Reuse in MDE
Concern-Oriented Reuse

Concern — Unit Of Reuse
Concern-Oriented Reuse

Concern — Unit Of Reuse

Variation Interface

Customization Interface

Usage Interface

Concern
Bridging the Gap
Bridging the Gap
Bridging the Gap

raise Abstraction to Modelling Level
Bridging the Gap

Incremental Refinement of Interfaces

Raise Abstraction to Modelling Level
Bridging the Gap

Incremental Refinement of Interfaces

CORE

Raise Abstraction to Modelling Level
The Variation Interface

Documents and Organizes Features

Feature Model of API
The Variation Interface
Documents and Organizes Features

from the user’s perspective

Feature Model of API
The Usage Interface

Tailors the API to the User’s Need

API split across features
Can be split at operation level
The Usage Interface
Tailors the API to the User’s Need

API split across features
Can be split at operation level
The Usage Interface
Tailors the API to the User’s Need

API split across features
Can be split at operation level
The Usage Interface

Tailors the API to the User’s Need

API split across features
Can be split at operation level
The Usage Interface

Tailors the API to the User’s Need

API split across features
Can be split at operation level
The Customization Interface

Clearly designates what user has to provide

Force user to adapt correctly
The Customization Interface

Clearly designates what user has to provide

Force user to adapt correctly
The Customization Interface

Clearly designates what user has to provide

Force user to adapt correctly
TouchCORE Tool Demo

Shows how Minueto framework concern is reused

Selecting the desired features from the high-level view of the framework

Trade-off analysis depending on impacts on non-functional goals

Produces subset of API based on chosen functionality

Customizing the chosen functionality (adapt to reuse reuse context)

Using the chosen functionality in a design model

View Demo Recording: phd_defence_demo.mov
Concernification
Automated Concernification

Use Executable Examples

Consider Structure

how is specific feature used?

Extract feature model
Help with initial concern interface creation
Automated Concernification

Uses Directed Acyclic Graph
Automated Concernification

Start

Initialize

Uses Directed Acyclic Graph
Automated Concernification

Start

Initialize

Uses Directed Acyclic Graph
Automated Concernification

Start

Initialize

Populate & Merge

Use structure and example usage
Automated Concernification

Start

Initialize

Populate & Merge

Use structure and example usage
Automated Concernification

Maintain integrity of API
Can be fine-tuned by designer after
Automated Concernification

Maintain integrity of API
Can be fine-tuned by designer after
Automated Concernification

Start

Initialize

Populate & Merge

Simplify

Maintain integrity of API
Can be fine-tuned by designer after
Automated Concernification

Start

Initialize

Populate & Merge

Simplify

Maintain integrity of API
Can be fine-tuned by designer after
Automated Concernification

Validated on three frameworks
Automated Concernification

Validated on three frameworks
Automated Concernification

Validated on three frameworks
Automated Concernification

Validated on three frameworks

Workflow Concern

Minueto

Android Notifications
Bridging the Gap

Raise Abstraction to Modelling Level
Bridging the Gap

Incremental Refinement of Interfaces

Raise Abstraction to Modelling Level

CORE
Bridging the Gap

- Incremental Refinement of Interfaces
- Raise Abstraction to Modelling Level

CORE
Bridging the Gap

Incremental Refinement of Interfaces

FileWriter(String)

defined in parent feature

Raise Abstraction to Modelling Level

CORE

defined in parent feature

FileWriter(String)
Bridging the Gap

Incremental Refinement of Interfaces

CORE

FileWriter(String)

FileWriter(String, boolean)

defined in parent feature

required by child feature

Raise Abstraction to Modelling Level
Concernification
Summary

Concernification

Automated Concernification
Summary

Concernification

Automated Concernification

Signature Extension
Future Work
Future Work
Future Work

Implementation
Integration

Understand
Future Work

- Implementation Integration
- Understand
- Code Completion
Future Work

- Implementation Integration
- Code Completion
- Understand
- User Studies
Summary

Key Contributions

Concernification
- concern interfaces for existing functionality
- tool support in TouchCORE
- qualitative study with Minueto developers

Automated Concernification
- algorithm to automate the creation of concern interfaces for existing frameworks
- implementation of algorithm
- validation of algorithm on three frameworks

Signature Extension
- identification and description of four difficult situations and empirical study on Java Platform API
- signature extension approach and support for class diagrams in CORE
- application of signature extension to two concerns