

Web-based 3D Visual and Haptic User Interfaces

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Course Description

- This course provides an overview on 3D Visual and Haptic User Interfaces.
- It will introduce students to specific paradigms in computer graphics and 3D visualization as well as paradigms in haptics and tactile interaction.
- Students will have the opportunity to work on small programming projects with the eXtended 3D (X3D) standard and the Haptic 3D (H3D) API.

Course Objectives

- Understand the principles and limitations of the human visual system
- Understand visual display characteristics, types and graphics rendering paradigms
- Learn about X3D basics, geometry and nodes in order to be able to develop static X3D scenes.
- Learn about X3D dynamics and animation paradigms in order to develop basic animation in X3D.
- Understand the principles and limitations of the human tactile system
- Understand haptic display characteristics, types and haptic rendering paradigms
- Learn about the design of Haptic simulations, basic force models and the H3D API.

Course Schedule and Assessment

Week	Topic	Assessment
Sept. 1	The Human Visual System	
Sept. 8	Visual Display Systems and Graphics Paradigms	
Sept.15	Introduction to X3D, The X3D Scene Graph	Q1
Sept.22	X3D – Basic Geometry, Grouping and Navigation	Project 1
Sept.29	X3D – Texture and Material Properties, Light Models	Q2
Oct. 6	X3D – Animation Paradigms: Interpolation, Routes	Test 1
Oct. 13	The Human Tactile System	
Oct. 20	Tactile Display Systems and Haptics Paradigms	Q3
Oct. 27	Haptic Rendering, Haptic Effects, Haptic Textures	Project 2
Nov. 3	Designing Haptic Interactions	Q4
Nov. 10	H3D – Basic Force Models	Test 2
Nov. 17	Simulation Validation	Q5

Required Software

- Notepad ++ (for scripting and programming)
- Bit Management Contact Player (X3D Player) plugin
- FireFox Browser
- H3D API

Grading

- Projects: 30%
 - Project 1 - Developing a static X3D scene
 - Project 2 – Adding dynamic (haptic) components to the X3D scene
- Quizzes: 25 % (5 quizzes)
- Tests: 45% (2 Tests – Midterm 20%, Final 25%)