

Introduction to GRACE Deliverable 2.1: Taxonomy of HCI Systems

This deliverable contains 9 papers and a software application (21-8, described in 21-9). Together with the joint paper with Annick Bertels, Leuven (D101-3), this deliverable comprises CCI's contribution to the work done in the first year of GRACE. The problem context and contents of the papers have been provided in the GRACE M1 PPR, *Task 2.1, HCI Taxonomy. Summary of Work at CCI*. What follows here is a short 'reader's guide' to the deliverable, each paper having already been provided with a summary. Two of the papers (21-4 and 21-10) have been selected for presentation at a workshop in August 1993 and will appear in the Proceedings; two others (21-2 and 21-3) have been submitted to journals; and the taxonomy workbench (21-8) was demonstrated at *InterCHI '93* in Amsterdam.

21-1 (Bernsen: *Matching information ...*) provides a 'walkthrough' of the GRACE research agenda using well-known unimodal and multimodal graphical interface representations as examples. The aim is to demonstrate the potential usefulness of the information-mapping goals of GRACE. By implication, the paper points to the need for a fundamental and systematic approach to the GRACE research agenda, different from the approach adopted in the paper itself.

21-2 (Bernsen: *Foundations of multimodal ...*) attempts to demonstrate that such a fundamental and systematic approach, at least as far as the analysis of output modalities is concerned, is feasible as the problem space exhibits sufficient structure for a stepwise implementation of the agenda.

21-3 (Bernsen: *Specificity and focus. ...*) addresses one of the foundational tasks identified in 21-2, i.e., that of analysing in depth the relationship between analogue and linguistic representations of information.

21-4 (Bernsen: *A research agenda ...*) proposes a research agenda for the field of modality theory based on the GRACE agenda. Modality theory, it is argued, bridges between basic science (formal and cognitive semantics, discourse theory, cognitive psychology, computer science and system modelling) and usability engineering interface design practice, and seems irreducible to any other known research paradigm. The field addresses partly or wholly new problems which arise because of recent progress in IT systems and interface technologies. At the same time, many of the problems of modality theory are closely related to long-standing issues in basic science and might be expected to put these in a fresh light.

21-5 (May: *Representations and homomorphisms. ...*) addresses some of the basic conceptual problems in GRACE and puts them in the context of logical semiotics and cognitive semantics. The paper argues for a constructive conception of the 'semantics' of representations in the sense, that what is needed for design purposes in HCI is to understand the construction of meaning that is assigned to diagrams and other multimodal representations, when they are interpreted by human agents.

21-6 (May: *Levels of representations ...*) takes a 'simple semantic types' approach to the analysis of output representations, and an operational structure for the semantic

types is introduced using lattice theory. The paper constitutes the type-level or atomic-level contribution to the stepwise implementation of the research agenda defined in 21-2.

21-7 (May: *From semantic types to ...*) illustrates how the approach described in (21-6) allows the analysis of some well-known multi-modal output representations.

21-8 (May and Bernsen: *Taxonomy Workbench*) is a database tool programmed in OMNIS 7 and designed to assist research in the GRACE project by (a) setting up a common database of examples (of representations in different modalities); (b) assisting the description and classification of these examples according to different assumptions about their modalities; and (c) making thought experiments possible, e.g. testing different hypotheses about features of the modalities and their interrelations. Shijian Lu, a Chinese geographer, assisted in finding examples to be scanned and inserted into the database. Examples scanned at HCRC have also been inserted. The workbench is expected to become an important tool during the next two years of GRACE when it will be used to classify a large number of samples of output modalities and interface types according to the CCI taxonomy.

21-9 (May and Tobin: *The Taxonomy Workbench. ...*) describes 21-8 as well as the implementation of a similar tool establish at HCRC, and some common lines of future development are indicated.

21-10 (May: *Taxonomy and levels ...*) takes a first step in addressing GRACE research agenda item 2, i.e. the conceptualisation of complete input/output setups for task performance, by distinguishing a number of levels of analysis of interface presentations. The levels and mappings introduced in 21-6 in order to differentiate different kind of design choices with regard to representational issues, are here explained from a *methodological* point of view. The methodological point is to capture all the levels of the interpretation, where something could “go wrong” for the enduser, and look at these levels as corresponding to design choices.