Physical Computing: Hand, Body, and Room Sized Interaction

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CoDe Lab

• Computational Design Research Laboratory
  – School of Architecture, Carnegie Mellon University

• Build Working Experimental Systems
  – Explore Ideas, Research Activity, Learning by Making

• A Community
  – Share Ideas and Resources, Learn from each other
CoDe Lab

• Design and Simulation
  – Sketch, Constraint, Knowledge

• Collaboration
  – Annotation, Multi-User Interfaces and applications

• Physical Computing
  – Tangible, Ubiquitous, and Interactive Art
CoDe Lab

Using the Computer to effect how you Design

Using Design to effect how you use the Computer
The Physical Computing Studio

- Explore Computationally-Enhanced Artifacts and Environments
- Interdisciplinary Collaborative Design Studio
  - Artists, Architects, Computer Scientists, Engineers, Information Scientists
- Hands-On, Learn-by-Doing
The Physical Computing Studio

4 weeks of skill building exercises

- Readings

- Sensing and Actuating
  - Microcontrollers, Programming, Electronics, Sensors, Actuators

- Mechanical Movement
  - Automata

- Collaboration and Communication
  - Team Projects
The Physical Computing Studio

6 week team project

• Seed Topic
  – Learning and Children
  – Interactive Furniture
  – Energy Displays

• Brainstorm and Story Telling
• Proposal
• Build, Present, and Document it
Hand-Sized Interaction
Hand-Sized Interaction

Navigational Blocks

- Tangible Query Interface for an Information Kiosk
- A Set of Physical Blocks
- Each Block Represents a Category of Information
- Each Face of Each Block Represents a Topic within the Category
Hand-Sized Interaction

Navigational Blocks
## Hand-Sized Interaction

### Energy Displays

- **Home Energy Tutor**
  - Wireless Sensor Network
  - Ambient Energy Displays
  - Easily Deployed and Configured Kit

- **Energy Cube**
  - 6 Sided Ambient Display

- **Energy Magnets**
  - Refrigerator Magnets
  - Query an Appliance
Hand-Sized Interaction

Flexy (aka FlexM)

- Flexible Hub and Strut Construction Kit
- Senses Topology, Strut Angles, and Object Orientation
- Geometric Modeling, Molecule Kit, Structural Design
Hand-Sized Interaction

Pop-Up Book

- Paper Book Augmented with Audio and Video
- Traditional Pop-up Elements as Triggers
- Embedded Photocells Sense Interaction
Hand-Sized Interaction

Stud Sketch

- Making the Invisible Visible
- Rubbing as a Metaphor
- Sketch the structural components in a wall onto its surface.
- Combines a studfinder with a mimio pen and projector.
Body-Sized Interaction
Body-Sized Interaction

People Pretzel

- Computational Play Board for Group Interaction
- Public Interface
- Audio, and Video Feedback
Body-Sized Interaction

Window Seat

- Controls the Pan and Tilt of a Remote Camera
- Embedded Projector - Wall as Display
- Architectural Model, Virtual Environment
Body-Sized Interaction

Musical Couch

- Couch as Musical Instrument / Experience
- Embedded Sensors Mapped to Midi Sounds
- Pressure Sensors, Infrared Rangefinders, Tap Sensors
Body-Sized Interaction

Musical Couch
Room-Sized Interaction
Room-Sized Interaction

Plant Tiles

- Cycles of Growth in Plants
- Pressure Sensitive Floor Controls 3 Video Segments
- Occupants Control the Growth of the Plants
Room-Sized Interaction

Jungle Room

- Help the Jungle Boy Find His Toy
  - An Educational Riddle Room

- A Non-Linear Narrative
Room-Sized Interaction

Espresso Blocks (Architectural Robotics)

• Self Assembling Building Blocks

• Expanding and Contracting Arms Make Moving Possible
  – Like a 3d Nine-Tile Puzzle

• Temporary Shelters, Self Transforming Space
Room-Sized Interaction

Alphabet Paint Space

- Interactive Mural
- Body as Paint Brush, Movement as Stroke
- Overhead Web Cam and Computer Vision
Room-Sized Interaction

Alphabet Paint Space
Summary

Introduced the CoDe Lab and our Physical Computing Studio

A lot of Computationally-Enhanced Artifacts and Environments

Organized them by a Human Scale: Hand, Body, Room
Physical Computing: Hand, Body, and Room Sized Interaction

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