Mobile Device Application Synthesis from Domain-specific Models

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Intro

- Over the years, programming has evolved from 0s and 1s to assembly to simple and later more complex languages to UML...
- UML models OO programming well but... is it the right meta-model for Mobile Device Applications (MDA)?
- Given a domain-specific model for MDA, how and on to what platform could it be translated to make it worthwhile?

Intro

- Over the years, programming has evolved from 0s and 1s to assembly to simple and later more complex languages to UML...
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- Given a domain-specific model for MDA, how and on to what platform could it be translated to make it worthwhile?

My project: Develop a DSMM for MDA that can be translated to the `Google Android` platform.

- Appropriate level of abstraction
- Worthwhile $\longrightarrow$ `Google Android` code is device independent

References


Droiddraw.


Google.
Google android.


MetaCase.
Domain-specific modeling with metaedit+: 10 times faster than uml, 2007.

Outline

Outline

Related Work

- Nokia has a similar DSMM used to develop MDA [3]
- It translates to the public smartphone platform `Series 60`
- Not much information on the expressiveness of their DSMM

Google Android (GA) Overview

A GA application has 3 key structure components:

- *AndroidManifest.xml* $\longrightarrow$ holds information about application features and classes
- *res/*.xml* $\longrightarrow$ describe each visible elements and screens on the mobile device
- *src/*.java* $\longrightarrow$ describe the control flow of the application

Much more information can be found at [2].

Outline

The Meta-Models

There are 3 meta-models in play:

1. `PhoneApps`
2. `TextualPhoneApps`
3. `Google Android`

The Meta-Models...PhoneApps

- The DSMM used by the MDA modeller
- Powerful enough to express a wide variety of applications
- Not sufficient to express all of the features of GA...future work could achieve this

The Meta-Models...PhoneApps...

Lets take look at the class diagram in AToM3 to see the PhoneApps

- entities
- attributes
- relationships
- constraints
- neat features (references, events, code, ...)

The Meta-Models...TextualPhoneApps

- The MM is not used or seen by the MDA modeller
- Simplified, summarized, cleaned-up and denser version of a PhoneApps model
- TextualPhoneApps models are generated by transformations from PhoneApps models
- TextualPhoneApps models are transformed to Google Android applications

The Meta-Models...TextualPhoneApps...

Lets take look at the class diagram in AToM3 to see the TextualPhoneApps

- entities
- attributes
- relationships

Outline

PhoneApps → TextualPhoneApps

The goal of this transformation is to make it easier to generate `Google Android` code from a `PhoneApps` model

- Useless information is removed
- Useful information is condensed into a XML form

PhoneApps → TextualPhoneApps...

Lets take look at the transformation in AToM3 to see the TextualPhoneApps

- initial/final actions
- rules

TextualPhoneApps → Google Android

This transformation outputs all the required files for a `Google Android` application from a `TextualPhoneApps` model Recall:

- *AndroidManifest.xml* → holds information about application features and classes
- *res/*.xml* → describe each visible elements and screens on the mobile device
- *src/*.java* → describe the control flow of the application

TextualPhoneApps → Google Android...

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Currency Converter

This model displays the following features:

- Coded textfields
- Clickable lists
- Transition self-loops

Let's take a look in AToM3 and try running the generated code

Menu

- This model is application launcher that could replace the traditional Main Menu program on a phone
- It allows one to select between Dial, SMS and Web, to specify launch parameters and to start the desired application

Conference Registration Model

This model displays nearly every feature of the `PhoneApps` meta-model

Let's take a look in AToM3 and try running the generated code

Outline

Hands-on modelling

Now, let's see if this seems like the appropriate level of abstraction for creating a simple "Hello World!"-style application

- Our application will display "Hello World!" for 4 seconds
- Then transit to a screen where we can enter text and click on a button
- Then display the text for 3 seconds and restart

Future Work

- Use real `GA` enabled device rather than emulator to test more features
- Support all possible layouts, widgets, etc... to match `GA` GUI expressiveness
- Give modeller access to `GA` controlled data (e.g. Contacts) without having to go through `ExecuteCode`

Questions, Comments?