

MAIS: An Awareness Mechanism for Change Identification on Shared Models

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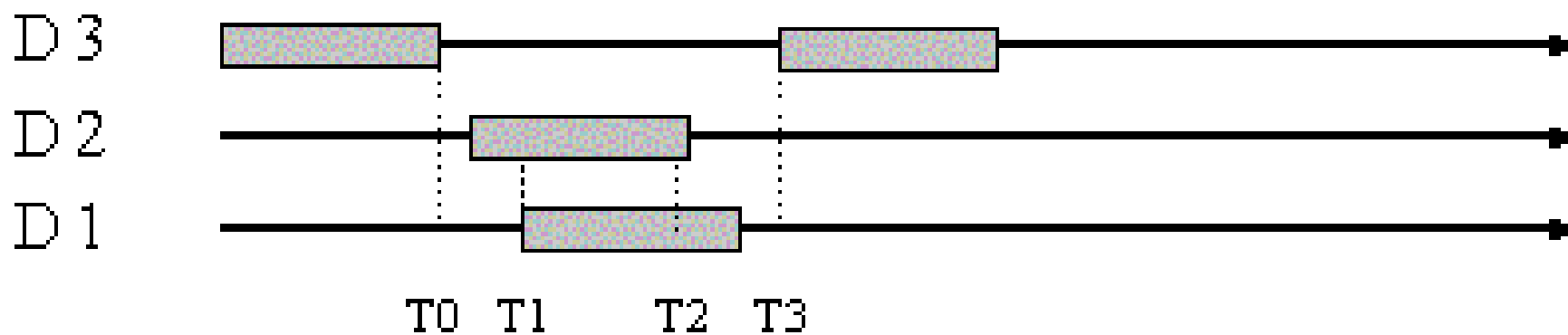
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Overview

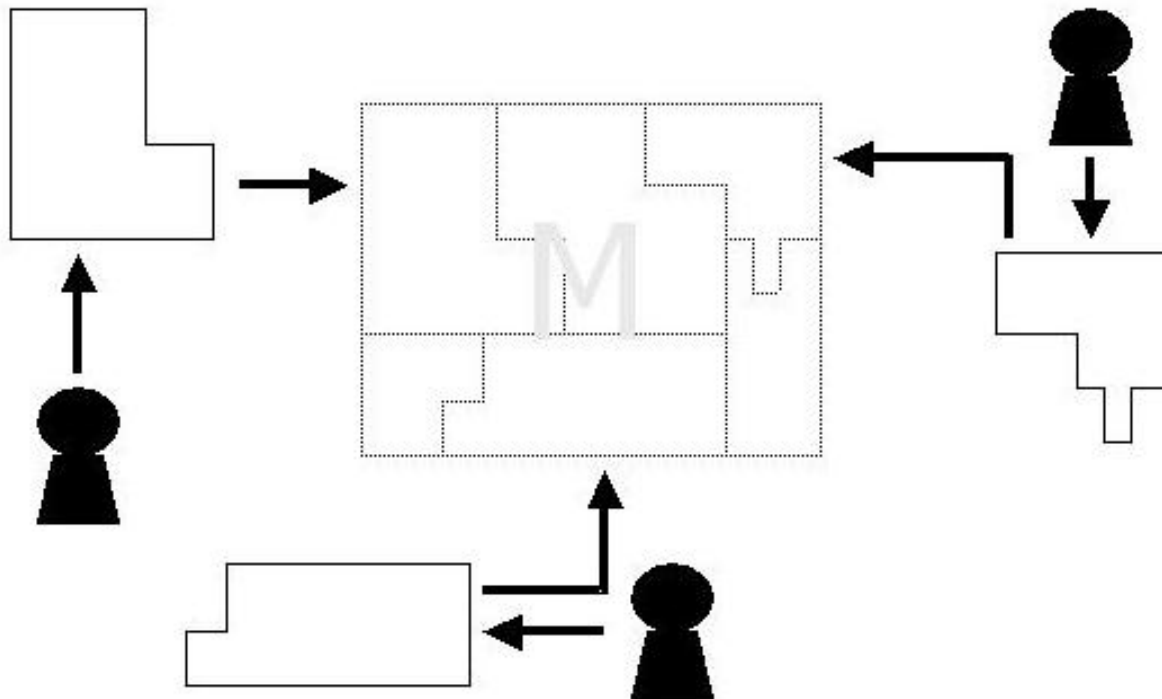
- Global Software Development.
- Individual's distribution among time and space
- Need of interaction to do the task.
- **Concurrent software modelling**

Scenario



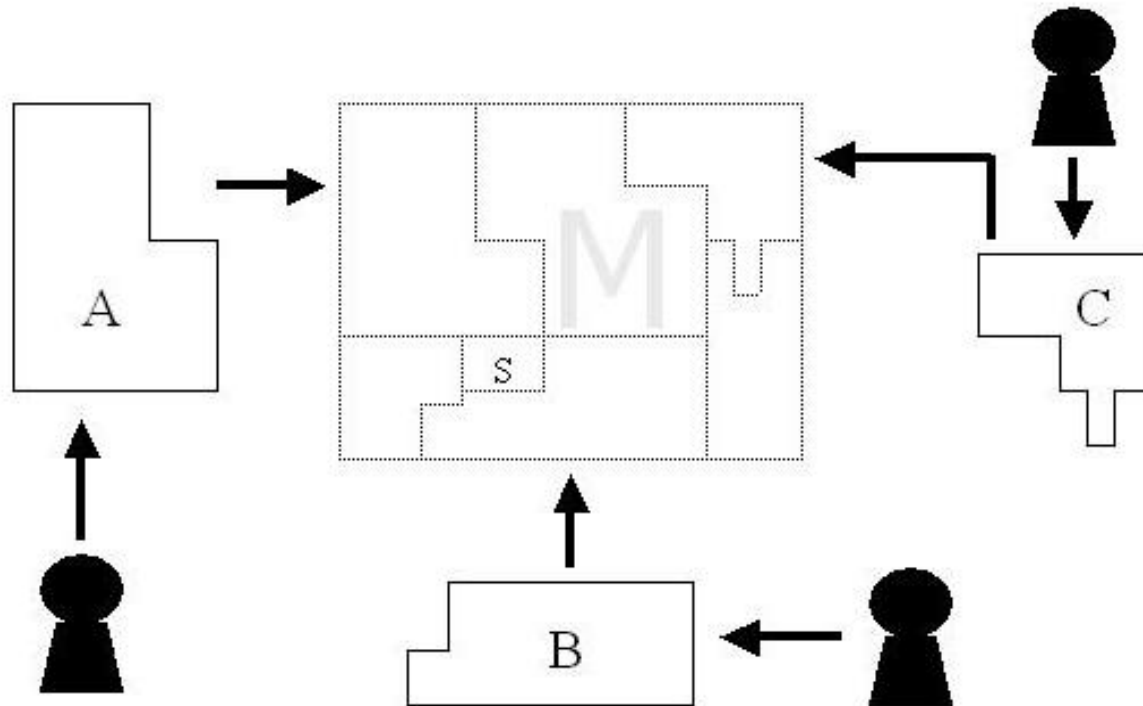
Context

- Changes occur in some parts of the artifact.
- “Puzzle” metaphor.



Problem

- Out-of-date conception of artifact's current state



Concepts

- **Awareness** concept can be useful if applied in this scenario.
- Developer's awareness extended by using awareness mechanisms.
- Knowing changes made by developers over the shared artifact.
- Developer's workflow must not be changed.

MAIS Approach

- **MAIS** (*Multi-synchronous Awareness InfraStructure*) awareness mechanism.
- Changes over shared models (events) generating awareness information.
- Events generated are collected, stored, distributed and presented.
- **Multi-synchronous** interaction mode.
- **Convergence** phase.

MAIS - Features

- **Optimistic** approach for concurrency control.
- **Not dependent** of a modeling tool.
- **Non-obtrusive** approach.
- **Implicit** collection of awareness information.
- **UML** shared models.
- Awareness information is **persisted**.
- **Conflict identification** is out of scope.
- Awareness information **classification (grouping/ranking)** and **filtering**.

Grouping

- Developers have different interests on events.
- Grouping events by some shared model feature.
 - Example: Grouping by class.
- Extensible set of different kinds of grouping events.

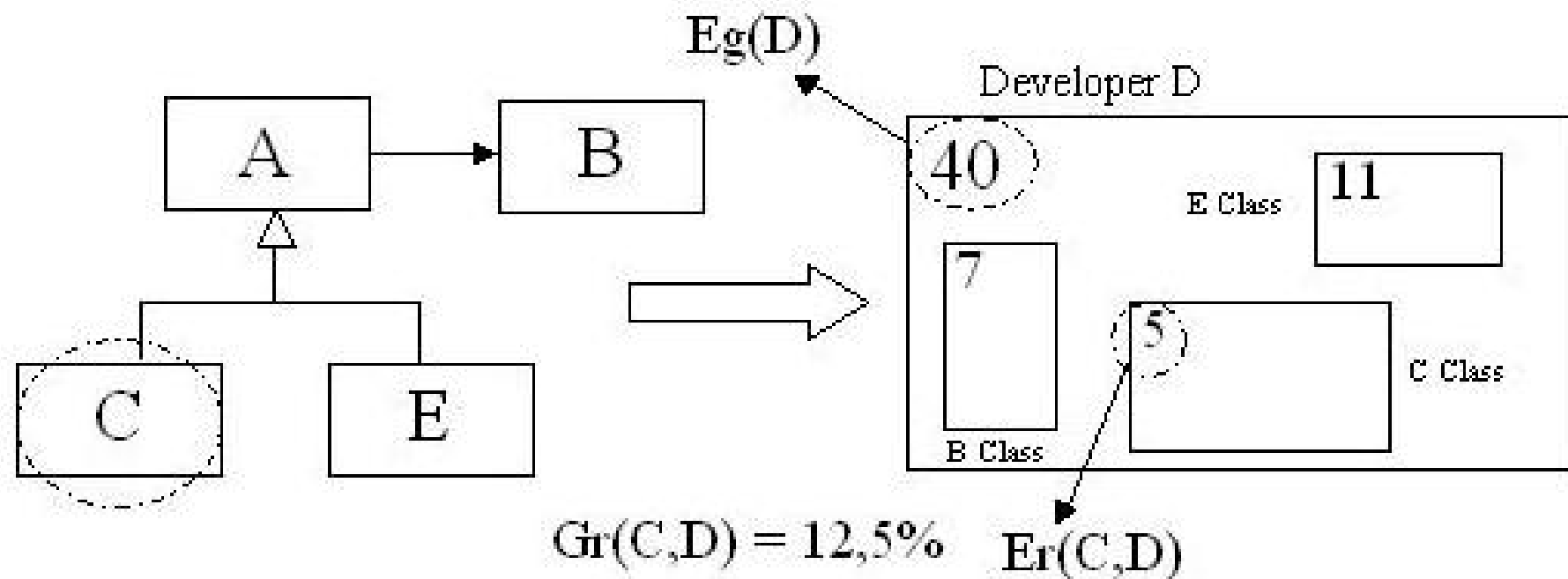
Ranking

- **Relevance** : aims to measure how important some kind of event is to a developer by analyzing other past events.
- **Relevance Formula**
 - Er : represents the amount of events that a developer "D" generated, relative to a shared model element "e"
 - Eg : total amount of events generated for "D" .
 - Gr : relevance degree, related to the event "e" for "D" .

$$Gr(e, D) = (Er(e, D) / Eg(D)) * 100$$

Ranking - Example

$$Gr(e,D) = (Er(e,D)/Eg(D)) * 100$$



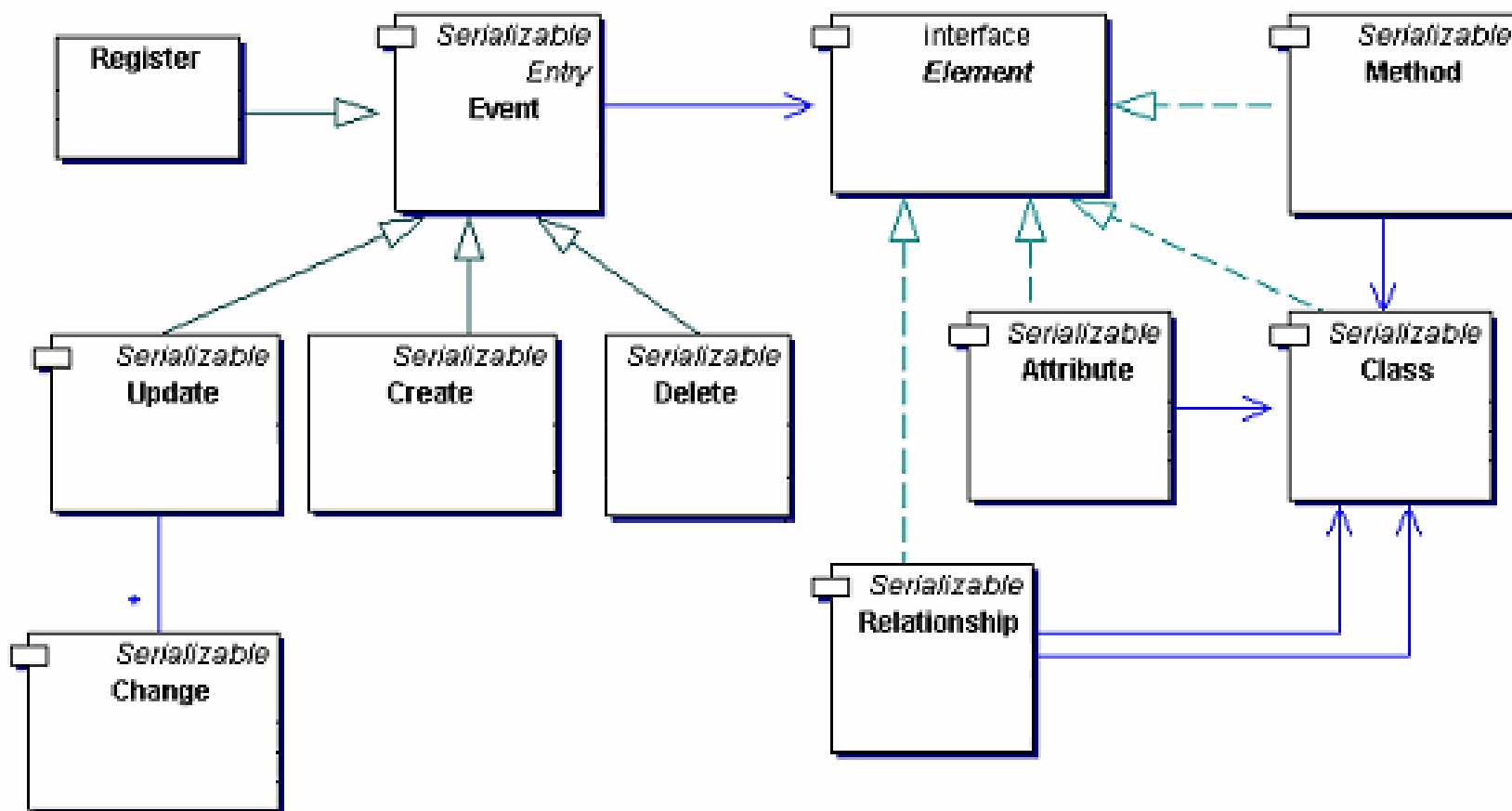
Filtering

- Retrieving of relevant information.
- Amount of known information can be greater than the new one → cognitive overload.
- Event filtering, following some extensible set of criteria
 - By user.
 - By element model.
- “Awareness of awareness” concept

MAIS Prototype

- *Odyssey Share* context.
- Shared UML model: **class model**.
- *Java* platform
- *UML* 1.4 notation
- Event's repository : tuple space.
- *Javaspaces* specification → *Gigaspace* implementation

MAIS Prototype - Events



Screenshot

The screenshot displays the Model Environment software interface. The main window shows a Class Diagram with three classes: Pessoa, Venda, and Produto. Pessoa is associated with Venda via a composition relationship (indicated by a filled diamond on the Pessoa side). Venda is associated with Produto via a 1..* association. A dialog box titled "MAIS - Event's Details" is open, showing the following information:

Author: Mangan
Element's Type: Class
Element's Name: Structural View.Venda
Action: Update
Date: 25/11/2004 01:49:59

Property	Old Value	New Value
Visibility	Private	Public
Type	Abstract	Common
Active	True	False

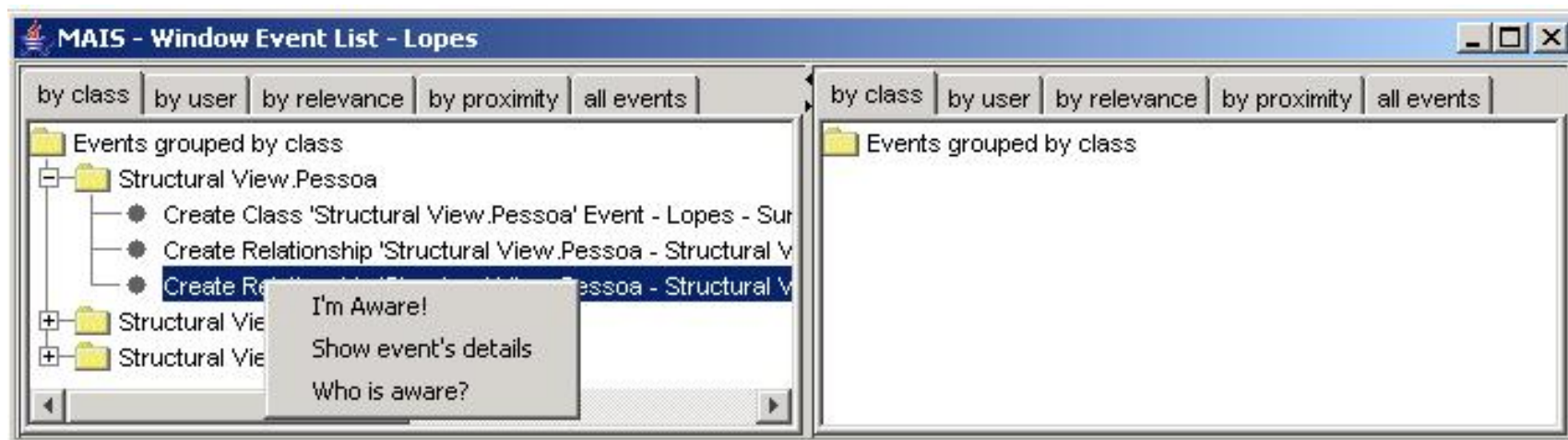
Below the main window, there are two event lists. The first is "MAIS - Window Event List - Mangan" with the following events:

- Create Relationship 'Structural View.Venda - Structural View.Produto'
- Register Client Event - Mangan - Thu Nov 25 01:48:49 BRST 2004
- Update Class 'Structural View.Venda' Event - Mangan - Thu Nov 25 0
- Update Class 'Structural View.Venda' Event - Mangan - Thu Nov 25 0
- Update Class 'Structural View.Venda' Event - Mangan - Thu Nov 25 0

The second event list is "MAIS - Event List - Mangan" with the following events:

- All Events
- Register Client Event - Lopes - Sun Nov 21 14:31:23 BRST 2004
- Create Class 'Structural View.Pessoa' Event - Lopes - Sun Nov 21
- Create Class 'Structural View.PessoaFisica' Event - Lopes - Sun N
- Create Class 'Structural View.PessoaJuridica' Event - Lopes - Sur

Screenshot



Observation Study

- Observe MAIS prototype → deficiencies and new requirements.
- Empirical study planning and execution.
- Collaborative modelling session
- Qualitative data.
- The study does not aim to test a hypothesis!
- Premises:
 - All developers use the same shared model version.
 - All MAIS users have the same role (i.e., developer).

Observation Study - Template

- **Participants**

- Ten volunteers (four undergraduate students and 6 graduate).
- *Odyssey Share* previous experience: one volunteer
- *MAIS* previous experience: no one.

- **Instruments**

- A signed commitment document.
- Characterization questionnaire.
- Task description document.
- Task accomplishment questionnaire document .

- **Study's Task**

- Two developers interact, using a pre-defined task set, over copies of the same class model version.
- Two groups of sessions: (i) one with developers that used the prototype, and (ii) another without the prototype support.
- *Odyssey Share* use.

Observation Study - Preliminary Analysis

- Informal meeting
- The groups that used MAIS prototype:
 - Need of a notification mechanism
 - Useful prototype → focus on conflict areas.
- The groups that did not use MAIS prototype:
 - Didn't externalize the need of a tool to support → task simplicity.
- Considerations:
 - Highlight critical changes.
 - Review study's accomplishment questionnaire (bias).
 - Improve study's task, providing more conflicts.

Conclusion

- *MAIS* awareness mechanism :
 - Non-obtrusive monitoring of events.
 - Implicit collection of change information.
 - Information about “awareness of awareness”

Contributions

- Events available to other tools.
- Use of software models → initial phases of the software lifecycle.
- Observation study → notifying developers about changes.

Future Work

- I. New ways of awareness information presentation.
- II. Pattern of change information → conflicts identification.
- III. Explore history events base
- IV. Infer “awareness of awareness” information.

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MAIS Architecture

