جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Special Topics in Visualization - CS 390H

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	CS 390H
Course Title	Special Topics in Visualization
Academic Semester	Spring
Academic Year	2018/2019
Semester Start Date	01/27/2019
Semester End Date	05/23/2019
Class Schedule (Days & Time)	09:00 AM - 10:30 AM | Wed Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Ivan Viola	IVAN.VIOLA@KAUST.EDU.SA			

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	Lecture Description – The course starts by discussing the role of human visual perception and introduces various forms of experimental research for visualization design. Then illustrative techniques that directly take the human processing into account in designing effective visualizations are explained. First algorithms for effective visual appearance models are explained. Afterwards, techniques that expressively convey data insights, such as visibility management techniques, guidance, and navigation techniques are covered. The second part of the course provides in-depth knowledge in molecular visualization. First, technically-oriented lectures convey how interactive performance for molecular representations and visualization can be achieved. Then we discuss how to procedurally generate scientifically-accurate molecular scenes and how dynamic molecular models can be visualized. Finally, visualization and geometric techniques that convey molecular dynamics simulations and DNA-nanotechnology models are explained. Assignments – Each lecture will be matched with a reading assignment, papers related to the lecture are presented by the students. Project – Students will agree with the lecturer on one new visualization technique that they will implement over the entire semester.
Course Description from Program Guide	
Goals and Objectives	The course deepens the knowledge of the scientific visualization subject by two emerging subfields, human-centric visualization and molecular visualization. After completing the course, students have enough of knowledge to become productive researchers in one of discussed research directions.
Required Knowledge	Calculus, linear algebra, programming, basic graphics programming
Reference Texts	Handouts of technical and survey papers Experimental Design: From User Studies to Psychophysics (Douglas W. Cunningham, Christian Wallraven) Interactive GPU-based Visualization of Large Dynamic Particle Data (Falk, Grottel, Krone, Reina)
Method of evaluation	**30.00**% - Homework /Assignments **70.00**% - Research Project

Nature of the assignments	Assignments are meant as reading assignments which the students present within the course's journal club.
Course Policies	Lecture attendance is not strictly enforced, however strongly encouraged. Active participation on the journal club is mandatory. Project assignment needs to be completed until May 15. Any two-days delay reduces the grade for the project by one level.
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Wed 01/30/2019 Thu 01/31/2019	No Lecture Takes Place
2	Wed 02/06/2019 Thu 02/07/2019	Human-Centric Visualization: Visual System and Perceptual Processing
3	Wed 02/13/2019 Thu 02/14/2019	Human-Centric Visualization: Experimental Design for Visualization
4	Wed 02/20/2019 Thu 02/21/2019	Human-Centric Visualization: Illustrative Shading Techniques
5	Wed 02/27/2019 Thu 02/28/2019	Human-Centric Visualization: Line Drawing Generation Techniques
6	Wed 03/06/2019 Thu 03/07/2019	Human-Centric Visualization: Visual Guidance Techniques
7	Wed 03/13/2019 Thu 03/14/2019	Human-Centric Visualization: Labeling and Navigation Techniques
8	Wed 03/20/2019 Thu 03/21/2019	Molecular Visualization: Rendering and Acceleration Techniques
9	Wed 03/27/2019 Thu 03/28/2019	Spring Break
10	Wed 04/03/2019 Thu 04/04/2019	Molecular Visualization: Deferred Shading, Ambient Occlusion
11	Wed 04/10/2019 Thu 04/11/2019	Molecular Visualization: Spatial Data Structures and Search Algorithms
12	Wed 04/17/2019 Thu 04/18/2019	Molecular Visualization: Instant Construction of Large Scenes
13	Wed 04/24/2019 Thu 04/25/2019	Molecular Visualization: Pathways and Reaction-Diffusion Models
14	Wed 05/01/2019 Thu 05/02/2019	Molecular Visualization: Advanced Geometric Representations
15	Wed 05/08/2019 Thu 05/09/2019	Molecular Visualization: Analysis of Molecular Dynamics Simulations
16	Wed 05/15/2019 Thu 05/16/2019	Molecular Visualization: Synthesis of DNA-Nanotechnology Design
17	Wed 05/22/2019 Thu 05/23/2019	Final Exam Week

Note

The instructor reserves the right to make changes to this syllabus as necessary.