Approach

Tackling the problem of traceability decay due to evolution of related model elements

Stage 1: Capturing changes to model elements and generating elementary change events
Stage 2: Recognizing the wider development activity applied to the model element, as comprised several elementary change events
Stage 3: Updating the traceability relations associated with the changed model element

Example

Convert attribute to a class

Step 1: Change of a traced use case (Numbers on elements depict OUT/IN trace relations; relations backward from dependent to independent element)

Step 2: ADD a new class

Step 3: MOD - rename new class and add additional properties

Step 4: ADD association between class Order and AudioSystem

Step 5: DEL original attribute audioSystem

Step 6: Traceability links have been updated automatically (2 incoming links on use case, 1 outgoing link on each class)

TraceMaintainer Prototype

Supports the following activities

(a) Analysis of a flow of elementary change events according to a set of predefined rules it imports from an XML file
(b) Restoration of traceability based on a match between change events and rules
(c) Specification of new rules

- Independent of specific CASE tools - deployable with every UML-CASE tool that allows event capture
- Implemented in Visual Studio .Net
- Necessity to write an adapter for each tool - current adapters include Sparx Enterprise Architect and ARTiSAN Studio
- Possibility to work in heterogeneous tool environments via EXTESSY ToolNET

Status

+ Supports the automatic maintenance of traceability relations between requirements, analysis and design models of software systems expressed in UML
+ Preliminary results show the approach capable of reducing the effort in maintaining traceability quite dramatically and at a high level of precision
+ Support limited to predefined development activities

Future Work

- Additional models and development activities
- Industrial case studies to further evaluate the approach in practice
- Semi-automatic definition of new rules
- Checks on the consistency of change activities undertaken