Understanding Challenges and Tradeoffs in iStar Tool Development

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Outline

- Motivation
  - Optimize development of iStar tools
- Tool Examinations
  - OpenOME
  - MUSER
  - Leaf-family of tools
- Analysis Model for Tool Development
- Conclusions and Future Work

Background

- iStar tools
  - iStar wiki: 26
  - Unlisted: MUSER, pistar, etc.

- OpenOME
  - As a standalone application and as a plug-in for other popular tools, such as Eclipse and Protégé, OpenOME is designed to be a goal-oriented and/or agent-oriented modeling and analysis tool.
- OME
  - A graph editor to support goal-oriented and/or agent-oriented modeling.
- REDEPEND-REACT-BCN
  - REDEPEND-REACT is a tool that supports i* modelling and the analysis of the resulting models. This version extends the REDEPEND i* modelling tool. The extension focus on the representation of the information system using the i* framework and provides specific functionalities for the generation and evaluation of alternative architectures for the modelled information system.
- TAOM4E
  - TAOM4E supports a model-driven, agent oriented software development and, in particular, the Tropos methodology. It has been designed taking into account Model Driven Architecture (MDA) reccomandations.
- GR-Tool
  - Forward and backward reasoning is supported in Tropos by a Goal Reasoning Tool (GR-Tool). Basically, the GR-Tool is graphical tool in which it is possible to draw the goal models and run the algorithms and tools for forward and backward reasoning. The algorithms for the forward reasoning have been fully developed in java and are embedded in the GR-Tool.
- T-Tool
  - T-Tool provides a framework for the effective use of formal methods in the early requirements phase. The framework allows for the formal and mechanized analysis of early requirements specifications expressed in a formal modeling language.
- ST-Tool
  - ST-Tool, the Secure Tropos tool, is a graphical tool where it is possible to draw Secure Tropos models and to perform the effective formal analysis of Secure Tropos specifications. The tool is written in Java with the swing components, and uses XML as its document format. Formal analysis is based on logic programming. ST-Tool allows to different systems based on Datalog to analyze Secure Tropos specification.
- J-PRiM
  - JPRiM is a tool in java that supports PRiM, a methodology that addresses i* modelling and analysis from a Process Reengineering point of view. J-PRiM allows to analyse an existing information system and to represent it as a hierarchy of i* elements. Once modelled, several alternatives for the system as-is can be explored, each of one modelled as a different i* model. All the generated alternatives can be evaluated by defining and applying metrics over the i* models in order to establish which is the most appropriate for the system to-be.
- jUCMNav
  - jUCMNav is a graphical editor for ITU-T's User Requirements Notation (Z.150). URN is composed of two complementary notations: the Use Case Map (UCM) scenario notation and the Goal-oriented Requirement Language (GRL). GRL is based on the i* and NFR frameworks. jUCMNav is an Eclipse plug-in that provides editors for both notations, links between both views, analysis capabilities (including GRL model evaluations), and various import and export formats.
- SNet Tool
  - Within this tool, the i* formalism is applied and extended in the context of a requirements engineering methodology to support inter-organizational networks. In particular, the tool provides an automatic transformation of graphical network representations (based on extended i*) into executable programs. Via this, network participants can simulate various network scenarios whose outcome may give valuable information regarding the risks and benefits of taking certain actions.
- DesCARTES
  - DesCARTES (Design CASE Tool for Agent-Oriented Repositories, Techniques, Environments and Systems) Architect a Computer-Aided Software Engineering (CASE) Tool developed by the Information Systems Unit (ISYS) at the Catholic University of Louvain (UCL). It is designed to support various models edition: i* models (Strategic Dependency and Strategic Rationale models), NFR models, UML models, AUML models in the context of Tropos and I-Tropos developments. DesCARTES is a plug-in for the Eclipse IDE (Integrated Development Environment). The originality of the tool is that allows the development of the methodology analysis and design models as well as forward engineering capabilities and an integrated software project management module.
- ADOxx-istar?
  - i* modeling on the ADOxx Meta Modelling Platform. University of Vienna, Open Model Initiative.
- I*-Prefer
  - I*-Prefer is a tool trying to uses goal and agent-based preference models to drive these decision making activities.
- IStarTool
  - A graphic editor that supports system modelling using the i* framework and also executes analysis for models of this framework.
- Measurer
  - A tool for defining and evaluating measures over i* diagrams.
- i* Modules
  - An extension of the jUCMNav 4.2.1 plug-in that supports module definition and operation.
- The RE-Tools
  - The RE-Tools is a model-based modeling tool that supports the i* Framework, the NFR Framework, KAOS, Problem Frames, and UML. All supported notations can be used together in an integrated manner, which means functional and non-functional requirements, agents, goals, softgoals, formal goals, and objects can be related as needed. The tool is implemented as a UML Profile that extends an open source UML modeling tool called StarUML. User models can be programmatically manipulated and reasoned about by external programs via APIs.
- GO-DKL browser
  - The GO-DKL browser is a a web-based interface designed to support a user including interesting goals and related design features from a goal-oriented knowledge base of scholarly material into his or her 'project model', which can then be exported to Open OME or analyzed in an interactive tree-list. It is still at a very early stage of development; feel free to contribute to the rough code at the project's github page. Visit http://www.designknowledge.org for more details and a demonstration.
- STS-Tool
  - STS-ml is a Socio-Technical Security modeling language for the specification of security and trustworthiness requirements of systems operating in a cross-organizational environment. The language is built on top of social concepts, such as role, agent, goal, delegation, authorization, etc. STS-Tool is the CASE tool for STS-ml, it is an Eclipse RCP application and supports multi-view modeling.
- CSRML Tool
  - CSRML Tool is a CASE tool that provides support to CSRML (Collaborative Systems Requirements Modeling Language), an i* extension for specifying CSCW systems requirements. Implemented as a Visual Studio 2013 extension with Visualization and Modeling SDK, this tool supports all the CSRML characteristics such us the specification of collaborative tasks with Workspace Awareness features, as well as the management of actors, roles and groups of uses involved in the system. Along with other features, this tool supports the automatic validation on the generated models, an integrated context-sensitive help system and automatic updates.
- BIM-Tool
  - BIM-Tool is an Eclipse RCP Application that supports graphical modelling and analysis with the Business Intelligence Model language. The tool supports graphical modeling as well as automated reasoning techniques of two types: "what if?" and "is it possible?".
- TAGOOn Tool
  - TAGOOn+ is a tool for the generation and integration of organizational ontologies that supports: 1) the automatic generation of organizational ontologies coming from models expressed with i*, Tropos and Service-Oriented i*, and 2) the automatic integration of those organizational ontologies with generic or domain ontologies.
- WebREd Tool
  - WebREd-Tool is a Model-Driven Tool conformed by a set of Eclipse plugins that have been developed to assist the designer in the early phases of a Web application development process. With the WebREd-Tool, the designer can specify the Web application requirements by using the i* goal-oriented framework. The WebREd-Tool assists the designer to compare different configurations of functional requirements, while balancing and optimizing non-functional requirements.
- i*-REST
  - i*-REST is a set of web-services that allows creation/modification and visualization of i* SD models over a RESTful web API.
- E4J
  - E4J: Editor for JGOOSE is a graph editor to support goal-oriented and/or agent-oriented modeling.

Motivation

- Optimize development of iStar tools
  - user viewpoint *VS* developer viewpoint
  - iStar tool functionality *VS* iStar tool development technologies

JavaScript

EMF/GMF

Adobe Flex

- Objective: help researchers make informed tradeoffs
  - understand (common) challenges in iStar Development
  - understand tradeoffs among different development technologies

Tool Examinations

- Selection of tools
  - OpenOME
  - MUSER
  - Leaf-family tools

- Focus of examination
  - features
  - architecture, design, and used technologies
  - pros and cons

OpenOME

| Examined	Results
Features	1. Graphically create iStar models 2. Forward and backward interactive, qualitative iStar analysis 3. Import and export iStar models in multiple formats (iStarML, Q7, etc.)
Architecture, design, and used technologies	1. Eclipse-based tool 2. EMF/GMF framework 3. SAT Solver
Pros and cons	+ Automatically generate code from a metamodel + New code packages can be easily added - Automatically generated code is entangled with customized code - Heavy installation

MUSER

Examined	Results
Features	1. Graphically create three-layer goal models 2. Semi-automatic security requirements analysis across three layers
Architecture, design, and used technologies	1. OmniGraffle 2. AppleScript 3. Java 4. Datalog
Pros and cons	+ Loosely-coupled architecture + Inherit good usability from OmniGraffle - Depend on commercial applications - Function only in Mac OS

Leaf-Family Tools

Examined	Results
Features	1. Graphically create iStar models 2. Combine creativity techniques with iStar modeling (Creative Leaf) 3. Model and analyze evolution of goal models over time (GrowingLeaf)
Architecture, design, and used technologies	1. Web-based tool 2. JointJS and Rappid framework 3. JavaScript, CSS, HTML
Pros and cons	+ Lightweight tool with less code + Installation is trivial - No metamodel support - It is difficult to be compatible with all browsers

Analysis Model
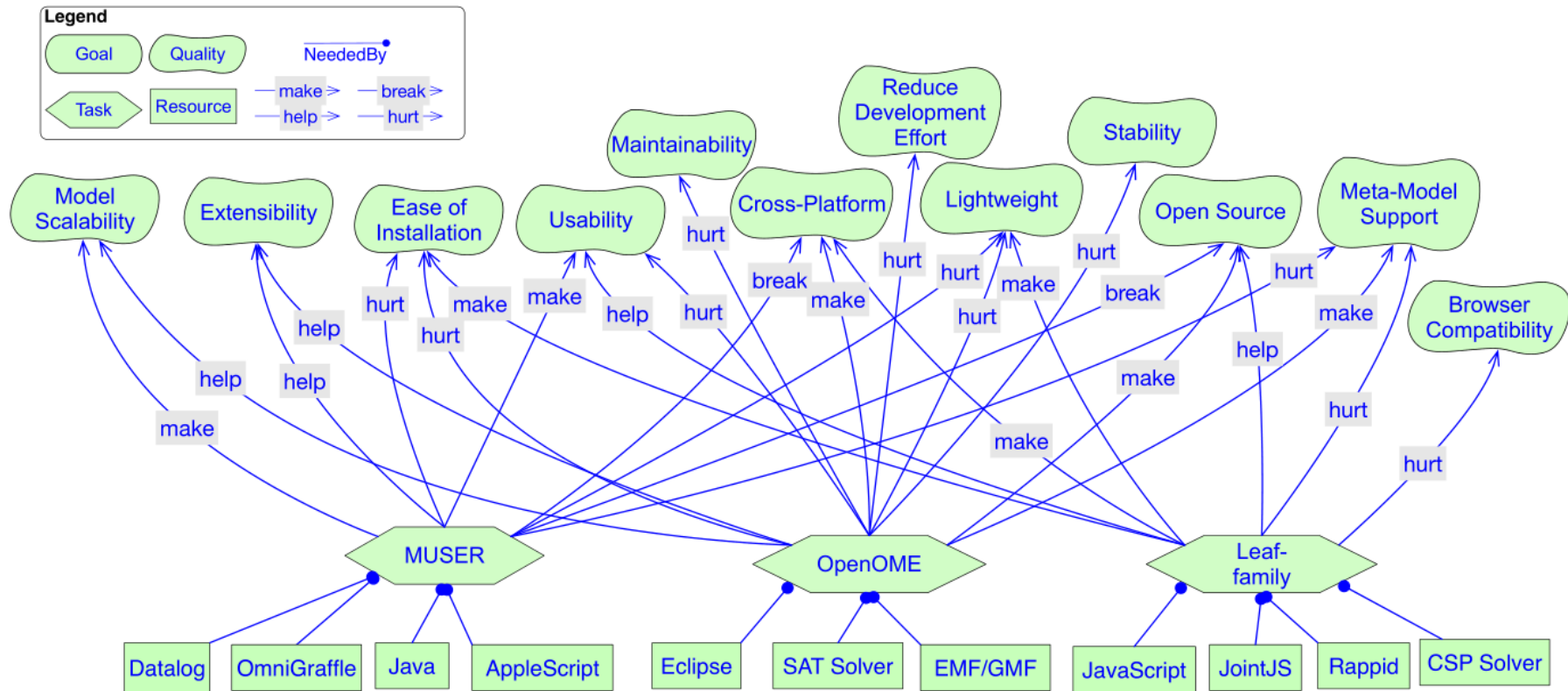
Conclusions

- Help researchers make informed tradeoffs

- Examine three iStar tools

- Establish an analysis model for tool development

- Create a discussion in the iStar community about tool development, sharing, and reuse

Future Work

- Study further iStar tools
- Mine further development knowledge
- Evaluate our research with potential tool developers

Thank You!

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