Educating Creative Technology for the Internet of Things: Research and Practice-oriented Approaches Compared

Geert de Haan
Wittenborg University / Mankind Inc.
Geert.de.Haan@upcmail.nl

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2) Human Centered ICT
3) Development in Media Technology (DevThis)
4) Human Centered Creative Technology
5) Ambient and Pervasive Design (AmbiPerv)
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Bachelor Media Technology @ Rotterdam University of Applied Sciences

Development in Media Technology = challenging course before final thesis in year 4 (8 cp's)
- full overview of IoT
- content based on developments in HCI & ICT
- form based on developments in (HCI) education
- prepare for research thesis, contribute 2 research

Ambient and Pervasive Design = creative kickstart course at the end of year 2 (2 cp's)
- accessible introduction to IoT
- guided introduction to basic IoT techniques (Arduino)
- apply the know-how to a novel problem

DevThis: Human Centered ICT (2009)
- User Centered Design
- Look at the future and how to research it / IT
- HC-ICT is ICT for humane purposes:
  - social computing
  - support of everyday life
  - emotional support
  - calm computing (?)
  - ubiquitous computing (?)
  - etc.
- but still: technology to support design

Why dev devthis?
Education - the web as old school
  - interactivity & networking
  - sensitivity & intelligence
  - social media, co-design
  - adaptive & adaptable
Professional education
  - learn to do scientific research
  - teach new topics; ubicomp, IoT, sensors …
Fun 2 Learn 4 Students
  - between internship & final thesis
  - do research with students

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

(cf. paper @ CSERC 2013)
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 ...

(cf. paper @ EADiM 2012)

Learning and Doing Research

- overview of ubiquitous computing
  - read classical and overview papers
- learn to handle scientific sources
  - find, select, review, utilize papers (without google)
  - project plan based on publications
  - create a concept poster
  - requirements and technical specifications
  - build and present a demonstrator
  - write a project report
  - write a short paper

Learning 2Do Research

- Why do scientific research?
- Research: experiments, questionnaires, demonstrations
- Finding suitable papers, magazines, conferences etc.
- The structure of publications: where is what information?
- Quick-scanning, reading and selecting scientific papers
- How to review a paper
- Peer- and meta-reviewing publications for e.g. workshops
- Extracting and comparing ideas and concepts
- Fraud, plagiarism and data massage
- How to design a poster, a demonstrator or a (short) paper
- Formatting papers and using publication templates
- How, when and why to use references and how to format them (APA, Harvard)

Discussion - DevThis

- Students acquire research skills --> improved quality of BA theses
- DevThis developed - new developments by the field and greedy colleagues
- Need for Creative Technology: from UCD to applying technology to solve humane problems

Some projects
- WiFi broadcasting
- Building-access control
- Mobile money with NFC
- Indoor climate control
- Bluetooth TV remote
- 3D aerial photography
- Sensing plant growth
- Ubiquitous gaming in & with the sensorlab
- Face recognition & authentication

Ambient and Pervasive Design: Human Centered Creative Technology (2013)

- Creative innovations through technology
- Beyond the desktop, tablet, smartphone
- Real life real people real context
  - smart objects
  - emotional interfaces
  - information ecologies
  - sensory interfaces
  - co-design etc..

(cf. EYA: European Youth Award & Festival)

Ambient and Pervasive Design

- accessible introduction to IoT
- guided introduction to basic techniques
- apply the know-how to a novel problem

Lecture topics
- IoT and the future
- Arduino and electronics
- from web 2.0 to web 3.0
- the semantic web: machines talking
- IoT concept and software design
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 ...

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)

AmbiPerv: examples

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

DevThis versus AmbiPerv

- full and textual overview of IoT --> accessible and visual introduction to IoT
- teaching research using publications --> guided learning by demonstration
- doing research DIY --> apply basic know-how in a creative way
- knowledge-centric design --> design based on creativity + know-how

Discussion - incomplete

- AmbiPerv is much more fun teaching / learning but DevThis is more useful for learning & research
- Students prefer building over studying papers: education 2 facilitate creativity (Brennan, 2013):
  - creativity lessons are hard but being creative works!
  - guided & accessible introduction accelerates
  - Early introduction to new developments (sensors, IoT, 'make', smart objects ...): possibly more innovative graduates & theses
  - Creative Technology design works!

Thank you!

Questions?

EC Action Plan (2013)  
Design-Driven Innovation  
IoT Comic Book  
Massimo Banzi @ TED '12  
Arduino Comic Book  
www.connectingthefilm.com  
Kevin Kelly @ EG '07  
Waag Society: Users as Designers  
www.studioroosegaarde.net  
fritzing.org  

giert.de.haan@upcmail.nl  
http://members.upc.nl/g.haan24/