Towards Checking Consistency-Breaking Updates between Models and Generated Artifacts

MohammadAmin Zaheri, Michalis Famelis, and Eugene Syriani
Towards Checking Consistency-Breaking Updates between Models and Generated Artifacts – Zaheri, Famelis, and Syriani - 2021

Models have fundamental roles

MDE applied to forward engineering

Focused on a specific sort of applications
Low-code platforms – Components co-evolution

**Specification**

**Configuration**

- 
- 
- 
- 

**System**

- **App specific components**
  - **Meta-data**
  - **Data**
  - **Logic**

Co-evolution during operation!
Co-evolution problem – Other approaches

Co-evolution Problem

Metamodel / Model Co-evolution

Model Inconsistency Management

Round-trip Engineering

Schema Data Co-evolution
Systematic Review

Cocoa levels in chocolate
Bitter, Bittersweet, SemiSweet, MilkChocolate

http://relis.iro.umontreal.ca/
ReLiS – A low-code platform

Flexible tool for conducting Systematic Review collaboratively and iteratively

Planning ➔ Conducting ➔ Reporting

- DSL for configuration
- Generated web application
- Synthesize data
Towards Checking Consistency-Breaking Updates between Models and Generated Artifacts – Zaheri, Famelis, and Syriani - 2021

ReLiS – A low-code platform

**Specification**

```
PROJECT chocohalise "chocohalise"
CLASSIFICATION
Simple madeIn "Made in" [1 : string(32)]
DynamicList cocoa "Cocoa level" [1 = ["Bitter", 
  "Bittersweet", "SemiSweet", "MilkChocolate"]
```

**Configuration**

generates

derivationFrom

**System**

**App specific components**

**Meta-data**

**Data**

Co-evolution during operation!
Case study

```python
PROJECT chocohalice "chocohalice"
CLASSIFICATION
Simple madeIn "Made in" [1] : string(32)
```
Case study

"Bitter"-less world!

```csharp
PROJECT chocohalice "chocohalice"
CLASSIFICATION
Simple madeIn "Made in" [1] : string(32)
```
Case study

Inconsistency
Inconsistent inconsistency definitions!

Merriam-Webster dictionary: "inconsistent": not always acting or behaving in the same way; having parts that disagree with each other: not in agreement with something.

Spanoudakis et al: A state in which two or more overlapping elements of different software models make assertions about aspects of the system they describe which are not jointly satisfiable.

Herzig et al: An inconsistency is present if two or more statements are made that are not jointly satisfiable, with the typical examples of failure of an equivalence test, non-conformance to a standard or constraint and the violation of physical or mathematical principles.

David et al: Two artifacts are consistent with respect to property p iff their respective satisfaction relation towards p is exactly the same.
Towards Checking Consistency—Breaking Updates between Models and Generated Artifacts—Zaheri, Famelis, and Syriani—2021

Consistency enforcement mechanisms

- Hard-coded and not flexible
- Consequences such as data loss

Case study

 specification

System

App specific components

PROJECT chocalise "chocalise"
CLASSIFICATION
Simple madeIn "Made in" [1] : string(32)

Add a classification to the paper:
Chocoholism, from myth to reality

Made in Belgium, South Africa, Brazil
Cocoa level Bitter

Save
A promising prototype with Alloy

Cocoa levels in config

Cocoa levels in config

Cocoa levels in config

Cocoa levels in config

Cocoa levels in the app

Cocoa levels in the app

Cocoa levels in the app

Cocoa levels in the app
Interesting challenges for future research

- Which change operation breaks the consistency
- Defining consistency severity
- Which constraints to relax
- Finding the fewest possible constraints to relax
- Expressing the identified constraints in a common formalism
- Imposed by users! Hard to identify
- Dealing with uncertainty
- Restoring consistency
Towards Checking Consistency-Breaking Updates between Models and Generated Artifacts – Zaheri, Famelis, and Syriani - 2021

Hope to meet you at the next MODELS here in Montreal!

mohammadamin.zaheri@umontreal.ca
famelis@iro.umontreal.ca
syriani@iro.umontreal.ca