Structured Design and Construction of Hypermedia Application

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ABSTRACT

This briefing focuses on design and development of WWW systems. I will present the principal elements of the Relationship Management Methodology which aids in the design and development of WWW applications. RMM will be introduced via a sample application. I will also, simultaneously, demonstrate a software tool, RM-CASE, that provides computerized support got RMM.

Keywords: Hypertext, Hypermedia, Relational Database Display, Design methodology, Design guidelines, Entity-Relationship Diagrams

1. MOTIVATION

The apparent simplicity of WWW design and development can be deceiving. Although the initial stages are relatively simple to handle, once a site begins to grow, the simplicity rapidly disappears. The design turns complicated, and the application becomes unstable as new information is added and links are relocated. The Relationship Management Methodology *(RMM)* [Isakowitz et al. 95] encourages solid design principles which enable the constriction of scaleable sites. In this briefing, I will illustrate how to approach the design of a WWW site in practical and effective terms. I will also demosntrate a sofwatr tool, RM-CASE [Diaz et al. 95] that supports RMM design.

2. The Relationship Management Methodology (RMM)

The *Relationship Management Methodology (RMM)* addresses the design and construction of hypermedia applications.

2.1 Methodological Steps

RMM consists of the following seven steps, some of which can be conducted in parallel: (1) *Entity-Relationship design*: models the information domain and its relationships, (2) *Slice design*: how information units are sub-divided for display, (3) *Navigational design:* how users will access information, (4) *User-Interface Design:* how information will be presented, (5) *Protocol Conversion Design:* how abstract constructs are to be transformed into physical-level constructs, e.g., what kind of WWW page corresponds to an index, (6) *Run-time behavior:* how to populate the application with data, and (7) *Construction and testing.*

Although first presented as a linear methodology RMM was conceived to be flexible by supporting rapid feedback loops as prescribed in [Nanard and Nanard, 1995]. Research in this direction has been embodied in software design tools presented in section 4.

2.2 The RMDM Data Model

The Relationship Management Data Model (RMDM) is the cornerstone of the RMM methodology. Figure 1 presents its elements. RMDM includes elements for representing information domain concepts (such as entities and relationships), and navigation mechanisms (such as links). An application's design is described via an RMDM diagram (see Figure 2 on page 3). The RMDM model is based on the Entity-Relationship model [Elmasri and Navathe, 1990], and on HDM [Garzotto, Paolini and Schwabe 1993] and HDM2 [Garzotto, Mainetti and Paolini 1996]. RMM groups attributes into *slices* (the symbol for a slice resembles a pizza slice).

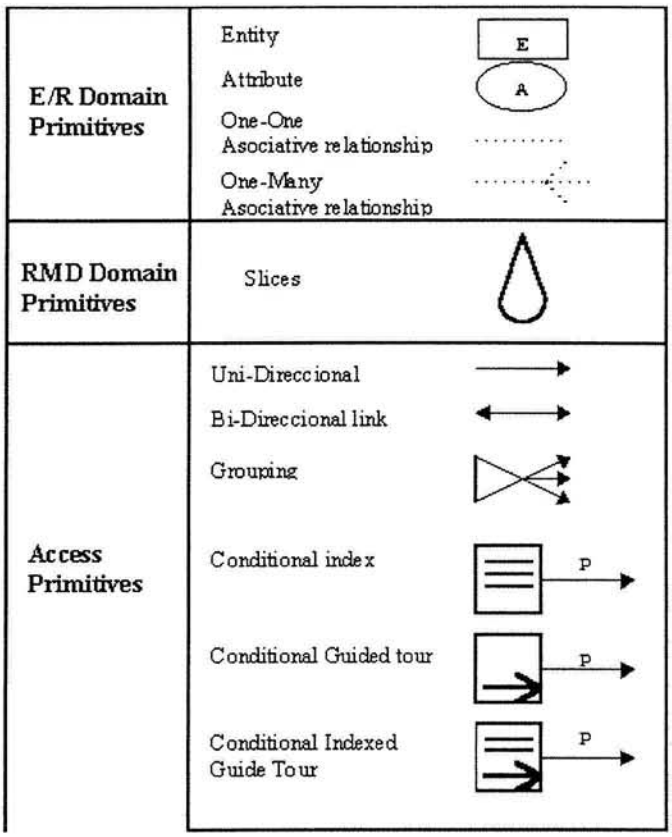

Figure 1: The elements of the RMM Data Model (RMDM)

RMDM specifies navigation via the six access primitives at the bottom of Figure 1. RMDM's most significant access structures are *indices, guided tours, indexed guided tours* and *groupings*. An index acts as a table of contents. A guided tour implements a linear path through a collection of items allowing the user to move forwards or backwards on the path. Indexed guided tours combine the functionality of indices and guided tours. Logical conditions qualify these access structures. For example, a condition "type=**panel**" attached to an index into a *conference_event* entity denotes an index to panels from that conference. The grouping mechanism serves as a major access gateway to other parts of the system, as often found on many applications' home pages or initial screens.

2.3 A Sample Application

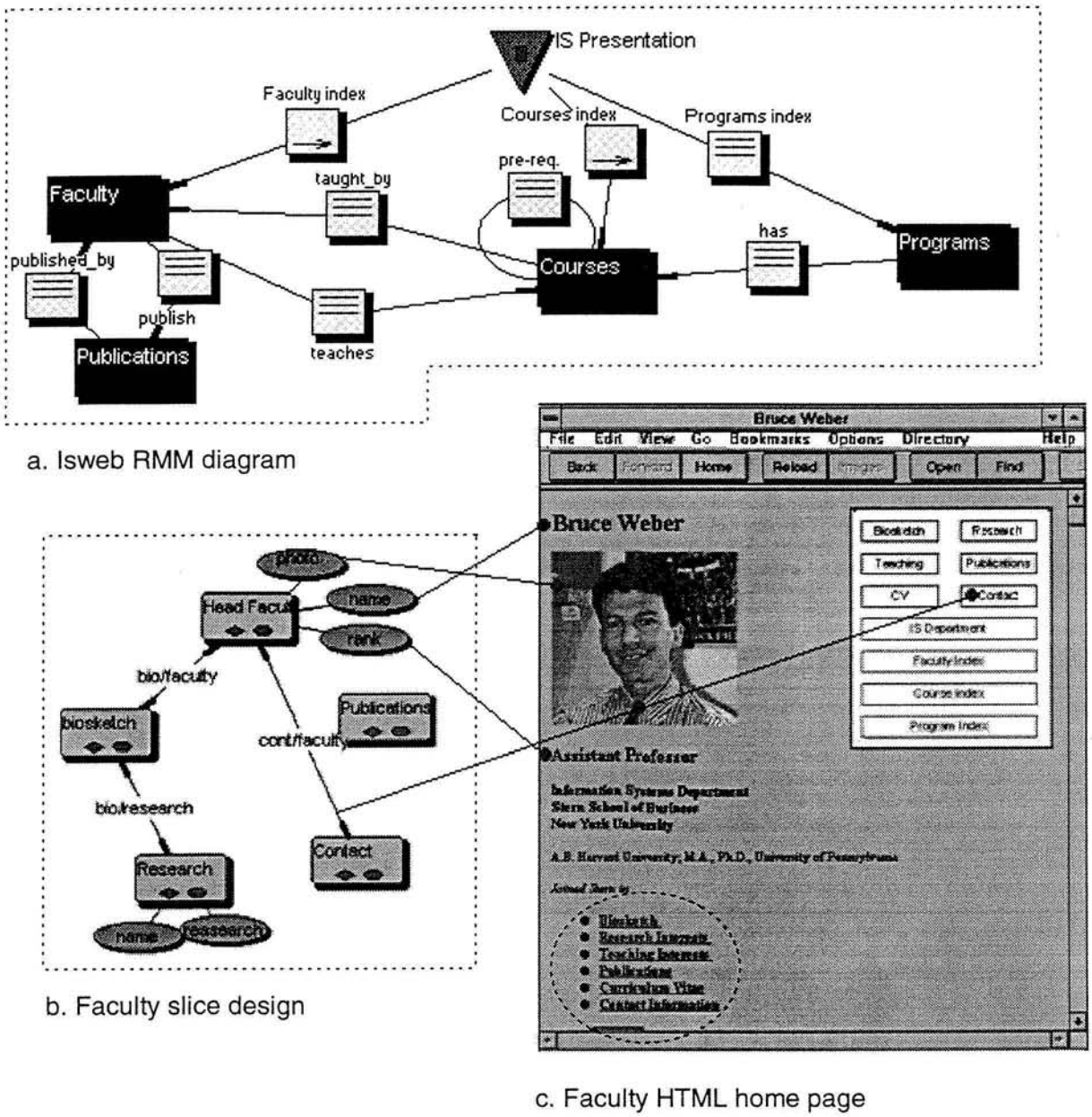

Figure 2: The RMD diagram for the ISWEB application

The ISWEB application [http://is-2.stern.nyu.edu/] is a WWW site for the Information Systems Department at the Stern School of Business. The application contains information about faculty, courses, research and other academic activities. Figure 2a shows an RMD diagram for the ISWeb. In contrast to an entity-relationship diagram that represents the design of a database, an RMDM diagram describes how users will navigate a hypermedia application. At the top of Figure 2a the grouping mechanism "IS Presentation" implements a sort of main menu'. Access into the *Faculty* and *Courses* information is provided via guided tours; access into *Programs* by means of an index. On choosing the guided tour to the

Faculty entity, the user can move back and forth among all faculty members (ordered alphabetically). There is a conditional index from the *Faculty* entity into *Courses* with predicate *teaches(F,C),* The predicate indicates that only those entity instances of *Course* whose teacher is F participate in the index. The button *Course Index* in the Figure 2c represents the possibility to navigate from a *Faculty* to his/her *Courses* The reciprocal index *taught_by(C,F)* can be accessed from *Courses*.
Figure 2b shows the *Faculty* head slice design and some of the entity attributes. The rendering in a Netscape browser of the HTML implementation is shown in Figure 2c, where the buttons appear within the rounded dashed area.

3. CHARACTERISTICS OF RM-CASE

Currently under development, RM-CASE is a CASE tool for the design and development of WWW applications that supports RMM set of contexts called *work contexts.* Contexts correspond roughly to RMM's methodological steps. I will use RM-CASE to illustrate the design process, as depicted in Figure 3, which shows the design steps in the design of the ISWEB application described above.

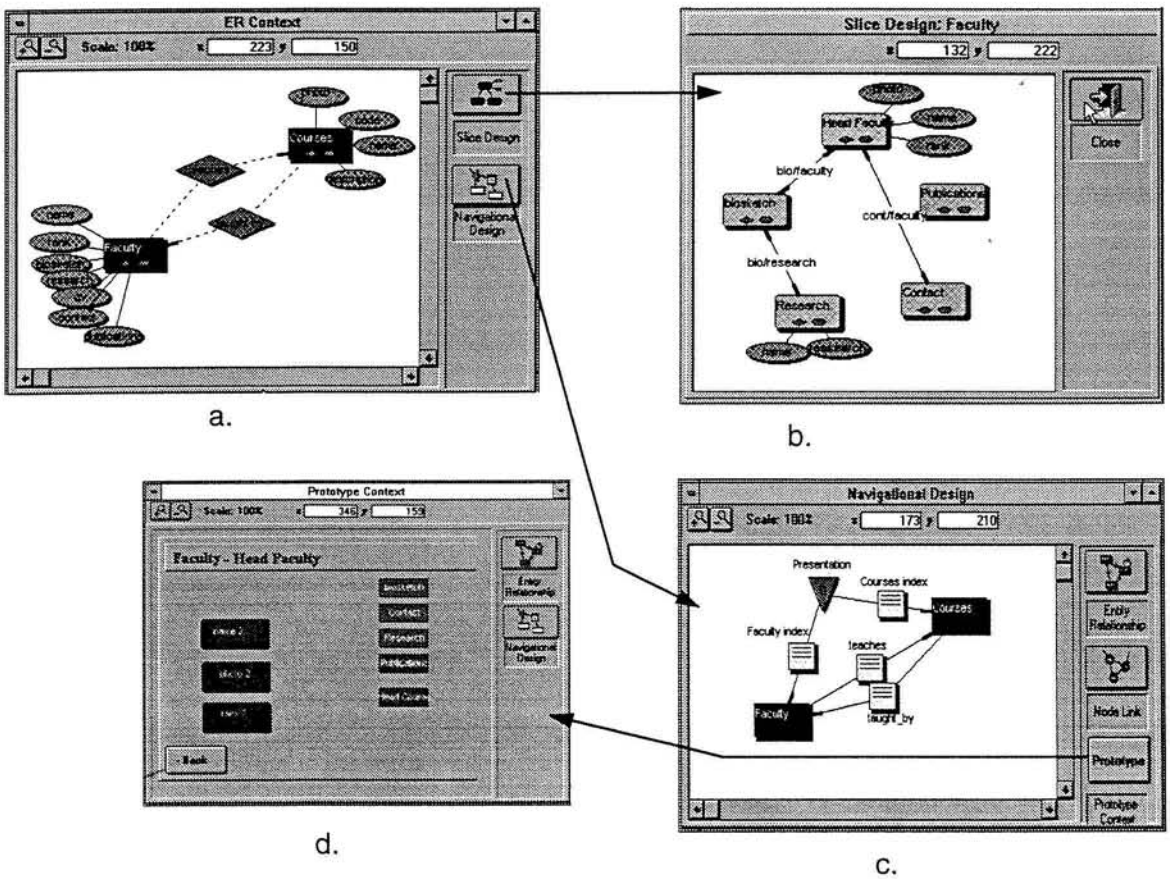

Figure 3: Contexts in RM-CASE's prototype. (a) The E-R context supports E-R design activities. (b) Slice design context. (c) The faculty-Course navigational design. (d) The prototype of the Faculty head slice

4. SUMMARY

This briefing will explain the RMM methodology and its application to the design of common WWW sites. A demonstration of a prototype tool will compound the presentation of the methodology. I expect the audience to gain from (a) exposure to the method, and (b) from seeing the RMCASE software tool in action.

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