A Hands-on approach to Making in the Internet of Things and Creative Technology

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Ambient and Pervasive Design - Aims

- Ambient and Pervasive Design = creative kickstart course at the end of year 2 (2 cp's)
- Developed for a Media Technology Bachelor curriculum but as a general-purpose course, used & adopted for different audiences
- Setup:
  - accessible introduction to IoT
  - guided introduction to basic IoT techniques (Arduino)
  - apply the know-how to a novel problem

Ambient and Pervasive Design

AmbiPerv: Human Centered Creative Technology (2013)

- Creative solutions for human problems using technology as a tool or enabler
- Beyond the desktop, tablet, smartphone
- Real life real people real context
  - smart objects
  - augmented reality
  - emotional interfaces
  - information ecologies
  - sensory interfaces
  - etc...

Also: Response to developments in (ICT) education

- Wealth of internet sources
- Lecturer as a facilitator
- Inter-active role of students
- DIY: own idea, design approach, knowledge about platforms, toolkits, SDK's ...
- Classic: lectures, scientific papers, video's ...
- Social: teams, mini-lectures, fablab ...

Some new developments in HCI

- mash-ups, soa’s
- scenario’s, co-creation, co-design
- social / mobile computing
- ‘make’ movement / exploratory design
- agile design / rapid prototyping
- IoT, ambient & ubiquitous computing
- intelligent / sensory interfaces
- context- and location-based interfaces
- open data / semantic web

Also: Response to developments in (ICT) education

- Accessible introduction to IoT
- Guided introduction to basic techniques
- Apply the know-how to a novel problem

Lectures

- IoT and the future
- Arduino and electronics
- From web 2.0 to web 3.0
- The semantic web: machines talking
- IoT concept development and software design

(cf. paper @ CSERC 2013)

(cf. paper @ EADiM 2012)
Accessible introduction IoT / Arduino

Massimo Banzi @ Ted - Arduino as open sourcing imagination

Bassett & Partners - Connecting the Film

Kevin Kelly @ Ted - The next 5,000 days of the web

Introduction to Arduino, IDE, Processing

- setup & connect Arduino (blink)
  http://arduino.cc/en/Tutorial/Blink
- extend with timing variation, button, potmeter, lightsensor, sound ...

```cpp
void setup() {
  // Initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH); // set the LED on
  delay(1000);           // wait for a second
  digitalWrite(13, LOW); // set the LED off
  delay(1000);           // wait for a second
}
```

Guided Introduction to basic techniques

- blink, Sensor, Effector
  http://arduino.cc/en/Tutorial/Blink
- button -> effector
- sensor -> effector
  http://learn.adafruit.com/tmp36-temperature-sensor/overview
- processing to connect arduino to / from pc or web
  http://www.arduino.cc/en/Tutorial/PhysicalPixel

- arduino applications (how to)
- concept air quality (research)
- prototype (realization)

Concept development and design: how to measure indoor climate

What is the problem? Why is it a problem? How can I solve it? ... and how to implement it as a technical system?

1. Write down all the core-words of the problem.
2. Create an abstraction ladder for each core-word:
   - Formulate a higher abstraction level.
   - The why-question brings you to a higher level.
   - Formulate a lower abstraction level.
   - The how-question brings you to a lower level.
3. Reformulate the problem (neither too wide nor too narrow) for the brainstorm.

AmbiPerv: examples

- arduino applications (how to)
- concept air quality (research)
- prototype (realization)

Discussion - incomplete

- teaching AmbiPerv is fun for all!
- students prefer do-ing over reading; education should facilitate creativity (Brennan):
  - creativity lessons are hard but being creative works!
  - accessible and guided lessons accelerate learning
- easy to adapt to different student groups
- early introduction of new developments (sensors, IoT, ‘make’, smart objects ...):
  - creates opportunities for innovative curriculum results.
- knowledge, know-how or creativity?
Thank you!

Questions?

- Van Turnhout et al. UX in the Wild @ Chi Sparks ’12
- IoT Comic Book
- Massimo Banzi @ TED ’12
- Arduino Comic (Book)
- www.connectingthefilm.com
- Kevin Kelly @ EG ’07
- iPrototype.nl starterkits
- www.eu-youthaward.org
- www.studio Roosegaarde.net
- fritzing.org

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