End-User Composition of Graphical User Interfaces for PalCom Systems

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Introduction

• **End-user composition important in ubiquitous computing**
  – Users combine devices in new, interesting formations
  – Users know best – empower them!
• Supported in **PalCom** – no code needed
• We extend to creation of **Graphical User Interfaces (GUIs)**
  – **Inverted** way of working with GUI development.
  – Realized as graphical editor + GUI language
    » Interpretation on any platform
PalCom, Middleware

- **PalCom** combines devices over heterogeneous networks
  - ...and much more
- **Service** - represent functionality, created by developers
- **Assembly** - configuration & trigger-action script

**Device**: Camera

**Service**: Photo

- **Command**: takePhoto

**Service**: Storage

- **Command**: getPhoto
- **Command**: photo
  - **Parameter**: image (jpg)
Problem

• No end-user composition for GUIs 😞
  – Ubiquitous systems typically “vanish into the background”
  – … but sometimes they need to be controlled manually
• PalCom GUIs: Time consuming, even for programmers
  – referred to use third-party tools

• Goals: Platform independent, no program code needed
Creating GUIs for PalCom Systems

• Traditional, call back methods.

```java
button.addActionListener(new ActionListener(){
    @Override
    public void actionPerformed(ActionEvent e) {
        sendCommand();
    }
});
```

• Support for non-programmers: inverted word flow!
  – No “glue code” is needed.
CREATING GUIS FOR PALCOM SYSTEMS

Graphical PML Editor
EVALUATION

Experiment

- Graphical PML Editor vs. Android Studio
- 24 students
- 6 sessions
- 4 hours
- Solving the same problems
- Monitored development time
EVALUATION

Experiment, cont’d

• Results\(^1\) from comparing development times:

\[
\begin{array}{cc}
\text{Task 1} & \text{Task 2} \\
65.4\% & 98.8\%
\end{array}
\]

USE CASE

itACiH Mobile Team App

Patienter

Planering

Anteckningar

Välkommen Björn Johnsson!
On Openness

• PalCom: not quite open source, but openly available
  – Download at http://palcom.cs.lth.se
• Graphical PML Editor: not included in distribution
  – Contact author at Bjorn_A.Johnsson@cs.lth.se