with you.

Midterm Exam

- You will have a midterm exam
  - It may not exactly in the midterm week
  - I will announce it later

Final Project

- The final project should use all you learn in this semester to create a beautiful image or small interactive 3D game
- Everyone should give a short demonstration in the final exam week
- This is solo project
- Details about the project requirements will be provided later

Academic Misconduct Policy

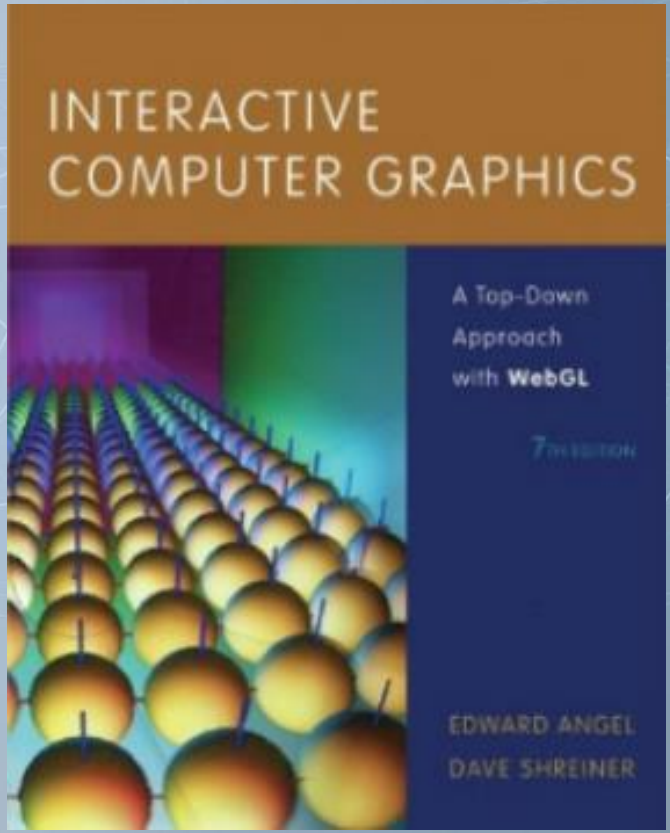
- I want you to utilize the internet, and each other, to learn Processing but also to learn how to learn. Outside the classroom, everyone references to the internet, colleagues, and sometimes books, to learn the new technical material.

- However, with regards to your lab assignments, you must indicate any code that you copied, including the source web address of the code. You are required to contribute most of the code in your lab; do not turn in a lab mostly written by other people.

- I reserve the right to give you a 0% on an assignment if I believe it is clear that you copied most or all of the answers.

Reference Book

- It is not necessary to buy. You suppose to get enough WebGL information on internet
- Interactive Computer Graphics, A Top-Down Approach Using WebGL, 7th edition by Edward Angel



What is Computer Graphics

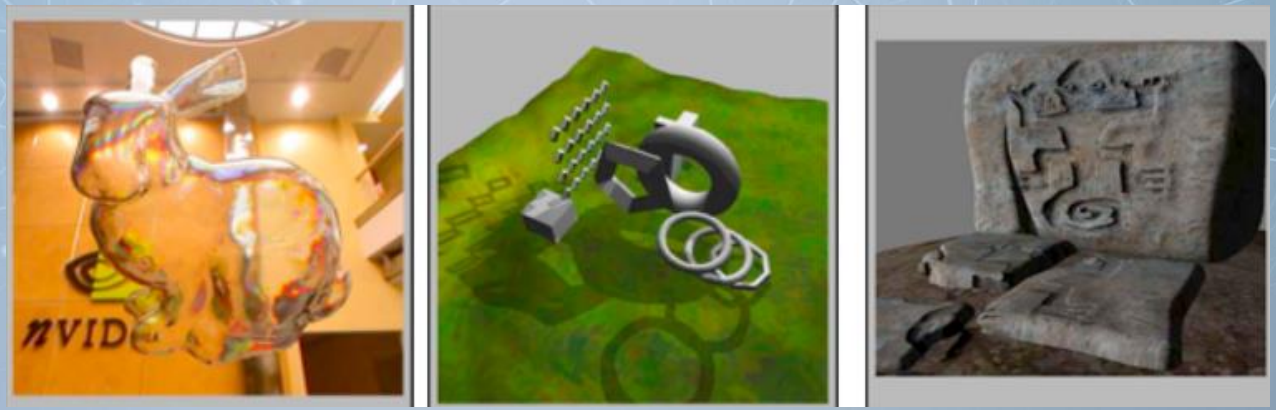
- Computer-generated images or sequences of images (i.e., animations, movies)
- The scientific study of techniques and methods for generating such images
- Not simply trying for photorealism
  - Painterly effects
  - Sketches, toon shading
  - etc

Some 3D Computer Graphics Application

- Manufacturing design (CAD)
- Movies, TV, commercials
  - Animations
  - Special effects mixed with live footage
- Visual arts
- Videos games
- Scientific visualization
- Simulation of natural

What will we learn from this course?

- Basic of graphics hardware/software
- GLSL/WebGL to control 2D/3D drawing
- Advanced real time rendering algorithm



Topics

- Overview of graphics hardware and software
- GLSL: vertex buffer objects, coordinate systems, vertex/fragment shaders
- 3D transformation and viewing
- Illumination
- Visibility and Z-buffering
- Texture mapping
- Bump, environment, and projective texture mapping
- Ray tracing basics
- Real-time shadows
- Advanced topics in shader and graphics application