15-397
Project Course
in
Pen-Based Computing

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Course Objectives

• Understand the use of pen-based and mobile computers
• Understand how to design applications for pen-based computers using solid HCI principles
• Learn how to program in C# and .net
• Learn how to develop Algorithms for sketch recognition
About the Course

• This is a project course
• A team of 3-4 students must complete a project within the semester
• Project idea must be a “cool” one that uses pen input (handwriting or sketching) in some form
• You can assume touch screen functionality that can be simulated by a pen tap
• Project must be practical and be deployable as a prototype
• You need to be a self-starter and a self-learner
• There is little out there on pen-based computing, and so you have to be innovative
• There is little lecturing in the course
Grading

• Programming Assignments – 10%
• Fist Prototype – 10%
• Second Prototype – 20%
• Final Presentation – 40%
• Peer Evaluations – 10%
• Team Evaluation – 10%
Project Phases

• Design using HCI
• Build using C#/.net
• Test using real users
• Improve (possibly using sketch recognition and other methods)
Technology Framework

- Microsoft Visual Studio 2005
- C# / .net development environment
- Tablet PC API
A Pen Computer

- Leapfrog’s FLY pentop computer
- A computer packaged inside a pen or a pen that uses a computer
- Recognize strokes written on special paper
- Does simple Math
- It is one way to make computers adopt to us

In this course we are talking about a computer that uses a pen
Prehistory of Pen Computers before 2000

• Lots of earlier attempts – mostly failures.  
  – DEC, Go, Newton, Pen Windows  

• Technology wasn’t ready  

• But vertical markets had limited success.  

• Needed: better UI, better handwriting recognition (without relying on it).  

• Key: Better digitizer (with hover).
An earlier attempt -- 1983

- TRS 80 Model 100
- Reporters and students loved it
- Ran for days on AA cells
- Solved most computing needs for its (low aspiration) users.
Another attempt -- 1993

- DEC Lectrice
- 5.5 pounds
- 1.5 hour battery
- Wireless network
- $5K LCD panel
- VxWorks OS, X11 server optimized for reading
Where Microsoft started
Internal MS (1999)

• Microsoft proof of concept
  – Transmeta TM5800
  – 256MB DRAM, 20GB HDD
  – 10.4” Slate

• Good points:
  – Proved viability
  – Pushed the Power Efficiency Envelope
    • 5 Hours runtime, 200 Hours standby
  – Provided a development platform
to get MS to Tablet PC launch.

• On the Other Hand:
  – It was so sloooooow
Today’s Market: New Slates

Sahara i213
12.1”, 1.6GHz Centrino

Motion Computing
Tatung TTAB
10.4”, 1 GHz ULV

NEC
VersaPro, 10.4”, 1.1 GHz

Tatung B12D
12.1” 1.2 GHz Centrino

Fujitsu 5000
10.4/12.1, Indoor/Outdoor
1.1 GHz ULV

Le 1600

LS 800

Motion Computing
Today’s Market: New Convertibles

**Acer**
- C1xx
- C300
- C250

**Gateway**
- M275
  - 14.1”, DVD
  - 1.8 GHz Pentium-M

**Toshiba**
- M200, 12.1” SXGA+
  - 2 GHz Pentium-M

**ViewSonic**
- 12.1”, 1 GHz

**SHARP**
- Actius TN10W
  - 12.1”, 1.1 GHz

**Fujitsu**
- T4000

**Electrovaya**
- 1.4 GHz Centrino
  - 12.1”, Biometrics
  - Scribbler SC-2200

**Averatec**
- C3500
  - AMD 2200+
  - 12.1”, DVD

**IBM**
- ThinkPad x41

**Toshiba**
- M200, 12.1” SXGA+
  - 2 GHz Pentium-M

**Gateway**
- M275
  - 14.1”, DVD
  - 1.8 GHz Pentium-M

**Electrovaya**
- 1.4 GHz Centrino
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**Averatec**
- C3500
  - AMD 2200+
  - 12.1”, DVD

**IBM**
- ThinkPad x41
Today’s Market: New Hybrids & Ruggeds

Hybrid

- HP Compaq TC1100ULV
  - Celeron or Pentium
  - 10.4”, 1.1 GHz

Ruggedized

- Itronix
  - 8.4”, 933 MHz ULV
- Xplore iX104
  - 10.4” 1.1 GHz ULV

Walkabout Hammerhead

- 10.4”, 4.5 lbs
- 933 MHz P-III M
Concept Design: New hinge
A Concept Tablet for Kids

- Low power – (7W)
- 8.4” display
- Tethered pen
- Rugged
Other Form Factors

OQO Model 1

Vulcan FlipStart
Samsung Q1

- A joint collaboration between Samsung, Microsoft and Intel
- A result of Microsoft Origami project
- A PC with touch screen and pen-input
- 7” screen
- Really Cool!!!
• Mobile Market Projections (IDC)

Today’s Market: Forecasts

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<td>Ultra-Mobile</td>
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<tr>
<td>Consumers, Mobile Professionals</td>
<td>0%</td>
<td>1%</td>
<td>3%</td>
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<td>CY08 Market: 2.5M, CAGR (04-08): 40%</td>
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<td>Ultra-Portable</td>
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<td>Mobile Professionals, Information Workers</td>
<td>8%</td>
<td>17%</td>
<td>31%</td>
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<td>CY08 Market: 28.4M, CAGR (04-08): 51.4%</td>
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<td>Thin &amp; Light</td>
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<tr>
<td>Information Workers, Consumers</td>
<td>63%</td>
<td>63%</td>
<td>56%</td>
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<td>CY08 Market: 51M, CAGR (04-08): 22%</td>
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<td>Transportable</td>
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<tr>
<td>Information Workers, Consumers</td>
<td>30%</td>
<td>19%</td>
<td>10%</td>
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<td>CY08 Market: 8.9M, CAGR (04-08): -11%</td>
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The Latest
Microsoft’s Surface Computer

- Introduced in spring 2007
- Computing at another level
- Originally intended for high end restaurants, hotels and other businesses
- Cost - $10,000 per unit

http://www.microsoft.com/surface/
Getting Started

• Claim your Tablet PC
• Sign the CMU equipment release sheet
• Login using your andrew ID (kerbros)
• Locate Microsoft Visual Studio 2005 and launch
• Type in your first pen-based computing application
Homework

• Do the following exercise
  – Create a Tic-Tac-Toe game

  – Due in a week
Project ideas

- We are completely open to project ideas
  - Think of some “cool” things
  - It must be a new idea where pen plays a critical role or something you can improve with pen-input
- May we suggest
  - A simple book reader application where you can write on margins with markup recognition
  - A Tablet PC based Math recognizer
  - A Navigator
  - A Hospital Mobile Input System
  - An Algorithm Animator
  - A Cartoon Animator
  - A Signature Recognition system
  - A pen-enabled excel
  - A pen-based remote tutor
  - Tablet Scrabble
  - Mind Mapping Tool
  - Your own idea
- We also encourage you to start from an existing pen application and improve its functionality