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 interactive tools
- Technique: sketch recognition of basic UI components
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Led to: Balsamiq
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
DENIM: web site storyboarding

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

[Klemmer et al., UIST ’01]
Designer’s Outpost: fluid interactive brainstorming

[Klemmer et al., UIST ’01]
Design galleries: comparing alternatives [Marks et al., SIGGRAPH ’97]

- Automatically generate perceptually-varying alternatives within a design space
Juxtapose: interactive parameter tuning [Hartmann et al., UIST ’09]
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Led to: Inventing on Principle

[Victor 2012]
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[Victor 2012]
Physical prototyping
The challenge of physical prototyping

- Prototype the **bits**, or prototype the **atoms**?
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
Phidgets [Greenberg and Fitchett, UIST ’01]

- USB plug-and-program I/O devices
  - servos
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- 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
Led to: Makey Makey
[Silver et al., TEI ’12]

- Alligator clips map onto keystrokes
d.tools: prototyping behavior via statecharts [Hartmann et al., UIST '06]

- Plug-and-play HW, visual statechart behaviors
d.tools: prototyping behavior via statecharts [Hartmann et al., UIST ’06]

- Plug-and-play HW, visual statechart behaviors

prototyping with d.tools
Authoring sensor-based interaction by demonstration
[Hartmann et al., CHI ’07]
Authoring sensor-based interaction by demonstration

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

- Author behaviors; software does circuit layout
Fabricating custom capacitive hardware [Savage et al., UIST ’12]

- Author behaviors; software does circuit layout
Behavior prototyping
Prototyping for daily, long-lived activities [Li and Landay, CHI ’08]

- Rather than treating sensors or states as the top-level abstraction, focus on **activities**