Migratable User Interface Descriptions in Component-Based Development

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Presentation Overview

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1. Introduction

Goal: Dynamically generating user interfaces for embedded systems using a high level UI description

- Building system and device independent UIs
- Enhance component-based development for embedded systems with high-level UI descriptions
- Easy to build for non-programmers

2. The SEESCOA Component System

- SEESCOA: **S**oftware **E**ngineering for **E**mbedded **S**ystems using a **C**omponent **O**riented **A**pproach.
- Components reusable for embedded systems
- Specific properties:
  - Asynchronous
  - Dynamically composable
  - Replacable at runtime
- Components annotated by UI description

3. User Interface Descriptions

- Focus on structure UIs
- XML syntax (platform independent, declarative, consistency, constraints, extensible, reusable, transformations)
- Linked to individual components, like functional component interface definition
- Only "interaction" components should export description

```
<interactor>
  <range name="focusrange">...</range>
</interactor>
<interactor>
<button name="camera1_onoff">
 <action>
  <func service="Surveillance.Controls">
     switch
  </func>
  <param name="camera2"/>
  <param name="camera1_onoff"/>
 </action>
</button>
</interactor>
```

4. Available Interactors

- Button
- Range
- Choice (Single, Multiple)
- Text input
- Video
- Label
- Actions

Enough to describe simple dialogs, forms only

5. The User Interface Component

- Special Purpose component
- UI description can be "submitted"
- The same interface, other rendering backends
- Can be replaced at runtime
- **input**: one or more high-level UI descriptions, **output**: a working User Interface

6. The UI Component Architecture

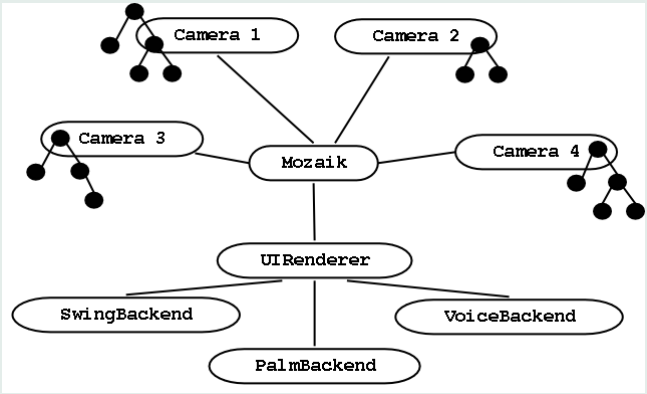
- 2 kinds of parsing available:
  - DOM: more memory, easier to experiment with
  - SAX: less memory, faster, more coding
- Available widgets dynamically loaded
- Availabe output formats/backends are modular and self-contained

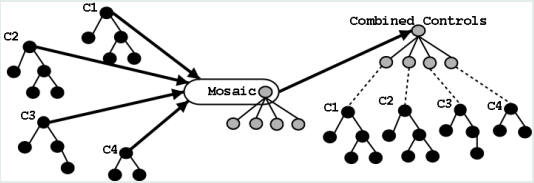
7. Components Example Case

The camera surveillance system

- Description: a guard has to check four places using the surveillance camera's
- Solution: dynamically generate a mosaic interface for viewing them all at once
- Each camera is represented by a Camera component
- Each Camera component is annotated with a high-level UI description
- The application logic requires a Mosaic component

- Mosaic component merges the camera component descriptions and submits them to a UI component




C1
C2
C3
C4
Mosaic
Combined_Controls
C1
C2
C3
C4


Camera Mozaik <2>
Zoom:
value : 0
Brightness:
value : 0
Zoom:
value : 0
Focus:
value : 0
Zoom:
value : 0
Focus:
value : 0
Zoom:
value : 0
Contrast:
value : 0

8. The Rendering Engine

- Independent, self-contained backends
  - Java Swing, Java AWT, HTML, Palm,...
- Eats XML, produces an adapted User Interface
- Action triggers
  - Interactors can have "action" childs
  - Action child = func child (target + method) + zero, one or more param childs

9. The Layout Management Problem

- Focusing on 2D dialog-based UIs
- Radically changing screen space and resources
- Define *spatial contracts* on the interactor layout
- Use hierarchical groups to allocate screen space

10. Future Work

- At the low end: Rendering engines for AWT, Swing, Applet (AWT) and HTML are finished, PDA in progress
- Conversion to other XML-based UI descriptions: UIML, XForms,...
- Adding sort of Domain Model: defining set of interactors for a specific context
- Introducing a Task Model on top
  - e.g. ConcurTaskTree (using XML output)
- ...

11. Conclusions

- The proposed approach offers
  - flexibility
  - adaptibility
  - reusability
- Dynamically show new interfaces (webservices)

12. Questions, Remarks,...

?