Co-evolving Code and Design with Intensional Views

A Case Study

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#&@!§ ...
I STILL HAVE TO
PREPARE MY
PRESENTATION FOR
ESUG 2005 !!!

Problem : Context

- *Intensional Views (and Relations)*
- have been proposed as a way to support
  - program understanding
  - software maintenance
  - co-evolution of source code and design
- by “actively” documenting high-level structural regularities in source code

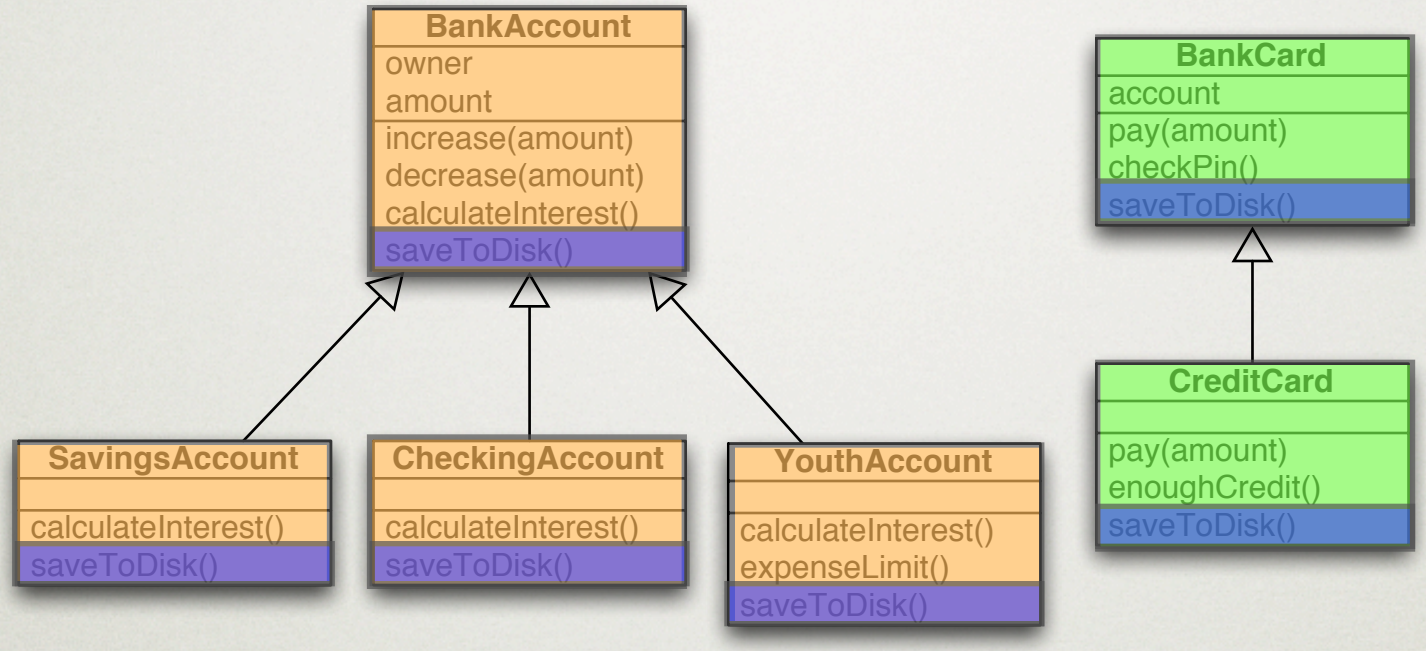
Problem : Goal

- Verify claims by conducting case study :
  - Document initial version
  - Apply to small evolution (1 month)
  - Apply to large evolution (+/- 1 year)
- Draw conclusions about *IntensiVE*
  - w.r.t. software understanding, maintenance and (co-)evolution

Intensional Views (and Relations)

- Motivating example
- Extensional vs. intensional views
- Alternative intensions
- Relations between views

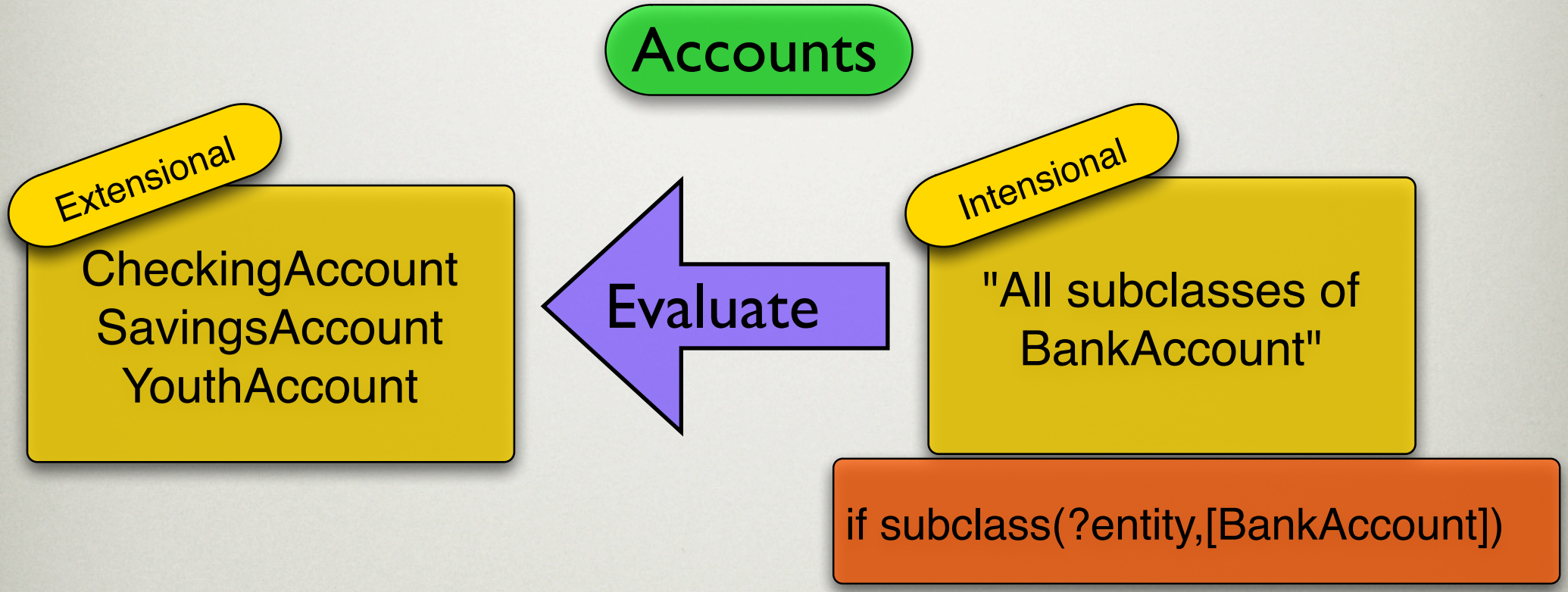
Motivating Example



Source-code View
Collection of source-code entities

Extensional vs. Intensional Views

Problem
Intensional views
IntensiVE
The case
Case study
Lessons learned
Future work



Alternative Intensions

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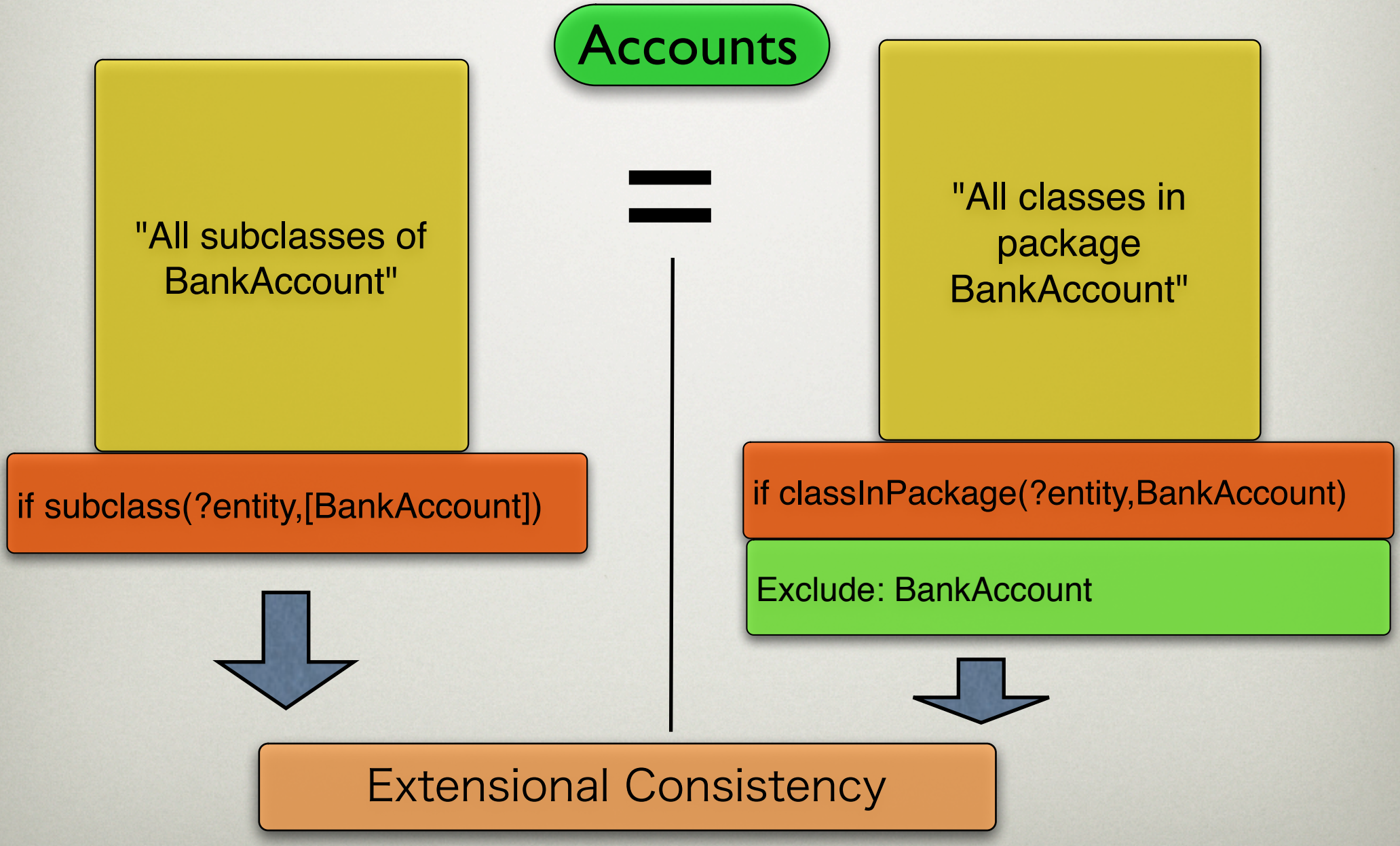

Intensional Relations

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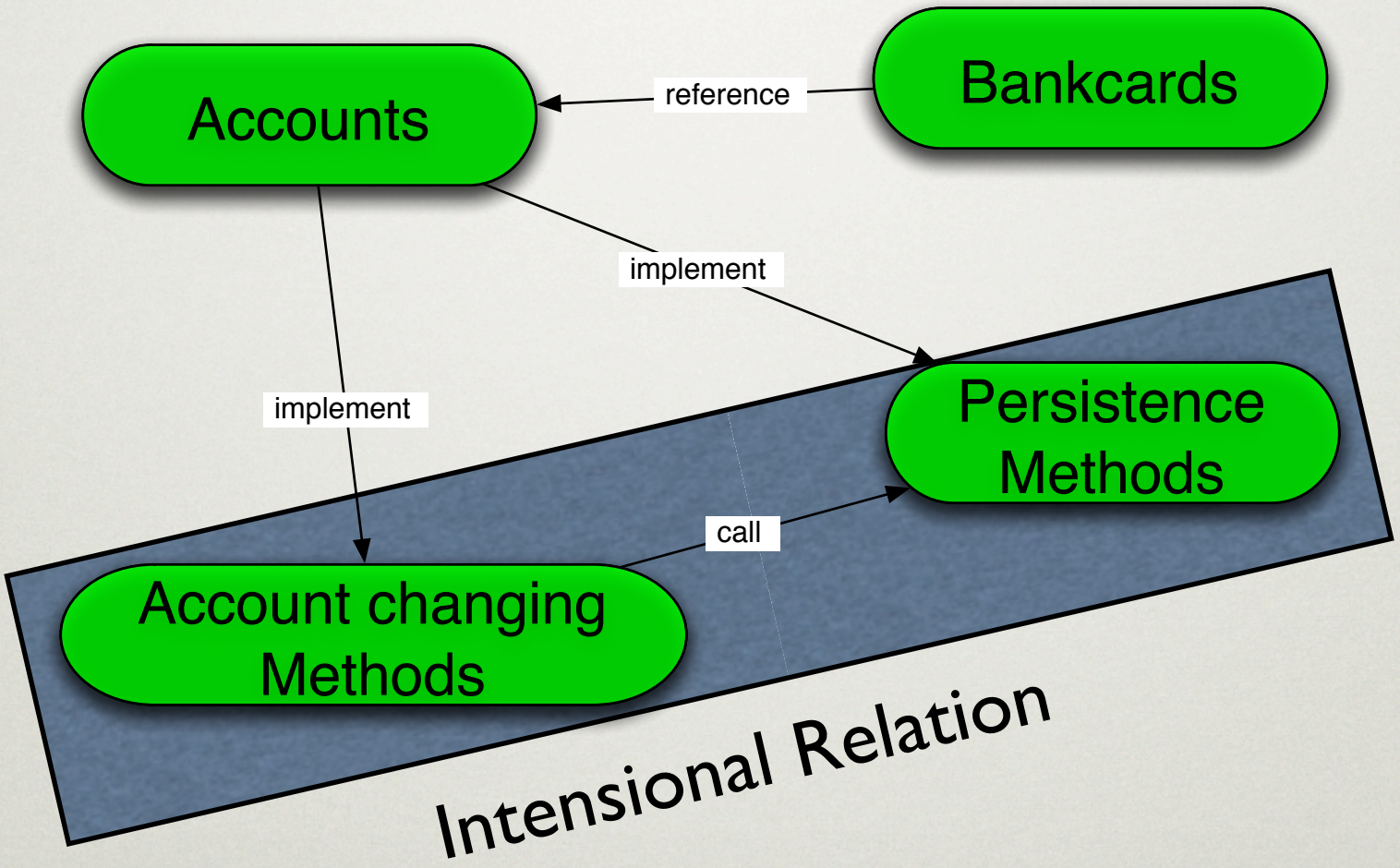

Intensional Relations

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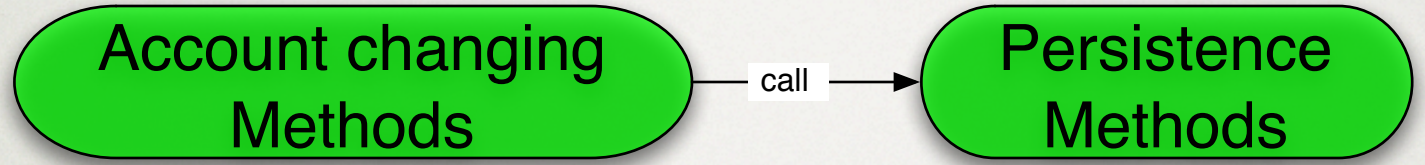

All account changing methods must call a persistence method

$\forall$ x $\in$ "Account changing methods"
$\exists$ y $\in$ "Persistence Methods"
x calls y

$Q_1 x \in V_1; Q_2 y \in V2: x\ r\ y$

$Q_1, Q_2 \in \{\forall, \exists, \nexists, \exists !, \ldots\}$

$V_1, V_2 \in$ Views

r = predicate over source-code entities

The Intensional View Environment

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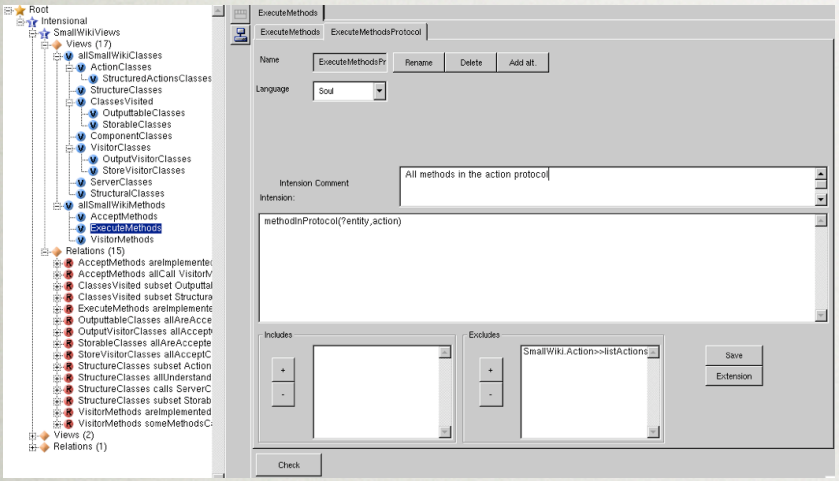

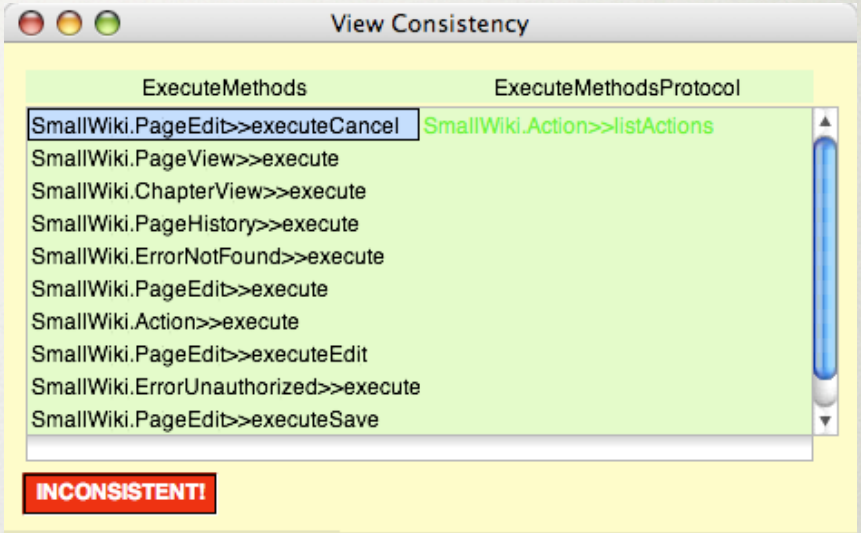

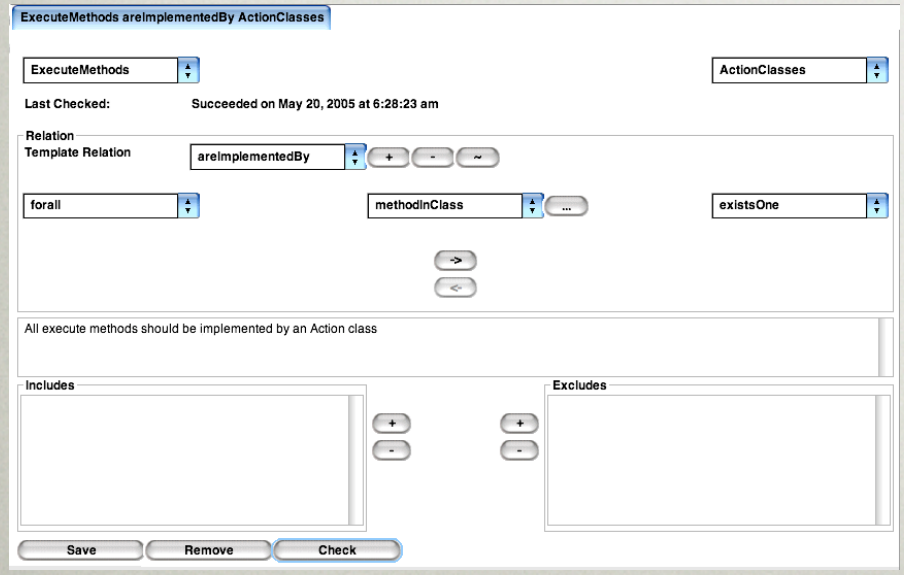

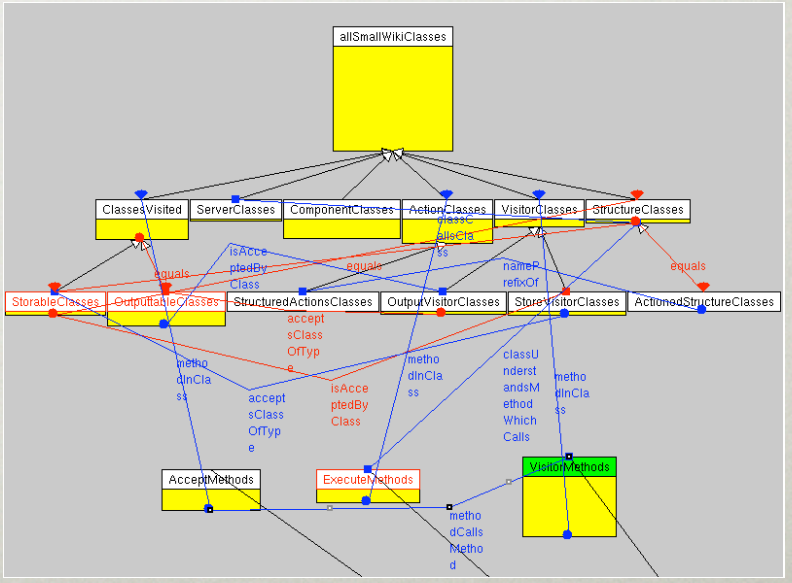

The Intensional View Environment

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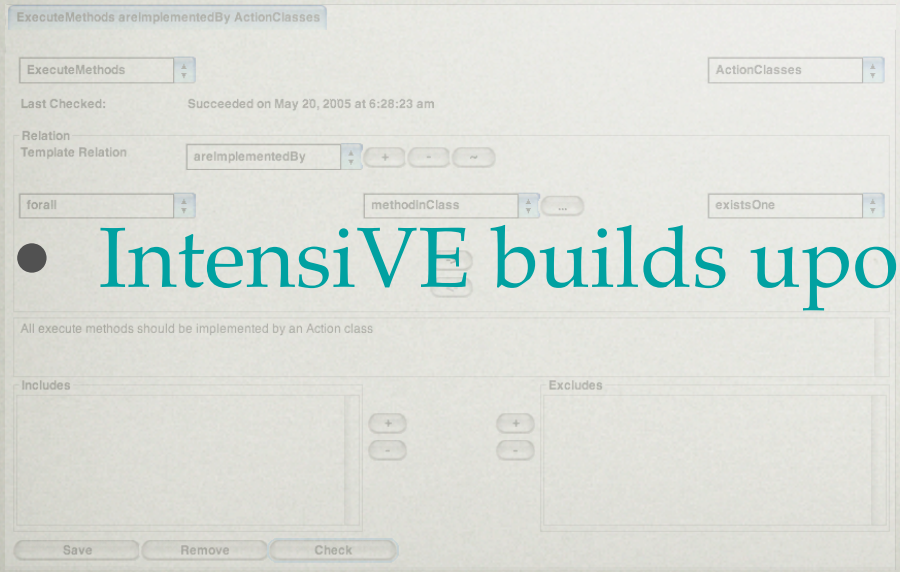
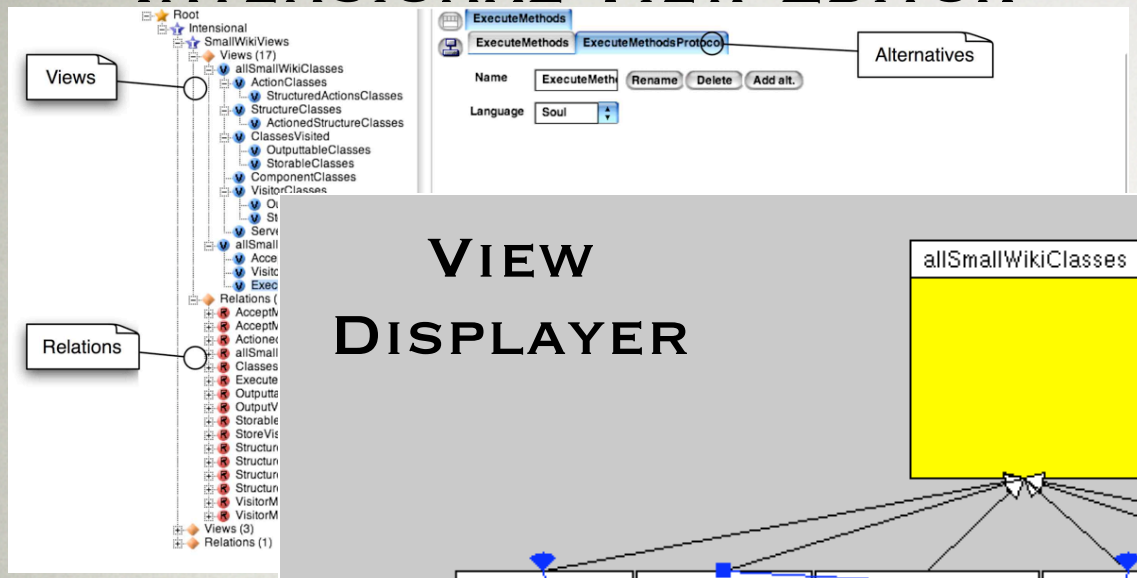
- Seamlessly integrated with Visualworks 7.3
- IntensiVE comprises:
  - *Intensional View Editor*
  - *View Consistency Checker*
  - *Relation Editor*
  - *Relation Checker*
  - *View Displayer*

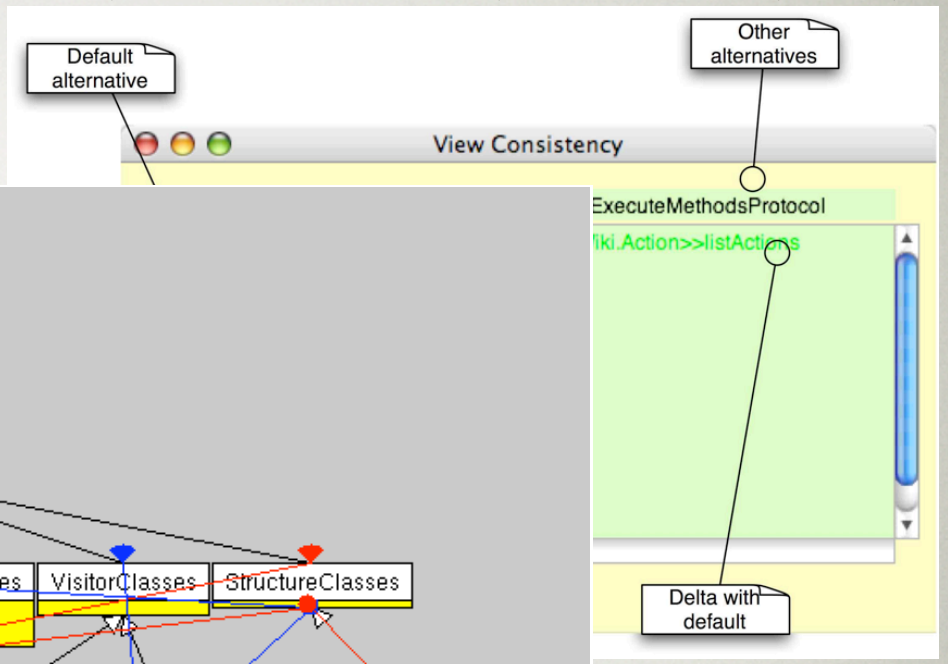


- IntensiVE builds upon:
  - *StarBrowser*
  - *SOUL + NewLicor*
  - *MOOSE + CodeCrawler*

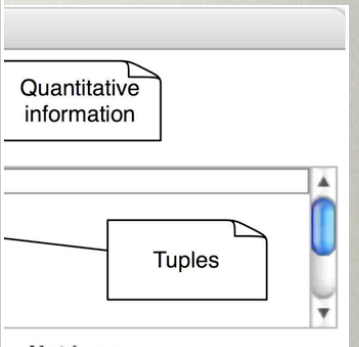
Intensional View Editor

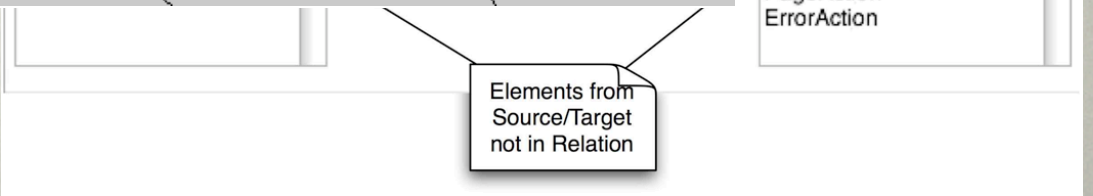


View Consistency Checker



View Displayer





Relation Editor

Relation Checker

The Case : SmallWiki

GOAL::
Support:co-evolution:of:
documentation:and:
implementation

- SmallWiki
  - 15 views
  - 15 nesting views
  - 17 relations
- Document initial version
- Apply to small evolution (1 month)
- Apply to large evolution (+/- 1 year)

Methodology

- Manual code inspection
  - Initial views / relations
- Check conformance:
  - Detected small “bugs”
  - Refine documentation
- Iterative process

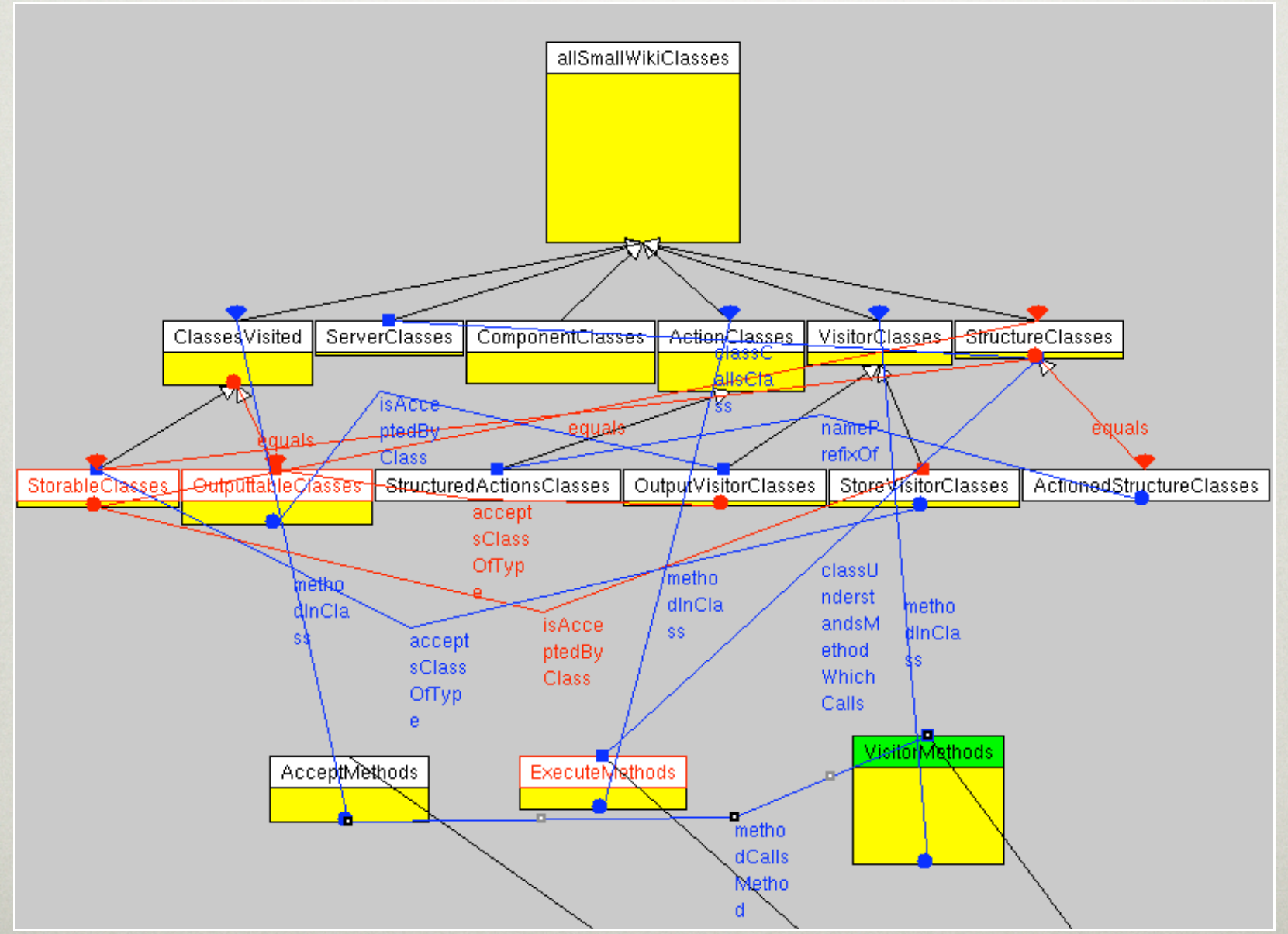
Applying to later versions

- Check views/relations to new version of code
- Inspect conflicts
  - Conflicts because of restructuring the code
- Update documentation when needed

Lessons learned

- Visualization
- Understanding (Evolution)
- Query languages
- Other

Visualization



Understanding (evolution)

- Start: little knowledge about SmallWiki
- Incremental documentation:
  - building views/relations in small steps
  - increased insights into the internals of the system
- Checking conformance: insights into evolution of the system

Incremental approach leads to better understanding of the system

Query language

```
| namesClasses |
namesClasses := SmallWiki.VisitorOutput allSubclasses inject: Set new
        into:
          [:tas :nextclass |
          tas
             addAll: (((Soul.MLI current methodsInClass: nextclass)
                      select: [:method | 'accept*:' match: method selector])
                         collect: [:method | method selector copyFrom: 7 to: method selector size - 1]);
             yourself].
namesClasses inject: OrderedCollection new
       into:
         [:tas :next |
         | value |
         (value := (Soul.MLI current classesFor: next asSymbol)
                  detect: [:class | SmallWiki allClasses includes: class]
                  ifNone: [nil] ) isNil ifFalse: [tas add: value].
         tas]
```

```
classInHierarchyOf(?c, [SmallWiki.VisitorOutput]),
methodWithNameInClass(?,?s, ?c),
[?s = (#accept, ?entity name, ':') asSymbol]
```

Other

- Coverage
- Deviations
  - some evolution conflicts due to obsolete deviations
- Dynamic vs. Static
- Do we need logic?
- Scaleability

Future work

- Mining:
  - Views (FCA + ILP?)
  - Relations (Brute-force technique)
- Document dynamic structure
- Support for documenting versions
- Aspect Documentation

Wanna learn more ?

- Contact :
  - Kim Mens (km@info.ucl.ac.be)
  - Andy Kellens (akellens@vub.ac.be)
  - Frédéric Pluquet
  - Roel Wuyts
- Publications :
  - TOOLS1999, SEKE2002, ICSM2003, ESUG2005, ICSM2005 (2)

Wanna learn more?

✍ *Innovation Awards* (tonight)
Andy Kellens
(☑ vote for us ☻)

☞ *Technical track* (tomorrow)
Frédéric Pluquet
Tools for Intensional Views

☟ Or check our **Website**

www.intensional.be