Design Tools

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CS 376
Design tools should...

[Hartmann, PhD thesis ’09]

- Decrease UI construction time
- Isolate designers from implementation details
- Enable designers to explore an interface technology previously reserved to engineers or other technology experts
Goal: facilitate rapid iteration

[Hartmann, PhD thesis '09]

- Prototypes enable exploration and iteration around concrete artifacts
- The more fluid the prototyping process is, the more you can learn before you sink time into engineering
Early stage design
What tools do designers use?

[Myers et al., VLHCC '08]

- Survey of 259 interaction designers
SILK: Sketching Interfaces Like Krazy
[Landay, CHI ’96]

- Combine the fluidity of paper-based sketching with the interactivity of tools
- Technique: sketch recognition of basic UI components
DENIM: web site storyboarding

[Lin et al., CHI ’00]

- Enable fluid, informal interactions for web site design
- Work at a higher level of abstraction than HTML
Designer’s Outpost

[Klemmer et al., UIST ’01]

- Fluid interactive brainstorming that bridges physical and digital artifacts
Mid-and-late stage design tuning
Design galleries

[Marks et al., SIGGRAPH '97]

- Automatically generate perceptually-varying alternatives within a design space
Juxtapose: parameter tuning

[Hartmann et al., UIST ’09]

```javascript
// load asset file "task1-assets.swf", which defines movieclips "circle", "box", and "boxes"
//@SWF_ASSET_FILE task1-assets.swf

class FlashApplication {
  static var app:FlashApplication;

  // variables to be tuned
  var xNumber:Number = 12; //@RANGE 2..12
  var yNumber:Number = 12; //@RANGE 2..12
  var scale:Number = 100; //@RANGE 1..195

  //class constructor - all initialization code goes in here
  function FlashApplication() {
    var canvasWidth:Number = Stage.width;
    var canvasHeight:Number = Stage.height;

    var total:Number = xNumber*yNumber; //total number of atoms that will be created
    var gridSpacing:Number = 20; //spacing between atoms
    var counter:Number = 0;
    //_root.scale = 100;
    _root.x=0;
    _root.y=0;
    //content_root.x = xNumber;
    //content_root.y = yNumber;
  }

  function gotoFrame(n:uint) {
    _root._x = n;
    _root._y = n;
  }
}
```
Voyant: crowd feedback
[Xu, Huang, and Bailey CSCW '13]
DesignScape: interactive layout

[O’Donovan, Agarwala, and Hertzmann CHI ’15]
Learning Visual Importance
[Bylinskii et al., UIST '17]
Physical prototyping
The challenge of physical prototyping

- Prototype the bits, or prototype the atoms?
- Goal: lower the threshold to prototype interactive systems that depend on electronics and physical materials
Phidgets
[Greenberg and Fitchett, UIST ’01]

- USB plug-and-program I/O devices
  - servos
  - LEDs
  - buttons
  - sliders
- Goal: program physical devices like you would a GUI widget
Led to: Arduino

- Maker board for artists, programmers and hobbyists
Led to: Makey Makey

[Silver et al., TEI ’12]

- Alligator clips map onto keystrokes

Banana Space Bar
d.tools: prototyping behavior

[Hartmann et al., UIST ’06]

- Plug-and-play HW, visual statechart behaviors

prototyping with d.tools
Sensor interaction by demonstration

[Hartmann et al., CHI ’07]
Fabricating capacitive hardware
[Savage et al., UIST ’12]

- Author behaviors
- Software does circuit layout
3D printing + camera prototypes
The Toastboard
Ubiquitous Instrumentation and Automated Checking of Breadboarded Circuits

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Skills for design tools research

- The same general criteria as design process research:
  - Experience teaching and doing interaction design — the ability to reflect on…
    - Which feedback loops are too open?
    - Why do design teams succeed and fail?
  - What structural support would amplify designers’ cognition?
- But with an orientation toward software that can either nudge behavior or tighten those feedback loops for the designer