Tutorial: Discourse Models for Interaction Design

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ABSTRACT

Any non-trivial graphical user interface (GUI) for human-computer interaction needs to be designed before it is actually created, whether it is a GUI for the Web or otherwise. Actually, the interaction supposed to be supported by the GUI needs to be designed first, in the course of *interaction design*. For representing such a design, we propose to use *discourse models* that we devised. This tutorial also explains how discourse models can be used for *automated GUI generation*. Since the usability of fully-automatically generated GUIs is still not satisfactory, unique *customization techniques* are explained as well.

Keywords: Interaction design, Discourse models, Automated GUI generation, Customization

OBJECTIVE OF THE TUTORIAL

This tutorial has the primary objective that participants will learn about an open and fully implemented approach to model interaction design with *discourse models*, which are at the highest level of the Cameleon Reference Framework, i.e., the Tasks & Concepts Level. These models focus on the specification of (classes of) dialogues in contrast to tasks for modeling activities that can be performed by the user or the application (system). Participants will also get an overview of both automatically generating and customizing GUIs.

CONTENT OF THE TUTORIAL

The content includes *Communicative Acts* as the basic elements, as well as *Adjacency Pairs* and *RST relations* for constructing the discourse models using these elements. It also includes an iterative-incremental process of user-interface generation using such models. This process also includes *customization*.

TUTORIAL OUTLINE

- *Introduction*
  - Brief introduction of the tutor
  - Brief introduction of the participants
  - Motivation and overview

- *Background*
  - Interaction design
  - Ontologies
  - Speech acts
  - Conversation Analysis
- *Interaction Design based on Discourse Modeling*
  - Discourse example
  - Communicative Acts
  - Adjacency Pair
  - RST relations
  - Conceptual Discourse Metamodel
  - Exercise: Understand given model
- *GUI Generation*
  - Generation of Structural UI Model
  - Generation of Behavioral UI Model
  - Weaving of structural and behavioral models
  - Optimization for tailoring to device
  - Process of user-interface generation
  - Examples of generated user interfaces
- *Customization*
  - Custom rules
  - Custom widgets
- *Conclusion*

DESCRIPTION

This tutorial is a combination of lectures, group discussions and exercises.

In the short *Introduction*, it turned out to be useful in the past to have all the people in the room briefly introduced. In particular, it is good to know the particular background and expectation of each participant, so that it becomes possible to focus parts of the following presentation on them. Then it also becomes easier to motivate the tutorial and to provide an overview.

Still, the group will not share the same *Background* required for digesting the subsequent material. So, very basic statements on underlying themes help in this regard. For this particular tutorial, sharing an essential view on *Interaction design* is important. *Ontologies*, *Speech acts* and *Conversation Analysis* may not necessarily be known by some participants at all, but these may not be ready to reveal that and ask. Therefore, it is important to say a few words, also on the historical background.

After that, the ground will be paved for the core material on *Interaction design based on Discourse modeling*. It starts with an example Discourse Model and its essential explanation by the tutor. Then the basic building blocks of such models, *Communicative Acts* (as a generalization of Speech acts), are explained, and the set of concrete ones is presented in some detail, always including examples. The Communicative Acts are connected via *Adjacency Pairs*, so that dialog structures can be modeled. Adjacency Pairs, in turn, are connected via *Rhetorical Structure Theory (RST) relations*. These are also explained, of course, as well as the set of RST relations adopted for discourse

modeling, always including examples. In addition, *Procedural constructs* are introduced, which serve for convenience in modeling the flow of a discourse. Based on all these building blocks, the *Conceptual Discourse Metamodel* can be explained, followed by another example of a Discourse Model, and an *Exercise* on interpreting the third overall example of a Discourse Model, this time by themselves.

Based on that, this tutorial explains how GUIs can be generated automatically and, in this course tailored to different devices (as specified). The tutor presents a *Sketch of automated user-interface generation* from such Discourse Models and Domain-of Discourse Models related to Ontologies (plus another kind of model and a device specification not treated in detail in the course of the tutorial).

This presentation includes a *Process of user-interface generation*, including its essential steps such as automated optimization for tailoring to a given device. It defines iterations dedicated to adding increments to the source model for automated GUI generation. This process is inspired by iterative and incremental software development. Still, this defined process only covers the inclusion of automated GUI generation and is, therefore, only a fragment of a comprehensive interaction design process. Finally, *Examples of generated user interfaces* are presented, in particular for a widely used smartphone.

This tutorial also shows how *Customization* can be integrated into such a generation approach, i.e., an adaptation of a generated GUI for the case at hand. These adaptations are supported through *custom rules* and *custom widgets* for making the changes persistent for re-generation (without any extra effort), in contrast to a manual modification on a lower level or even in the GUI code. Custom rules have absolute precedence over the other competing transformation rules in the course of the optimization search, which are not further investigated during this search. In addition, our approach provides the designer with the possibility of including custom widgets as alternatives to the widgets given in the specified toolkit.

Finally, a *Summary and Conclusion* wraps up and makes a few statements to carry home.

The references to papers published by this tutor given below cover this material.

TARGET AUDIENCE

The target audience can be students or educators primarily of software or systems engineering, or information systems. They can also be practitioners creating software, embedded systems or information systems with a user interface.

BIOGRAPHY OF PRESENTER

Hermann Kaindl is the head of the organizational unit entitled "Software-intensive Systems" of the Institute of Computer Technology and a Vice Chairman of the Senate at TU Wien. He joined this institute in early 2003 as a full professor. Prior to moving to academia in early 2003, he has gained

nearly 25 years of industrial experience in require-ments and software engineering as well as human-computer interaction at Siemens Austria. Kaindl is a *Senior Member* of the IEEE and a *Distinguished Scientist* Member of the ACM.

He has previously held more than 70 tutorials, e.g., at RE'03, CADUI-IUI'04, RE'04, INCOSE'05, AAAI'06, OOPSLA'06, IFIP Interact' 7, OOPSLA'07, RE'08, IFIP Interact'09, ACM EICS'10, AAAI'11, RE'11, ACM CHI'12, BCS HCI'12, ACM SAC'13, IEEE APSEC'13, HICSS'14, ACM SAC'14, RCIS'15, RE'15, SMC'16, APSEC'16, RCIS'17, eics'17, ER'17, CAiSE'18, RE'18, ACM SAC'19, RE'19, SPLC'19, RE'20, SPLC'20, IUI'21, RE'21, SPLC'21 and ASE'21.

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