Instructor: Joseph J. LaViola Jr.

Office: Engineering III Room 321
Hours: Tues. 4:00pm-5:30pm
       Wed. 6:00pm-7:00pm
Tablet PC Lab: Engineering III 208
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If you want to email me, MAKE SURE to enter in the subject line “cap6105” followed by your name.

Course Objective and Topics

Topic in Pen-Based User Interfaces is a course designed to give students a thorough understanding of the latest techniques, algorithms, and evaluation methodologies used in designing and developing pen-, sketch-, and gesturally-based user interfaces. In addition reading and presenting research papers, students will write several programs to reinforce concepts discussed in class and will produce a final project of their choice.

General Topics include:

1. Introduction and History of Pen-computing
2. C#, Visual Studio, and Windows Presentation Foundation
3. Ink Preprocessing
4. Gestural User Interfaces
5. Ink Segmentation
6. Classification Algorithms for Recognizing Ink
7. 2D Parsing
8. Sketch and Multi-touch based Interfaces
9. Evaluation Methodologies
Syllabus

Week 1

August 23, 2010     Lecture - Introduction to Pen-based UIs
                    -- go over course mechanics
                    -- discuss the history pen computing
                    -- present some challenges with pen computing
                    -- present various applications

Readings


August 25, 2010     Talk about final projects
                    Papers discussion

Week 2

August 30, 2010     Lecture - Visual Studio, C#, Tablet PC SDK

September 1, 2010     Lecture - Windows Presentation Foundation, StarPad

Readings


Week 3

September 6, 2010     Holiday – No Class
Assignment 1 Out

September 8, 2010     Lecture - Ink Preprocessing & Simple Features
                    -- data representation
                    -- filtering
                    -- transformation invariance
                    -- dehooking, cusps, and self intersections
Readings


Week 4

September 13, 2010 Papers discussion

September 15, 2010 Lecture - Gestural User Interfaces
-- in computer graphics/modeling
-- gesture structure - 1 or multi-stroke
-- gesture invocation - buttons & button placement
-- gesture learning - existing notations, tutorial, embedding in GUIs
  visual (pre & post) feedback
-- FSAs
-- punctuated gestures

Assignment 1 due
Assignment 2 out

Readings


Week 5

September 20, 2010 Papers discussion

September 22, 2010 Lecture - Ink Segmentation
--- spatial segmentation
--- temporal segmentation

Readings


Week 6

September 27, 2010 Papers discussion

September 29, 2010 Lecture - Classification Algorithms for Recognizing Digital Ink (Part 1)
--- Feature Extraction
Assignment 2 due
Assignment 3 out

Week 7

October 4, 2010 Lecture - Classification Algorithms for Recognizing Digital Ink (Part 2)
--- Classifiers
   - procedural
   - template matching
   - linear classifiers
   - SVMs
   - K-nearest neighbor
   - AdaBoost

Readings


October 6, 2010 Class canceled (UCF Football game)

Week 8

October 11, 2010 Lecture - Parsing Ink
-- parsing mathematics
-- multi-stage
-- parsing drawings
-- parsing diagrams
- 2D grammars
- graph rewriting
- procedurally coded syntax rules
- stochastic grammars

Assignment 3 due
Assignment 4 out

Readings


October 13, 2010 Papers discussion
Week 9

October 18, 2010 Lecture - Sketch-based Interfaces and Understanding
-- multi-domain sketch understanding frameworks

Readings


October 20, 2010 Papers discussion

Week 10

October 25, 2010 Lecture - Evaluation Methodologies
-- user studies
-- qualitative vs. quantitative
-- comparative vs. formative.

Assignment 4 due

Readings


October 27, 2010 Papers discussion
**Project proposals due**

**Week 11**

November 1, 2010 Student paper presentations
**Project proposal decisions made**

November 3, 2010 Student paper presentations

**Week 12**

November 8, 2010 Student paper presentations

November 10, 2010 Project status updates

**Week 13**

November 15, 2010 Student paper presentations

November 17, 2010 Project status updates

**Week 14**

November 22, 2010 Student paper presentations

November 24, 2010 No class

**Week 15**

November 29, 2010 Student paper presentations

December 1, 2010 Project Status updates

**Week 16**

December 6, 2010 Project Status updates

**Week 17**

December 13, 2010 **DEMO DAY and Final Reports Due!!!!**
Collaboration Policy

Students must do their own work but are encouraged to collaborate with others in the form of discussion of concepts and implementation details pertaining to Visual Studio, C#, and Windows Presentation Foundation. For final projects, teams of up to two students are encouraged.

Assignments

Paper Presentations – Students will have to present 1-2 papers of their choice, outside of the assigned readings and give a 25 minute presentation on it.

Guided Discussion – During the paper discussion sections, students will lead the discussion on a particular paper that was assigned in class.

Programming Assignments

1. Intro

Students will replicate Windows Journal to get them acclimated to Visual Studio, C#, and Windows Presentation Foundation. This application will also be a test bed for the other assignments in the course.

2. 2D SKETCH

Students will develop a 2D shape recognition program to create and manipulate circles, rectangles, squares, and triangles. The focus of the assignment will be on heuristic gesture recognition.

3. Math Symbol Recognizer (Research Contest)

Students will implement Anthony and Wobbock’s $N symbol recognizer and try to improve its accuracy.

4. Pen Calculator

Using the math symbol recognizer created in assignment 3, students develop a pen-based calculator that will recognize and evaluate mathematical expressions.

5. Final Project

Students will do a final project of their choice that explores a particular concept in pen-, sketch-, or multi-touch-based user interfaces. They must first write a short proposal and get it approved by the professor. Students will also have to prepare a final report on their projects.
Tentative Grading Scheme:

Assignment 1  10%
Assignment 2  10%
Assignment 3  10%
Assignment 4  10%
Paper discussions  5%
Paper presentations  5%
Final Project  50%

The instructor reserves the right to use plus/minus grading in this course.