Model-Driven Development of Mobile Applications

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The Mobile Age
Mobile Applications Development
Factors to Consider during Development

Operating Systems & APIs
- Symbian
- Windows Mobile
- Android
- Palm
- Java
- iPhone

Device Limitations
- Screen size
- Power consumption

Input Methods

Additional Capabilities
- Wi-Fi
- Bluetooth
- Camera
- Music
- Clock
- RSS Feed
- Maps
## Mobile Applications Development

### Challenges, Solutions and More Challenges

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Current Solutions</th>
<th>More Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex process of developing software applications</td>
<td>Provide Integrated Development Environment (IDE) and Emulator</td>
<td>Complicated to use; Some have no support for drag-and-drop GUI development; Development view of the application does not reflect actual application; Device Limitations/ Capabilities are not known during application development; Different IDEs for different operating systems</td>
</tr>
<tr>
<td></td>
<td>Application Wizards</td>
<td>Too basic</td>
</tr>
<tr>
<td></td>
<td>Tutorials</td>
<td>Too basic</td>
</tr>
<tr>
<td></td>
<td>Discussion Groups</td>
<td>Too difficult to find specific solution to specific problem</td>
</tr>
<tr>
<td>Interoperability of applications</td>
<td>Web-based applications</td>
<td>Limited access to device; Limited functionality; Needs device to be online</td>
</tr>
<tr>
<td>Multiplatform development</td>
<td>Creating applications separately (same design and application logic)</td>
<td>Tedious and redundant</td>
</tr>
<tr>
<td></td>
<td>Virtual Machine running on device</td>
<td>Interpretation overhead</td>
</tr>
</tbody>
</table>
Model-Driven Development

**MDD**
- High-level, Platform-independent Model
- Platform-specific Code

**MDA®**
- PIM (e.g. UML)
- PSM
- Code

**DSM**
- Model (Domain-Specific Model)
- Code

**Example Researches:**
- SMS Project [3]
- Model-driven development for pervasive systems [14]
- MML [15]
- Multi-platform UI development [7][9]

- PIM (Platform Independent Model)
- PSM (Platform Specific Model)
Problem Statement
Model-driven Development of Mobile Applications

“To simplify the creation of applications for mobile platforms by developing a high-level and platform independent model of an application, and automatically transforming this high-level model to platform specific code.”

- Knowing the Target Users
- Design & Development of the modeling tool
- Iterative User Testing and design modification
- Coming up with algorithms for conversion from Model to Code
Knowing the Target Users

- **Non-Expert Users**
  - No experience in mobile applications development

- **Sample Users**
  - WeP Investigators
    - Group of scientists and psychologists from the LMU Institute of Medical Psychology involved in the Worldwide Experimental Platform (WeP) project

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The Worldwide Experimental Platform Project (WeP)

A project from the LMU Institute of Medical Psychology which aims to “create a platform for large-scale use of the Internet for medical, epidemiological and genetic studies.”

- Subjects giving DNA
- Subjects wearing devices
- Specific individuals keeping online diaries and logs
- Phenotyping thousands through online-questionnaires

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Florence Balagtas-Fernandez: MDD of Mobile Applications
## Knowing the Target Users

<table>
<thead>
<tr>
<th>User Survey</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment of users' technical knowledge (Computer Applications used, Operating Systems used, Background in programming)</td>
<td>Most of them do programming (MATLAB, C, Fortran, etc)</td>
</tr>
<tr>
<td>Current projects involving the use of mobile devices and problems encountered during development</td>
<td>Only one of them has a project: psychophysical tests and psychomotor vigilance tests running on a PDA (field work)</td>
</tr>
<tr>
<td>Application design: Features wanted on graphical tools</td>
<td>• drag-and-drop environment</td>
</tr>
<tr>
<td></td>
<td>• icons and other visualizations</td>
</tr>
<tr>
<td></td>
<td>• flowcharts: create flows and relationships</td>
</tr>
<tr>
<td></td>
<td>• math and programming are taken care of by the tool</td>
</tr>
<tr>
<td></td>
<td>• allows simulation of actual application</td>
</tr>
<tr>
<td></td>
<td>• provide features of current IDEs (versioning, reverse engineering)</td>
</tr>
<tr>
<td></td>
<td>• independent from operating system</td>
</tr>
<tr>
<td></td>
<td>• accessible for both young and old: font size adjustment, acoustic signals, ease of errors</td>
</tr>
<tr>
<td></td>
<td>• few clicks as possible</td>
</tr>
<tr>
<td></td>
<td>• joy to use the tool without fears of any kind</td>
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</tbody>
</table>
Design & Development of the Modeling Tool

- Mobile Applications (MobiA) Modeler
  - Allows non-experts users to easily create mobile applications by allowing them to create the application through graphical means.
Design & Development of the Modeling Tool

Level of abstraction and modeling constructs

How to abstract technical details

How can device capabilities be shown
Design & Development of the Modeling Tool

How to visualize device interaction

How should a modeller interface look like
High-level form?
Reflect actual interface?
Iterative User Testing & design modification

- **Given a** MobiA Prototype/s
- **User** is given a **Task**
- User does the task using a MobiA Prototype
- Get **feedback** from user regarding tool and ease of task
- **Modify** Prototype based on user feedback and observations

*Observe user while doing the tasks*
Thank you for your attention.

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References