LFE Medieninformatik • Adalie Hemme

Physical Computing – Sketching in Software

Medieninformatik Hauptseminar
Wintersemester 2009/2010
„Prototyping“

Overview

- Introducing Physical Computing
- Toolkits
- Outlook

Physical Computing

• Building interactive physical systems with software and hardware that can integrate digital information with everyday physical objects.

• **Tangible Interfaces**

Adding sensor technogies to electronic devices – the physical input can control graphical or audio output.

• **Ubiquitous Computing**

Integrating computer elements into analog devices, to enter our everyday objects.

Prototyping

- Prototyping decreases: Development cost
  Development time
  Reduces errors
  Helps improve and evaluate the design & usability

Hardware toolkits

- Are connected to the software.
- Usually consist of sensors, actuators and displaying technologies.
- Popular toolkits – Arduino, Phidgets, Lego Mindstorms, Smart Its, Calder toolkit, ...

User Groups

• Sketching software is interesting to different user groups, which have different goals, and therefor need different toolkits.

- Programmers
- Designers
- Domain experts
- Non programmers
- Children

• Visually programming is a good way to enable the users, with a low technical understanding.

Papier Mâché

- Developed by university of Stanford, Berkeley, and Washington since 2004
- Free and runs on Java, Phidgets for RFID, and is supported by Eclipse

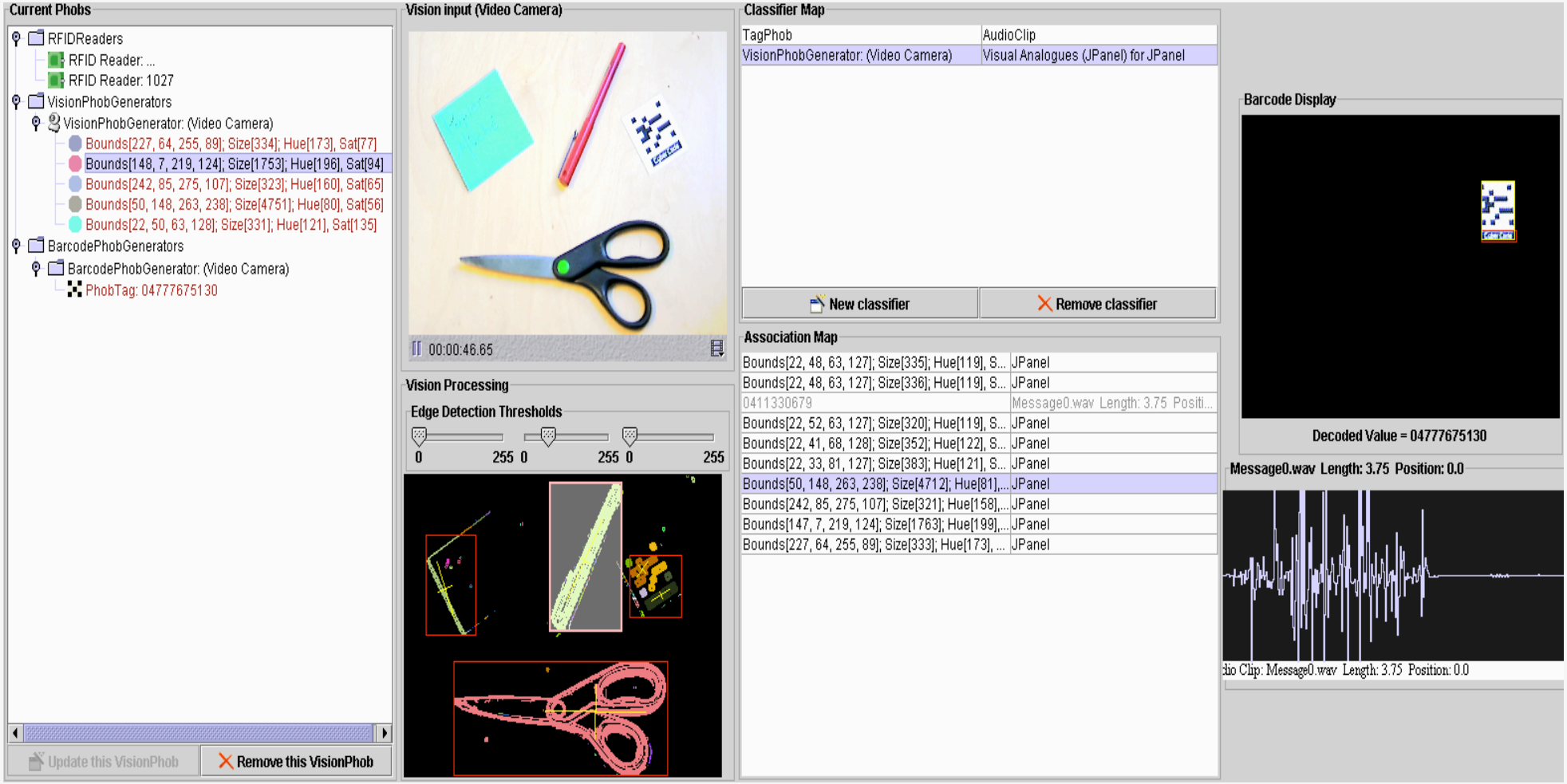
• No hardware or connection knowledge required - ease everybody to use Papier Mâché.

• Abstracts input, which is tracked by a camera, tagged with barcodes, or RFID tags.

• Mapping the input into application behavior for tangebile user interfaces.

• Once an Object is detected, it will behave in the way it was authored.

Papier Mâché



Source: Klemmer et al. (2004)

d.tools

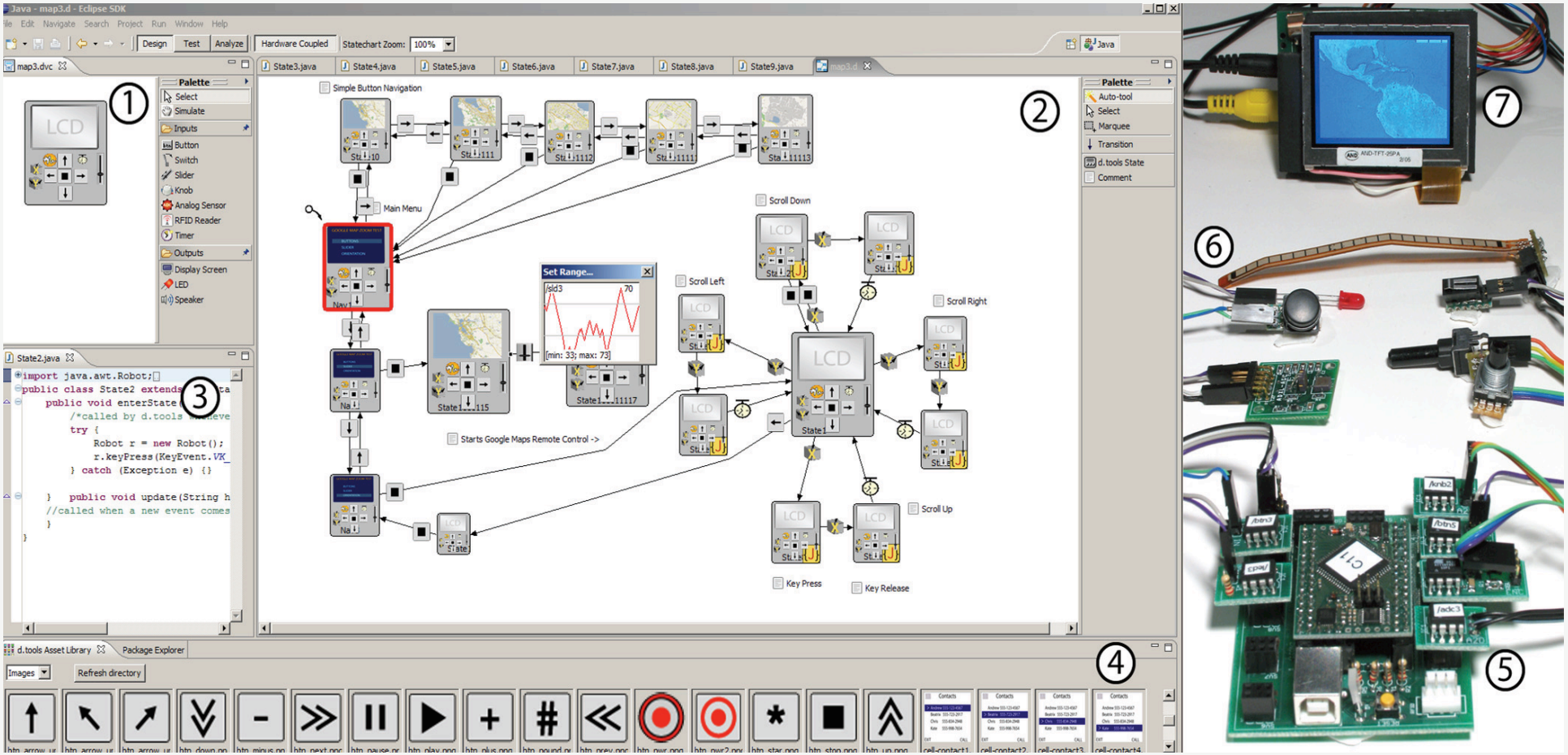
- Developed by the Stanford university since 2006
- Free, editor as a Eclipse plugin, own hardware but Wiring and Arduino board can be connected and the Phidgets interfaceKit.

• Prototype digital cameras, MP3-players, and mobile phones.

• Workbench connected to hardware setup, which builds the device.
• The devices behavior is authored in the workbench.

• Offers Design-Test-Analyse mode for the prototype.

d.tools



Source: Hartmann et al. (2007)

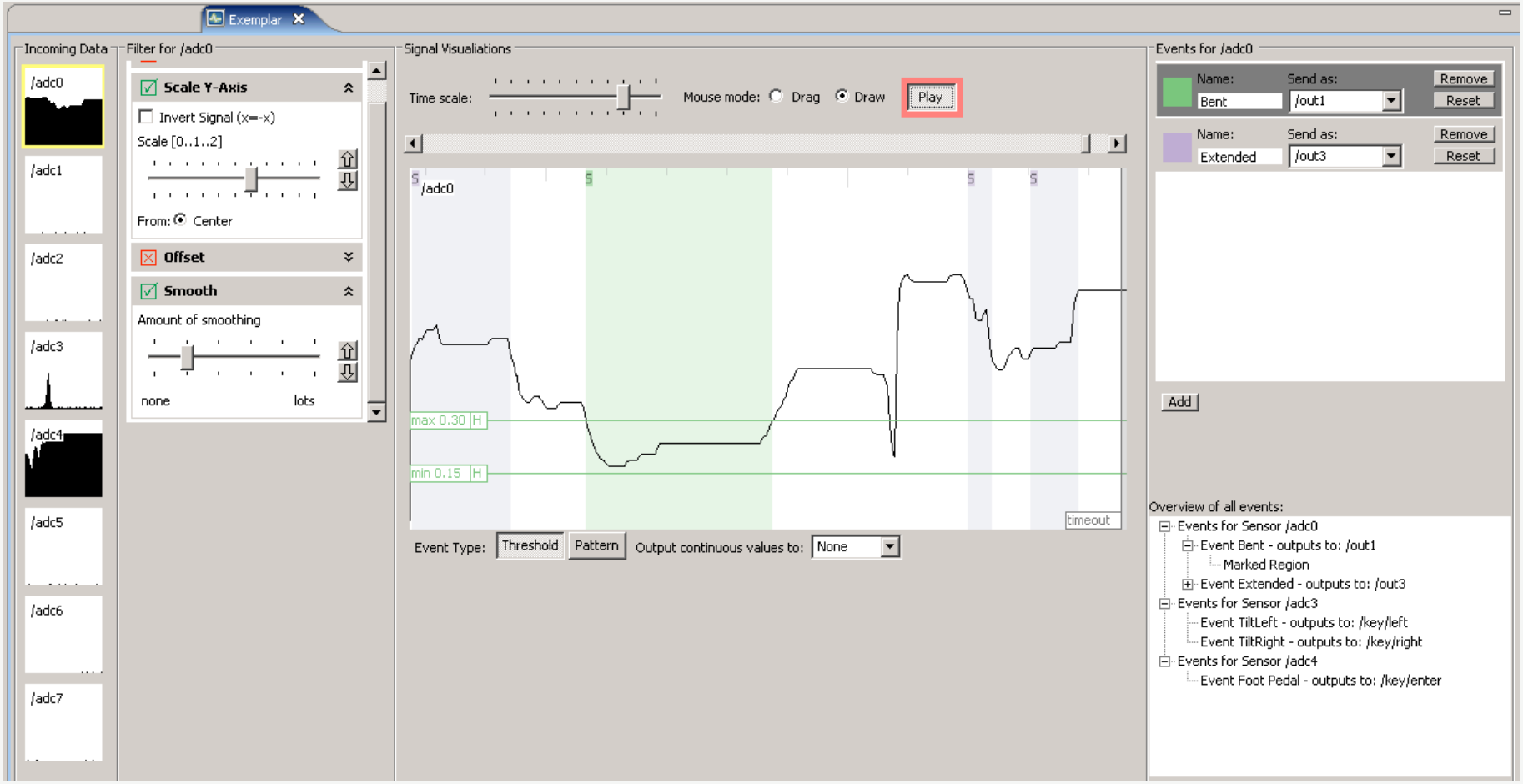
Exemplar

- Developed by the university of Stanford in 2006
- Corresponds to d.tools hardware interface.
- Free and works as a Eclipse plugin.

• Shows the sensor data from the hardware interface in a window.

• The data can be filtered and used for other applications, or the data can be turned into discrete events.

Exemplar



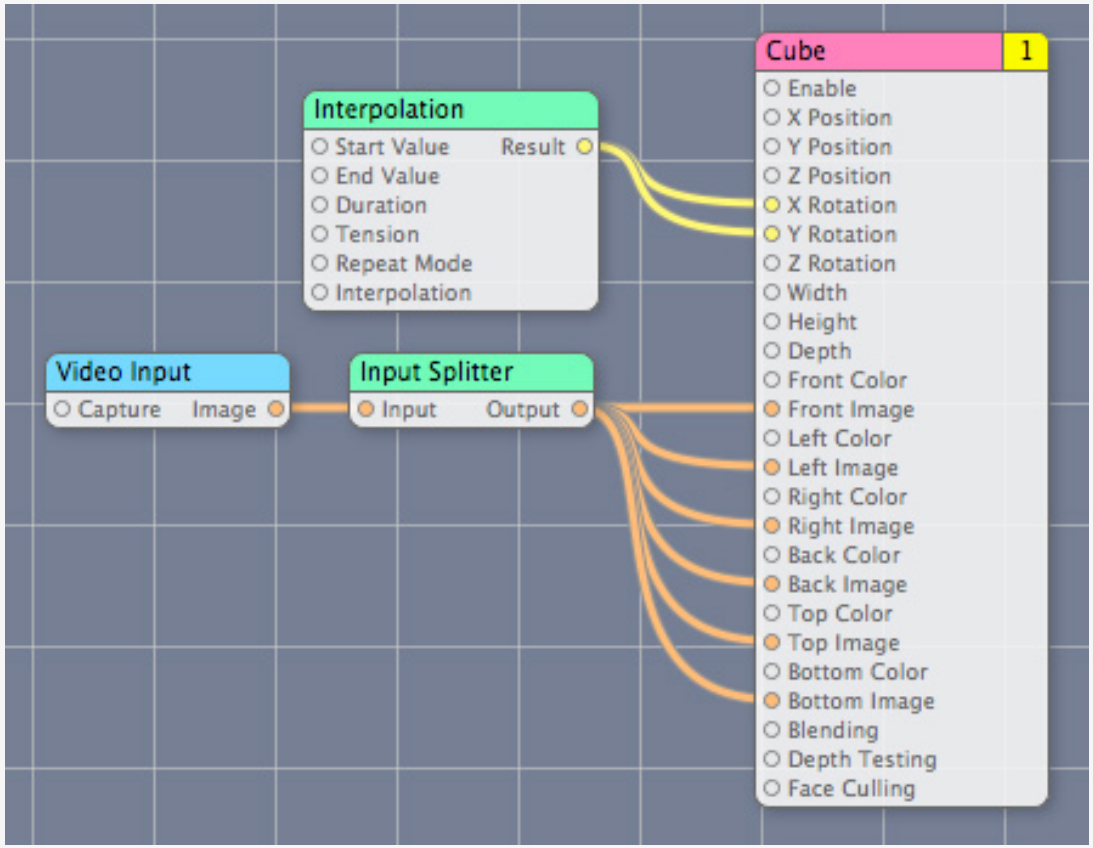
Source: http://hci.stanford.edu/research/exemplar/ (10.01.2010)

Quartz Composer

- Developed by Apple, since Mac OS X v10.4 „Tiger“, Xcode-development environment as visual programming tool for processing and displaying information.

- Programming environment for 3D and animation graphics.

- Patches are base processing units, that produce and execute results.



Source: http://developer.apple.com/graphicsimaging/quartz/quartzcomposerfordashboard.html (10.01.2010)

iStuff Mobile

- Developed by the RWTH Aachen in 2007
- Works with Smart-Its sensors.

• Enables to build new mobile phone applications and interactions.

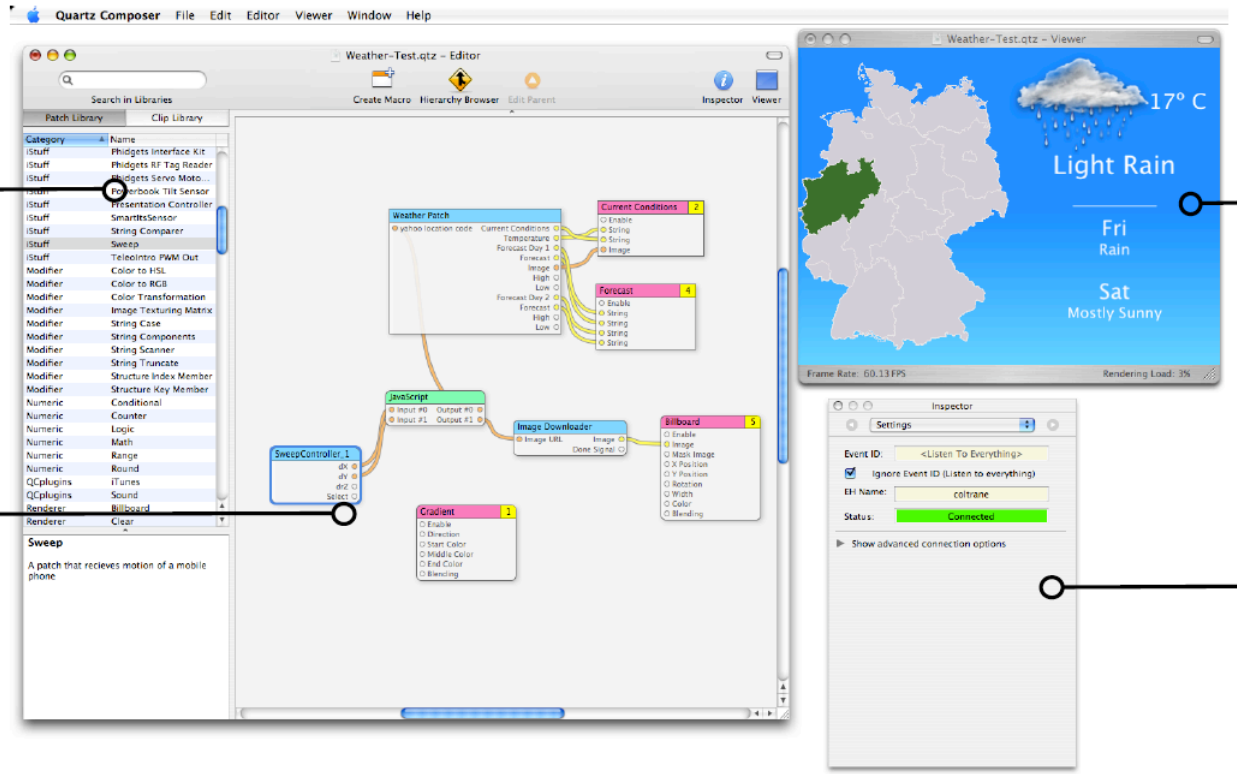
• Communicates with visual programming environment – using a reversion of the Quartz Composer.

• Build new sensor based interfaces with existing mobile phones, by adding new hardware.

iStuff Mobile

The library is used to select which components are used in the composition.

The workspace is where components are linked together to form a composition.



The preview window is live. The 3D animation immediately shows the impact of the designer's changes.

The inspector window allows the designer to adjust parameters and settings of the different library components used in the composition.

Source: Ballagas et al. (2007)

NETLab toolkit

- Developed by the college for design in Pasadena in 2007.
- Free and based on Flash, uses Arduino

• Made for designers and students

• Control motors or video projections with sensors, slides, etc.

Source: http://newecologyofthings.wik.is/NETLab_Toolkit (14,02,2010)

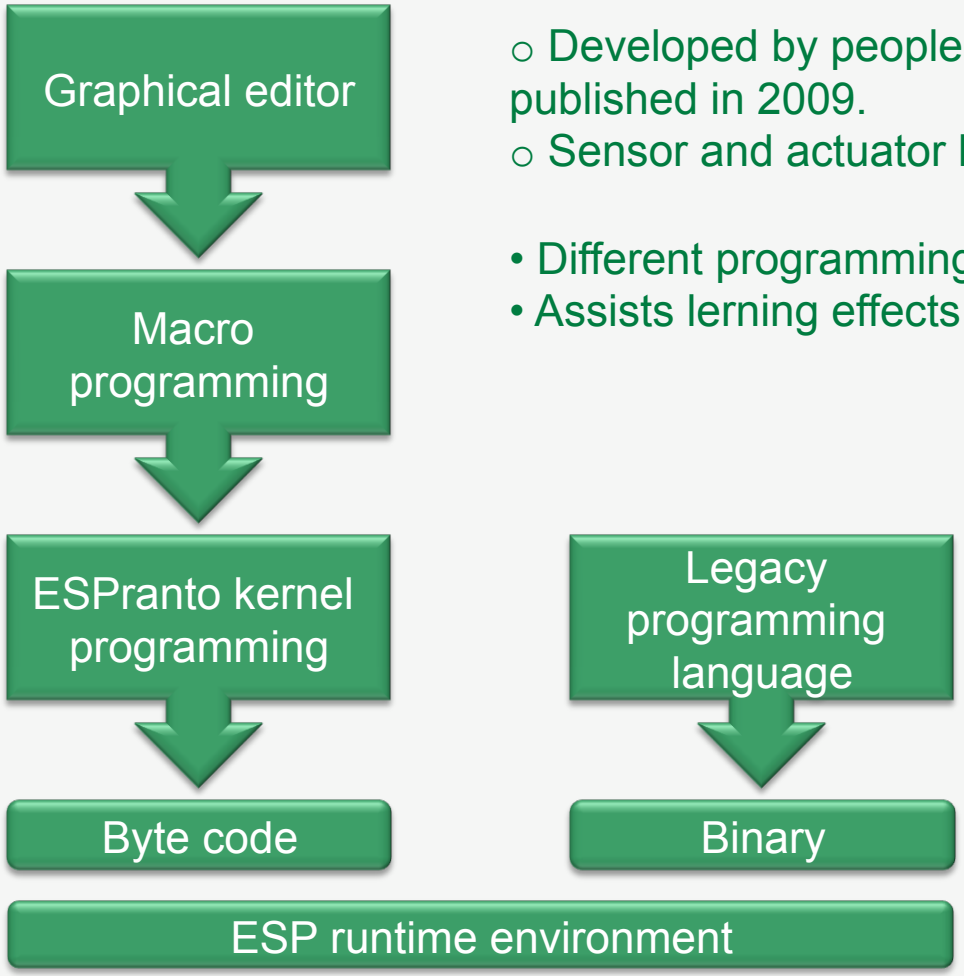
EduWear

- Developed by the university of Bremen in 2007.
- Uses Arduino for Switches, LED´s and actuators, and textile technologies

- For children
- Adding functionality to cloth.
- Programming visually with „Amici“

Source: Reichel (2007)

EsprantoSDK

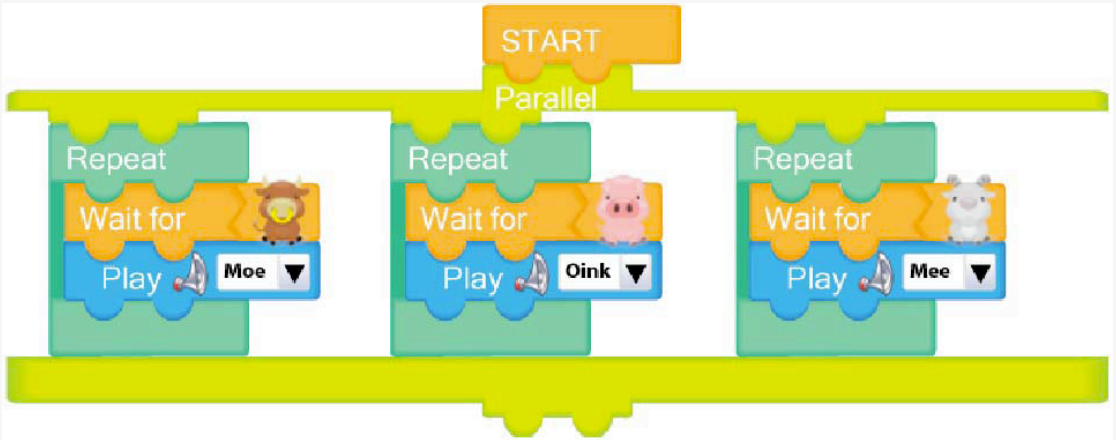


- Developed by people from Philips and SeriousToys, published in 2009.
- Sensor and actuator based applictation.

- Different programming layers for different user-groups.
- Assists lerning effects to rise in programming layer.

EsprantoSDK

- Graphical layer with puzzel pices.



- Translated into macro code.

```
repeat (waitFor Cow;
        play Moo)
|
repeat (waitFor Pig;
        play Oink)
|
repeat (waitFor Sheep;
        play Mee)
```

Source: Herk et al. (2009)

Outlook

- Becoming more portable to other architectures.
- Visual programming enables a larger user group.
- No „universal“ toolkit.
- Sketching software is becoming more important.

? ? ? Questions ? ? ?