

Dialogue-based design for Multi-channel interactions

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1. Introduction and Motivation

Lightweight design processes and usable methodologies are increasingly being recognized as “must” requirements for effective design of complex interactive applications. In particular, these requirements imply different factors:

- It must be easy to teach the design methodology and model to someone (a practitioner, especially): professionals do not have time and resources to invest for learning new methodologies; one of the success factors of “Entity Relationship” (probably the most successful design model, ever) stems from the fact that it was very easy to transmit its basic concept.
- It must be possible to use the design model for brainstorming and for discussing ideas (among developers, with stakeholders, with possible users, etc.): it is of little use to have a design methodology (model) capable of representing only fully developed solutions.
- It must require little time to write down design ideas: developers do not like to spend too much time in preliminary activities.
- It must be possible to move, smoothly, from a general design, to more detailed design, without need for excessive reworking and without need for completeness; in other words, even an incomplete design document must be useful and understandable.

Other factors could be added to the above list. That is enough to explain some of the motivations behind this paper: the complexity and the “richness” of the design model is not what we are aiming for. Simplicity and “usability” of the design model itself is our goal.

At a first glance, there is apparently no need for further design models and/or methodologies. In fact, as it will be discussed in the next section, the literature about design models is abundant (OOHDM, HDM, WSDM, OO-H, EORM, WebML, UML WAE, and others).

However, besides the technical differences which distinguish current design models, they all share a common feature: they are based upon an *information-navigation paradigm* to describe the user interaction. This legacy is simply due to the conceptual background underlying the origins of the World Wide Web, which is derived from the Hypertext and the Data Base field: a network of links interconnects pieces of information (nodes). In this scenario, it should not surprise that the nature of the technology available strongly influenced (if not determined) the concepts used to describe, design and evaluate the applications (such as nodes, units, information pieces, entities, slot, links, classes, etc.).

Detaching for a moment from the technological mechanisms underlying the application, we argue that it is possible to express the features of the communication between the user and an interactive application in terms of a *dialogue*, and not in terms of data structures. If this interaction is a sort of dialogue, designers should conceive and craft dialogues and dialogue strategies, and only *then* derive a sound information architecture.

2. Dialogue-based design

The idea of describing man-machine communication as a dialogue is not new. Human-Computer Interaction research has been for long assumed that using an interactive application establishes a sort of *dialogue* between the use and the application. But what

sort of dialogue is it? What are the rules of this dialogue? How does it relate to human-human dialogues? How can existing linguistic (rhetoric) theories and methods help us in shaping more effective designs? How can dialogue-based methods help us improve the quality of interactive application design?

The research project WED (Web As Dialogue, Swiss National Research Fund – FNSRS 105211-102061/1) [1][2][3] focuses on these and other issues which have both a practical and theoretical implication. In particular, the pragmatic motivations for the WED research can be synthesized as it follows:

- a) Improving the quality and effectiveness of web applications, by “importing” dialogue techniques and patterns that have been proved to be effective for human-to-human communication.
- b) Improving the efficiency of the web design process by borrowing dialogue-based structuring techniques.
- c) Creating methodologies for web design based upon linguistics, in order to make them more suitable for designers with non technical background (i.e. graduated in classic studies, in art or literature, philosophy, etc.).
- d) Being able to provide dialogue-based (rather than graphic interface based) Web applications useful (effective) for users with visual disabilities.

If an interactive application establishes a dialogue, the application itself is a “dialogue generator”, meaning that it serves for the actualization of a (limited) number of possible dialogues. Therefore, instead of conceiving an interactive application in terms of information structures and navigation functionality, the project is exploring the concrete possibility of using dialogic primitives to express the design of a complex interactive artefact.

3. C-IDM conceptual design (Channel-independent)

Looking in this direction, thanks to a tight collaboration between linguistics researchers, design practitioners and communication experts, one of the WED first results is the definition of IDM (Interactive Dialogue Model), a design model entirely based on dialogue primitives.

Having a design model closer to the nature of the dialogue between the user and the system also meets our aim to keep the design process “light” and effective.

In fact, the conceptual model of an “information intensive” dialogue to be supported through an interactive application (neglecting the problem of performing operations, that for the time being, as we have said, it is outside of our scope) must convey the following aspects:

- A. What is the overall content?
- B. What is the overall organization of the content?
- C. How can the user access the content and browse through the fragments of the dialogue?

While precise answers can be provided only when a specific channel of delivery has been chosen (determining factors like screen size, pointing mechanisms, available media, etc.), important decisions can be taken in advance.

What we call “conceptual model” of an interactive application is the possibility of defining the “communication strategy” and the overall interaction pattern of the potential dialogues with the user, before digging into details depending on technical issues.

In essence C-IDM, based on linguistic analysis of dialogues, is based on a few simple ideas. In a dialogue we can have a few simple situations: the machine is illustrating a “topic” (e.g. a “print”, or a technique”); while being presented a topic the user may ask to switch to a “related topic” (e.g. switching from a print to the technique used for it); the user always starts a dialogue from a selected “group of topics” (e.g. “the masterpieces”, or “the prints dealing with sickness”) and then browse within the group.

With the above simple dialoguing concepts we are able to explain what happens in most information intensive web (or interactive in general) applications, at the exception of operational services, not being considered for the time being.

The above simple ideas have been translated into the C-IDM design primitives that we list below.

Topic: something that can be the subject of conversation between the user and the interactive application. “DRYPOINT” (a technique for prints), “THE SICK AN THE CHILD” (a print by Munch), “INTRODUCTION TO MUNCH” are example of topics, i.e. possible subjects of a dialogue between the user and the application.

Kind of Topic: the category of possible subjects of conversation. “technique”, “print” are kinds of topic. “DRYPOINT”. is an example of “technique”.

Change of Subject (or Relevant Relation): it determines how the dialogue can switch from a kind of topic to another one. “made with” is a possible change of subject relating any PRINT to one TECHNIQUE.

Group of Topics: it determines a specific group of topics, possible subject of conversation. MASTERPIECES is a specific group of PRINTS, while ALL_PRINTS is another, larger, group.

Multiple Group of Topic: it determines a family of group of topics. It could be nice, for example, to group the prints according to the themes, sources of inspiration for Munch. All the prints of the same theme are a group of topics; “prints by theme”, overall, is a family of groups of topics (as many as there are themes). Each multiple group of topics has a corresponding “higher-level” group of topics (e.g. “all themes”), which allows to select the specific group of topics of interest (e.g. “prints about theme “sickness”).

As we have said in the introduction, design documents, we believe, do not need to be always complete. Designers often want to negotiate strategic decisions and document those decisions, without being forced to commit on premature details early in the development.

In many situations design documents can be left “unfinished”, still fulfilling their role of conveying most of the ideas about the application. Even with the enrichments above indicated a conceptual design document can be kept very simple, easy to write and effective for the reader.

4. L-IDM: logical design (channel-dependent)

In particular, starting from C-IDM, logical design for a specific channel may be defined by exploring the following lines of inquiries:

- a) What is the detailed dialogue strategy for communicating the content about a topic or a kind of topic? This concern involves two aspects to be considered:
 - How the content of a topic can be structured into atomic units of dialogue? For example, when talking about a print, how should the content material for a print be split into pieces (or nodes) meaningful for the user to consume?

- How these units of dialogue are organized within each topic? What is the first thing to say about a topic? And then, how can the user explore the other units of content concerning the same topic?
- b) How and when should a change of subject happen within a dialogue?
- c) How does a group of topic organize the access to the topics of the conversation?

Answers to these questions may lead to design decisions which can be expressed by the following L-IDM design primitives:

Dialogue Act: a unit of the dialogue within a topic. The content of a topic is split into dialogue acts, each one containing a meaningful piece of content. For the web channel, the content of the kind of topic “Print” could be split into the dialogue acts such as “introduction”, “big image”, and “description”. A dialogue is basically the turn of the dialogue on behalf of the application.

Structural Strategy: the way in which the user may browse the dialogue acts of a topic. For topic and kind of topic, the designer has to decide which dialogue act has to be told first (**Default Act**), and which is the interaction pattern by which the others may be accessed.

Transition Act: in case of change of subject where the target topics of the dialogue are more than one, an intermediate transition act should be defined to allow the user to select the destination topic of interest among the ones proposed. For example, from “Technique” - Used for: List of Prints of the same technique.

Transition Strategy: the way in which the user may browse the target topics after a change of subject. After having been told about the transition act “list of prints made by technique X”, the user select one print, and then gets the list of print again to select another print, and so on. This is a possible transition strategy.

Introductory Act: a group of topics should have a way to introduce the user to the topics belonging the group and letting her start to dialogue about this topics. To this end, each group of topic has associated an introductory act, which serves two main goals: introduce the user to the topics of the group (e.g. an introduction to Munch’s masterpieces selection for the group of topics “masterpieces”) and provide pointers to masterpieces for the user to select. Introductory acts are the unique starting points for the dialogue.

Subject Strategy: the way in which the user may browse within topics of a group. After having been told about the introductory act “masterpieces”, the user select one print, and then can go directly to the next masterpiece of the group and then to the next, and so on. This is a possible subject strategy.

Multiple Introductory Act: it is an introductory act corresponding to a “Multiple Group of Topics”.

Whereas the conceptual map represents the utmost degree of interactivity potential (resembling the richest channel of the ones available, such as the web for example), the L-IDM design defined a subset of interactions which are sound and suitable for the channel at issue.

On the basis of our project experience, the common activities which can be done to specialize the conceptual map into a “channel-dependent” version are the following:

- Dialogue acts or entire topics may be removed
- Relevant relations may be removed
- Groups of topics may be removed or simplified

Based on the results of these decisions, the design is refined without totally changing the overall dialogue pattern. In fact, the user should perceive that s/he is dealing with the same application across different channels. We should in fact solve the trade-off between a unifying user experience and the constraints imposed by each specific channel.

On the basis of the results of the L-IDM map, the model provides guidelines for assembling the dialogue elements into page types corresponding to the different types of dialogue act.

A running example of application designed on the principle of IDM and which is available on different channels (visual web for sighted users and oral version for blind users) can be visited at www.munchundberlin.org [4]. For listening to the oral version, a common screen reader can be used.

References

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