Physical Interaction Design - Vision for a visual programming and simulation environment

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Outline

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Motivation

- Pentiment Summer Course 2008
  - Wearable Computing / E-Textiles (Eyal Sheffer)

- Cooperation Design Department
  - Master Project „Emotional Tent“
Motivation

Facts:
- electronic and (wearable) computer are widely available (and cheap)
- new (physical) interaction techniques
- fashion designer put the esthetic point to electronic and computing
- different kind of inputs / sensors
- physical computing:
  - human body as input source
  - use sensors
  - MCU process input
  - MCU controls actors (electro-mechanical devices): motors, servos, lightning ....
Motivation

Challenges:
• need to assemble different kind of electronics
• sewing is a problem
• a minority can program micro controller
• disappointing difficulties with installation
• can not take components apart and modify them
• debugging is difficult
Motivation

**Pentiment:**
- Gruppen mit 3 bis 4 Studenten
- Erarbeitung eines Konzeptes
- Auswahl von Hardware (was gerade da war)
- Versuch der Umsetzung des Konzeptes in zwei Wochen

**Probleme:**
- Interaktive Komponenten erfordern den Einsatz von Mikrokontrollern
- Schwierigkeiten der Abstraktion von Technik bei Designer
- Nicht genügend „Techniker“ vor Ort
- Einbau aller Komponenten auf einmal ➔ Problem wo liegt der Fehler
- Keine Zeit für Debuggen vorhanden
- Keine Möglichkeit elektrische Komponenten oder elektrische Schaltkreise zu verändern ➔ alles fest vernäht
- Schwierigkeiten beim Debuggen (nicht eingeplant)
Motivation

- **physical computing:**
  - human body as input source
  - use sensors
  - MCU process input
  - MCU controls actors (electro-mechanical devices):
    - motors
    - servos
    - lightning
    - ....
Motivation

- Platforms for physical Computing
  - Handyboard (http://handyboard.com)
  - LogoChip (http://www.wellesley.edu/Physics/Rberg/logochip/distribution)
  - Phidgets (http://grouplab.cpsc.ucalgary.ca/phidget)
  - d.tools (http://hci.stanford.edu/dtools/)
  - Gainer (http://gainer.cc)
  - MakingThings (http://www.makingthings.com)
  - Wiring (http://wiring.org.co/)
  - Arduino (http://www.arduino.cc)
Arduino

- Hernando Barragán (Interaction Design Institute Ivrea) developed Wiring in 2003
- small IO – Board based on Atmel MCU
- based on Wiring the international Arduino Projekt was launched
- IO – Board complete open-source
- can communicate with Flash, Processing, Max/MSP,…
- stand alone programming environment based on Processing

Ref 7
[http://www.arduino.cc]
Arduino

- development environment runs on Windows, OS X and Linux
- integrated compiler and communication tools
- C like language (based on Wiring)
- uploading to IO – Board by clicking on the upload button
- bootloader on Atmel starts Sketch
- communication through USB – Serial converter
- environment extendable

[http://www.arduino.cc]
LilyPad

- microcontroller board designed for wearables
- developed by Leah Buechley  University of Colorado 2007
- can be sewn to fabric
- available as of October 2007 from Spark Fun
- fully Arduino compatible
- a lot of different sensors and actors are available
Fritzing

- Fritzing:
  - open-source initiative
  - startet October 2007 University of Applied Science Potsdam
  - Elektronic Design Automation Software
  - goal: allows the designer to create a finished PCB of an individual circuit

...support designers and artists to take the step from physical prototyping to actual product.
Fritzing

[http://www.fritzing.org]
Motivation - Summary

- there are a lot of different platforms
- some platforms with development environment
- Arduino with huge community
  - a lot of projects and examples
  - different tutorial and development tools

**BUT:**
- need some practice to program MCU
- still too complex for non-programmers
- difficult to debug
- no simulation environment
Vision

A graphical programming and simulation environment:
- allowing non-programmers to easily explore physical computing
- for Arduino / LilyPad
- with integrated graphical simulation tool
- possibility to enhance the visually generate program with ‘handwritten’ code
- stable and simple to use
- using visual programming techniques
Vision

Why visual programming?
- lowering the barriers to programming
- drag & drop commonly used
- easier to take in a lot of information's
- use symbolic of a domain
- easier to change the program
- fixed instruction set

Possible problems:
- multidimensional can be confusing
- require more space
- less documentation
Vision

- Why is simulation so important?
  - hardware and software design
  - you never know where the problem is:
    - hardware correctly assembled?
    - software fully functional?
    - both together work as expected?
    - ...
  - often impossible to take components apart and change the design
  - easier for artists to imagine what the final piece looks like
Risks / Perspective

- **Risks:**
  - oblique approach to the topic
  - Too extensive for one master thesis?
  - visual programming inapplicable

- **Perspective:**
  - a lot more research necessary
  - precise the subject
  - project Svenja Keune & Martin Tischmann in summer ➔ first prototype / possible tester
Questions?

The End