Syllabus
HNRS 3035: 3D Imaging and Animation, Spring 2014

Lectures: 101 Tureaud Hall; M 10:30 am - 11:30 am

Computer Lab Sessions: 101 Frey Computing Services Center; W/F 10:30 am - 12:30 am

Faculty
Dr. Dominique G. Homberger, Dept. of Biological Sciences, 251-255 Life Sciences Building, zodhomb@lsu.edu

Guest lecturers:
Dr. Jinghua Ge, Center for Computation & Technology (Advanced Visualization), jinghuage@cct.lsu.edu
Dr. Le Yan, High Performance Computing, lyan1@tigers.lsu.edu
Dr. Kenneth (Kip) Matthews II, Dept. of Physics & Astronomy (Medical Imaging Physics), kipmatth@lsu.edu
Dr. Hermann H. Bragulla, Dept. of Comparative Biomedical Sciences, School of Veterinary Medicine, bragulla@lsu.edu
Dr. Margaret A. McNulty, Dept. of Comparative Biomedical Sciences, School of Veterinary Medicine, mcnulty@lsu.edu
Dr. Les Butler, Dept. of Chemistry, lbutler@lsu.edu
Dr. Guang Jia, Dept. of Physics & Astronomy (Medical Imaging Physics), gjia@lsu.edu

Course Objective
An introduction to the theory, application, and techniques of 3D visualization and animation, which have become part of the communication and research tool box of health care and many other professionals in research and industry.

The course consists of one lecture and two hands-on computer two-hour lab sessions per week.

Students are expected to bring a laptop to the lectures and lab sessions. They will also have access to the software/hardware of the 101 Frey Computing Services Center.

Students are expected to spend extra hours to practice the use of visualization software and to complete a visualization project.

Course content
- Biological and physical basis of vision
- Radiation safety procedures; physics and instrumentation of X-ray tomography
- Principles and mathematics of 3D data acquisition, reconstruction, visualization and analysis
- Data storage, access, visualization and quantification
- Hands-on experience with cutting-edge visualization software and real research projects
- Morphology of the animals and objects of the research projects
- Presentation techniques for visualized data (e.g., 3D electronic media in pdf, 3D printing, etc.)
- Basics of animation of visualized objects

Course Texts
Topical readings (journal articles, book chapters, manuscripts, etc.) will be posted on the Moodle page of the course.
Some of these will be required readings, others will be just for interest. There is no required textbook, but a useful reference can be consulted for supplemental information:

Exams and other graded work; grading scale
- Essay exams (50% of total course grade): (1) mid-term exam and (2) comprehensive final exam. The questions may be drawn from the lectures or the lab sessions.
- Research Visualization and Animation Project (50% of total course grade):
  - Participation in and contributions to discussions
  - Helpfulness on the projects of fellow-students
  - Degree of innovation and originality of the executed project
  - Complexity of the executed project
  - Oral presentation of the executed project
  - Technical presentation of the executed project
- Grading scale: 90-100% = A; 80-89% = B; 70-79% = C; 60-69% = D; below 60% = F
General Notes

- The lectures do not parallel the laboratory exercises, but the lectures, required readings, and laboratory exercises will supplement and reinforce one another.
- 3D Imaging is a work-intensive course. Plan to spend additional hours on your imaging project. Keep up with the reading and lecture materials, and get together in study groups to review the materials and discuss the projects.
- Your instructors are ready to assist you if you encounter any difficulties with the lecture materials or your imaging project (or any other problem). Make sure to contact them any time.

Academic Calendar for Spring 2014:
http://www.cas.lsu.edu/sites/cas.lsu.edu/files/tips-tools/AcademicCalendarSpring2014.pdf

Lecture and Lab Schedule for HNRS 3035 “3D Imaging and Animation”, Spring 2014

Lectures: M 10:30 am-11:30 am; 101 Tureaud Hall
Lab sessions: W/F 10:30 am-12:30 am; 101 Frey Computing Services Center

1. Week of 13 January 2014
   a. We 15 Jan.: Introduction, computer assignments, software downloads (D.G. Homberger, J. Ge, L. Yan, & TA)
   b. Fr 17 Jan.: Lab Session: J. Ge & D.G. Homberger & TA

2. Week of 20 January 2014 (Martin Luther King Day on Monday)
   a. We 22 Jan.: Lab session: J. Ge and D.G. Homberger
   b. Fr 24 Jan.: Lab Session: D.G. Homberger & TA (cancelled due to LSU closure due to icy conditions)

3. Week of 27 January 2014
   a. Mo 27 Jan.: Lecture: D.G. Homberger: 3D imaging-animation-computing projects in the Homberger lab
   b. We 29 Jan.: Lab Session: J. Ge and D.G. Homberger (cancelled due to LSU closure due to icy conditions)
   c. Fr 31 Jan.: Lab Session: D.G. Homberger & TA

4. Week of 3 February 2014
   a. Mo 3 Feb.: Lecture: D.G. Homberger
   b. We 5 Feb.: Lab 10:30am-11:20am: J. Ge and D.G. Homberger
      Lecture 11:30am-12:20am: K. Matthews II: X-ray Imaging Concepts
   c. Fr 7 Feb.: Lab 10:30am-11:20am: Independent study with TA (D.G. Homberger is out of town)
      Lecture 11:30am-12:20am: K. Matthews II: Tomography Concepts / Math / Instrumentation

5. Week of 10 February 2014
   a. Mo 10 Feb.: Lecture: D.G. Homberger
   b. We 12 Feb.: Lab Session: J. Ge and D.G. Homberger
   c. Fr 14 Feb.: Lab Session: H.H. Bragulla: 3D printing

6. Week of 17 Feb. 2014:
   a. Mo 17 Feb.: Lecture: D.G. Homberger
   b. We 20 Feb.: Lab Session: J. Ge & D.G. Homberger
   c. Fr 21 Feb.: Lab Session: J. Ge & D.G. Homberger (make-up for cancelled lecture on We, 5 February)
   d. Sa 22 Feb.: Lab Session: D.G. Homberger (make-up for the cancelled session on We, 29 January)

   a. Mo 24 Feb.: Mid-term Exam (D.G. Homberger)
   b. We 26 Feb.: Lab Session: J. Ge & D.G. Homberger
   c. Fr 28 Feb.: Lab session: D.G. Homberger & TA
8.  Week of 3 Mar. 2014 (Mardi Gras on Mo and We)
   a.  Fr  7 Mar.: Lab Session: J. Ge, D.G. Homberger & TA

   a.  Mo 10 Mar.: M.A. McNulty: *Contrasting tissues in x-ray CT data; 3D applications in research*
   b.  We 12 Mar.: Lab Session: J. Ge & D.G. Homberger
   c.  Fr 14 Mar.: Lab Session: D.G. Homberger & TA

10. Week of 17 Mar. 2014
    a.  Mo 17 Mar.: Lecture: D.G. Homberger
    b.  We 19 Mar.: Lab Session: J. Ge & D.G. Homberger
    c.  Fr 21 Mar.: Lab Session:

    a.  Mo 24 Mar.: Lecture: D.G. Homberger
    b.  We 26 Mar.: Lab Session: J. Ge & D.G. Homberger
    c.  Fr 28 Mar.: Lab Session: D.G. Homberger & TA
    d.  Sa 29 Mar.: Lab Session: D.G. Homberger (*make-up for the cancelled session on Fr, 24 January*)

    a.  Mo 31 Mar.: Lecture: D.G. Homberger
    b.  We  2 Apr.: Lab Session: J. Ge & D.G. Homberger
    c.  Fr  4 Apr.: Lab Session: D.G. Homberger & TA

13. Week of 7 Apr. 2014 (class presentations scheduled by students by Friday (see Moodle Forum))
    a.  Mo  7 Apr.: Lecture: D.G. Homberger
    b.  We  9 Apr.: Lab Session: J. Ge & D.G. Homberger
    c.  Fr 11 Apr.: Lab Session: D.G. Homberger & TA

Spring Break: 14-20 April: Voluntary independent work on research projects

    a.  Mo 21 Apr.: Lecture: L. Butler: *Tutorial from raw data to 3D volume*
    b.  We 23 Apr.: Lab Session: Presentation of research projects (J. Ge, D.G. Homberger, & guests)
    c.  Fr 25 Apr.: Independent work on research projects (D.G. Homberger out of town)

15. Week of 28 Apr. 2014
    a.  Mo 28 Apr.: Lecture: Dr. Guang Jia: *3D MRI and fMRI* (D.G. Homberger out of town)
    b.  We 30 Apr.: Lab Session to tie up any loose ends (last day of the semester; D.G. Homberger out of town)

Final Exam: Monday, 5 May, 10:00 am – 12:00 noon (D.G. Homberger; partly proctored by Doctoral Graduate Assistant) Bradley M. Wood)