A Support Tool for Writing Multilingual Instructions*

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Abstract

Multilingual instructions generation has been the object of many studies recently motivated by the increased need to produce multilingual manuals coupled with the cost of technical writing and translating Ihese studies concentrate on the *automatic* generation of instructions leaviDg technical writers out of the loop In many cases, however it is not possible to dispense with human intervention entirely, for at least two reasons First, the system must be provided with a semantic knowledge base from which the instructions can be generated Second, it is the technical writers who have the expertise necessary for producing instructions appropriate for a specific product or company and it is not necessarily an easy task to make this expertise available to a system The results of a requirement analysis stud} confirm the view that the moat useful tool is not a stand-alone writing tool but rather one that supports technical writers in their task In this paper, we describe Buch a support tool which wc developed based on the results of our user requirement analysis

1 Introduction

The automatic generation of instructional texts has been the object of many studies recently, motivated by the increased need Lo produce manuals coupled with the cost of technical writing, the time required to produce documentation, and the potential flexibility offered h> the automatic generation of instructions Researchers have concentrated on designing methods for integrating graphics and text, e g , [Wahlster *el at* , 1993, Feiner and McKeown, 1990], and for tailoring instructions to the user s level of expertise, e g , [Peter and Roener, 1994] At a more linguistic level of concern others have studied various ways of realising purpose expressions in English, e g [Vander Linden 1993] and of generating appropriate referring expressions, e g [Dale, 1992] More recently there has been an emphasis on the generation of multilingual instructions e g [Rosner and Stede, *1991,* Kosseim and Lapalme, 1994] The latter is not entirely surprising since multilingual manuals are important not only for European manufacturtrs, who are required to produce manuals in the language of the end-user, but al60 for other multinational companies whose overseas sales are reporled to constitute over half of their total sales Multilingual generation is also more appealing than monolingual generation followed by translation because (1) the texts can be generated in several languages simultaneously rather than waiting for the translation process, (2) the underlying knowledge being expressed in monolingual instructions can be used to generate instructions *m different languages,* and (3) generating directly from the underlying knowledge base can produce more natural texts as the output text 16 not constrained by a source text

Most of the prototypes developed so far are intended to be used as stand alone tools leaving the technical writers out of the loop The> assume that an underlying knowledge base containing all the information necessary to produce instructions (or documentation) is already available to the generation system, or can be easily obtained However, this is unlikely in the near future Generating texts from an underlying knowledge base is indeed a very knowledge intensive task Furthermore, this knowledge base must contain user-oriented information, as user-oriented documentation is recognised to be more effective than product-oriented documentation Such information concerns the goals of the user and the ways in which the product can be used to achieve these goals It is not always available from the design specification of the product Consequently, it needs to be entered by hand, a task which is neither simple nor straightforward In addition, most companies have specific house-styles', these are not always set out in the form of detailed and explicit rules but tend to be tacitly learnt by technical writers For all these reasons, the expertise of technical writers might not easily be embodied in a computer system

Available evidence thus suggests that it would be desirable at this point to provide a *support drafting tool* (as opposed to a stand-alone writing tool), recognising

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that it would need to be integrated into the technical writers' wider working practices Such a Lool would not be intended to bypass the human authors but would rather help them in their task by automatically generating drafts in several languages Our first step towards developing such a tool was to conduct a user requirements analysis, identifying the wider environment in which the proposed tool would be used Based on the results of our Btudy, we have developed DRAFTER, a drafting tool intended to be used by technical writers in producing multilingual instructions Our current domain of application is software manuals In this paper we bncfiv describe the results of our user requirements analysis, present the resulting DRAFTER architecture, and, finally, illustrate the system with an example of how a ttchnical writer might work with DRAFTER We give examples for creating multilingual instructions for the Open Windows Calendar Manager

2 The User Requirements Analysis

To study the technical writers needs, we conducted interviews with technical authors, (mostly software documentation specialists), both In-houst and fret lance The discussions covered a range of issues from overarching constraints of time and budget to the areas of the job perceived as interesting, difficult etc The authors explained the succession and timing of the processes in the documentation task, and their coordination and monitoring They also described the form in which the evolving document is represented the sources and channels of information, and the tools and resources used While lack of space prevents us describing Lhit stud} in detail we present the main findings (Set [Power *ft al* 1991] for details)

2 1 The Technical Writer's Tasks

Interestingly, we found that technical writers spend little time working on new texts The greater part of their work is updating existing documents The notion of reuse is thus quite important Five main tasks emerged from our discussions knowledge acquisition document planning, composition, validation and maintenance These tasks are of course interleaved in the production process

Knowledge Acquisition Technical writers have to work in close collaboration with designers and engineers to gather and structure the information about the product or procedure they need to document This is done by consulting the designers, reading the comments in actual code, and experimenting with prototvpe versions of the new product The task of knowledge acquisition is very difficult, and it occupies as much time as the writing proper The main burden of knowledge acquisition is borne by the authors when they first encounter the product, at which time they must construct a mental model of the product *from the end-user s perspective* Authors acknowledge that a formal record of this model would be useful in documenting subsequent modifications of the product by the same writer or by colleagues It could also be used when the same procedure needs to be explained again but in a different context, such as a different part of a manual However such a model typically is not created explicitly

Doc time at Planning Writers need to establish the overall structure and purpose of the document It is widely recognised thai a task-oriented viewpoint is more communicatively effective than a product-oriented one faking such a viewpoint, a typical structure for an in structional manual is to ha*e a short (about a page) chapter for each self-contained task, broken down into operations of about six or seven lines

Composition Technical writers typically write several drafts of a document They aim to be effective communicators avoiding jargon and conveying their message in clear and concise terms Bv training and experience, authors become conversant with general standards of technical writing (e g , the convention for distinguishing notes from warnings)

\lost companies also have style guides, formal or informal which further constrain the authors A style guide might, for example recommtnd or even prescribe the use of specific constructions and terminology A rigorouslv formalised style guide imposes a controlled language which is sometimes difficult and time-consuming to master

Validation Quality assurance mechanisms range from informal proofreading by colleagues to formal reviews by committee Some organisations require their writers to submit their output for critiquing by an automatic terminology and grammar checker This process may be reptated over several drafts, depending on the time available for preparation

Maintenance A significant proportion of a writers time is spent on maintaining documentation when changes are made to existing products

2 2 Desiderata for a Support Writing Tool

From our discussions with technical writers and our understanding of their task, the following desiderata for a Support Writing lool emerged

- *Support for knowledge reuse by helping authors create a formal model of the knowledge they acquire* As a lot of time is spenl in knowledge acquisition and knowledge is reused frequently authors indicated that they would welcome a tool that would help them formalise their knowledge about the product allowing then to structure it in a consistent manner, examine it later, and share it with colleagues
- *Production of alternative formulations when possible* — As there are often several ways to express a sel of instructions, the authors expressed a desire to have several drafts produced, from which they can choose the most appropriate one
- *Availability of early drafts produced simultaneously* in *several languages* — The possibility of producing drafts as soon as some mental model

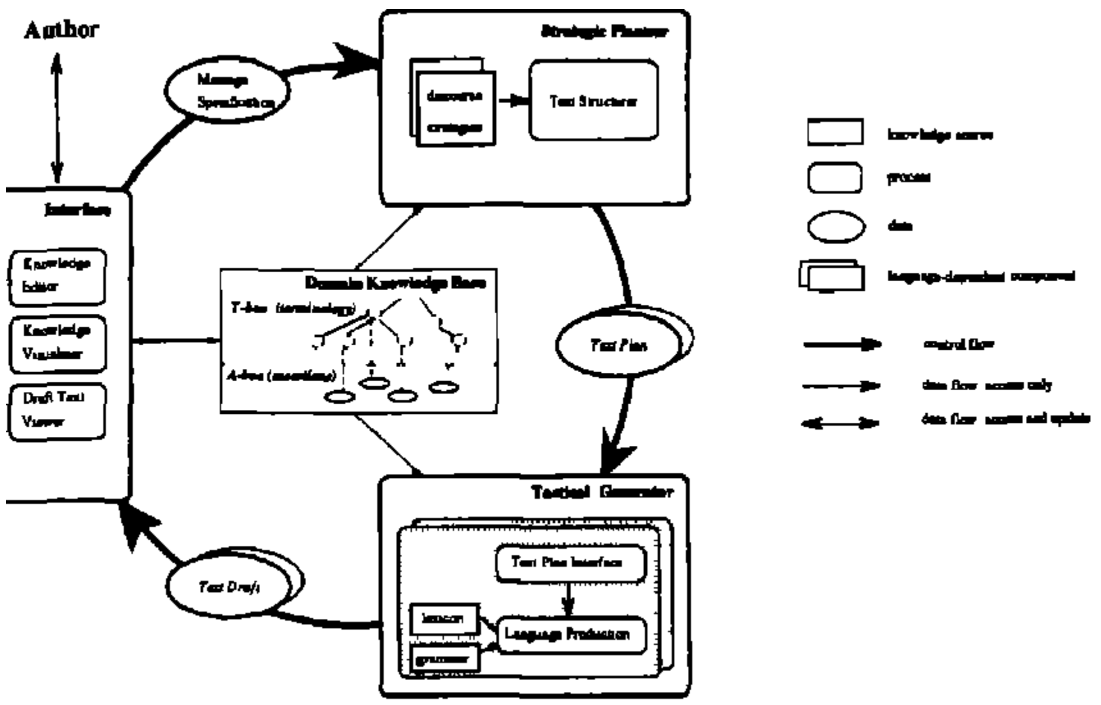


Figure 1 Block Diagram of the Architecture

of the task is formalised would help authors find out what underlying knowledge is still missing to provide good instructions It also speeds up the whole process

Propagation of changes throughout document and languages — When a change is required, authors would like to make the change only once Modifying the same text in several places is a tedious task, and it jeopardises consistency

Support for accurate and consistent terminology — Technical terms need to be employed consistently within and between documents even if these are produced by several authors Furthermore, there are often constraints imposed by the company Authors would welcome a tool to help them learn these constraints and ensure that they are applied systematically

Retain creative satisfaction of technical writing — A tool to support writers should automate those aspects writers find tedious, such as revision and some of the rudimentary aspects of composition (e g , consistent terminology and syntax), and leave to the authors the tasks they find interesting and challenging, such as structuring knowledge and expressing ideas

3 DRAFTER

Based on the user requirements analysis described above, we have designed and implemented DRAFTER a software manual drafting tool for English and French The overall architecture of DRAFTER is shown in Figure 1 It contains three processing modules, which form two main support tools

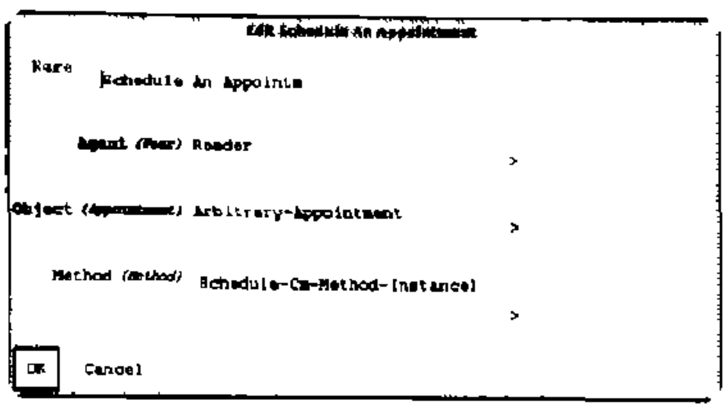
- An interface for the technical writer This allows authors to specify formally the procedures necessary for the user to achieve their goals, thus supporting user-oriented instructions It also allows them to control the drafting process
- The drafting tool This comprises two major components the strategic planner and the tactical generator The strategic planner determines the content and structure of the text, and the tactical generator performs the realisation of the sentences The result is English and French drafts of the instructions for the procedures defined so far by the author using the interface

Underlying the processing components is a domain *model,* i e , the main repository of information about the domain

3 1 The Domain Model

The Domain Model, implemented in LOOM [MacGregor, 1988], is a collection of entities representing the information commonly occurring in the software domain These entities include actions, states, objects, and a set of relations between them This knowledge, derived from a study of a multilingual corpus of software manuals, is treated as language-independent, an important requirement foT multilingual generation It is hierarchically organised, using the Upper Model [Bateman *et al*, 1990][1] as its root, and maintaining three further levels of structure corresponding to (1) the concepts and relations general to all instructions, (2) those general only to soft-

[1]The Upper Model is an ontology of distinctions employed to determine how to express the concepts linguistically



Edit Schedule An Appointment

Name Schedule An Appointm

Agent (User) Reader >

Object (Appointment) Arbitrary-Appointment >

Method (Method) Schedule-Cm-Method-Instance1 >

OK Cancel

Figure 2 The Schedule Action

ware interfaces, and (3) those specific to the chosen soft ware application domain

The technical authors use the concepts and relations in the domain model to specify the procedures appropriate for the particular software system being documented These procedures are represented as hierarchical configurations of actions, states, and objects, in a manner common in traditional plan structures [Fikes and Nilsson, 1971, Sacerdoti, 1977] Because our interest is in the expression of these procedures rather than their execution our representation allows authors to include information not typically found in traditional plan representations [2] such as user-oriented motivational goals helpful side-effects (often included in written instructions), and explicit specifications of alternative plans, conditions, and options

3 2 The Interface

DRAFTER provides an interface for creating and maintaining a formal record of the knowledge authors learn during the knowledge acquisition task It allows them to specify the conceptual knowledge required for the task to be documented, and information important from the user s point of view It exploits the domain model to provide guidance and structure The interface encompasses the following functions

- Construction and maintenance of the assertional knowledge base containing the descriptions of functions the user can perform with the software being documented
- Visualisation of aspects of the knowledge base
- Viewing and editing the automatically generated drafts

All these functions are invoked from menus interface widgets and other mouse-sensitive objects, in a style common to systems such as Motif

Constructing the Assertional Knowledge Base

Authors can enter or change the information to be included in the documentation for the software system under consideration using the *Knowledge Editor* This editor relies on the presence of a domain model constraining and structuring the data to be entered

Before making a new assertion, the author chooses the appropriate node in the domain model to which the new information will be subordinated This is done by navigating through a sub-graph of the domain model via cascading menus These contain at each point the types of concepts available in the domain Once a concept is chosen, the interface determines the properties to be specified and dynamically constructs a dialog box for the author to fill in The interface also allows the writer to create the concepts on the fly , thus providing a flexible and un-constraining interaction style Figure 2 shows a sample dialog box for entering information about the action of *scheduling appointments* in the OpenWindows Calendar Manager The *agent*, *object* and *method* slots are derived from the domain model [3] The interface also provides defaults, if these are present in the model (e g , **Reader** as the default agent in Figure 2) For each slot, the author can choose to keep the default value when present, or to specify a new value, again guided by the interface In the example the author kept the default values for the *agent* and *object*, and defined one method *Schedule-Cm-Method-Instance1* for achieving the action It is in the method that the author specifies the sub-actions that a user performs The method also includes preconditions and side-effects when necessary

DRAFTER also provides a *Window Description Facility* allowing the author to annotate images of application windows with semantic information These images are obtained either by scanning in from hardcopy or by taking an electronic snapshot directly from the screen [4] This allows buttons or other interface gadgets that need to be mentioned in the instructions to be identified easily and later referred to when defining procedures (they are automatically asserted in the knowledge base)

Visualising the Knowledge Base

To prevent the author from losing orientation, DRAFTER provides the *Knowledge Visualiser* which keeps the author informed about the status and content of the knowledge base It can be used to view several aspects or areas

[2]For more detail, see [Delin *et al* 1994]

[3]The bold face for *agent* and *object* indicate that these slots are *required*, while *method* is optional

[4]It is also conceivable that such images be extracted automatically by consulting appropriate resources e g output files of interface building tools

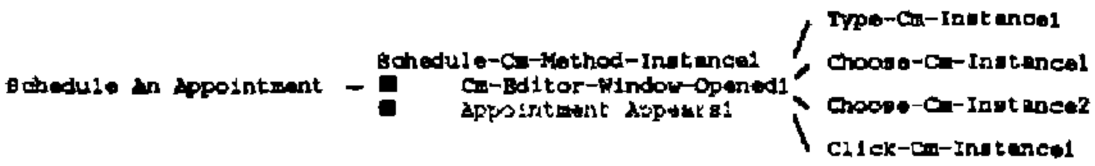


Figure 3 The Scheduling Procedure

of the knowledge base in tabular or graphical form The author may, for example, view the relationship between actions, methods and sub-actions as illustrated in Figure 3 There, we see the method the author has defined for the action *Schedule* an *Appointment* (shown on the left) The method, *Sehcdule-CM-Mcikod-Instancel*, is shown to have four sub-actions type the description of the appointment, choose the start time of the appointment, choose the end time of the appointment, and click on the insert button The two small squares under the name of the method indicate that this method has a precondition and a side-effect, namely in this case the CM Editor Window must be opened, and the appointment just defined appears ID a list of appointments These can be viewed {and updated) by chcking on the rectangle representing the method

The Knowledge Visualiser is fully integrated with the facility to construct and update the knowledge base so that the writer can trigger interface functions such as editing or generating on ever} constituent of a visualisation allowing a parallel development of knowledge base and natural language text

The Draft Text Viewer

After the procedures and objects have been specified, text in French and English can be generated The text is mouse-sensitive, allowing the author to access the knowledge base entry for selected part of the text In this way, the author can modify the underlying knowledge base while working from the text In some cases the writer will decide to modify the generated text rather than the underlying knowledge For this purpose, a text editor is currently provided We intend to develop a more sophisticated tool that will constrain and record this post-editing

3 3 The Strategic Planner

We use an existing text planning system that constructs text by explicitly reasoning about the communicative goal to be achieved, as well as how the goals relate to each other rhetorically to form a coherent text [Moore and Paris, 1993] Given a communicative goal the system finds from its library of discourse strategies (or plans)[5] a plan capable of achieving this goal Plans typically post further sub-goals to be satisfied These are expanded, and planning continues until primitive speech acts are achieved The result of this planning process is a *discourse tree,* in which the nodes represent goals at various levels of abstraction {the root being the initial goal, and the leaves the primitive realisation statements speech acts such as INFORM The discourse tree also includes *coherence relations* [Mann and Thompson, 1988] indicating how the various portions of the text are related rhetorically

Some of the constraints imposed by writing standards or house style concerning the structure of a manual can be embodied in the discourse strategies, and, by associating several strategies for the same discourse goal, it is possible to provide alternative drafts, as desired by the authors

3 4 The Tactical Generator

We employ the KPML environment [Bateman, 1994] for our tactical generators We have extended its coverage in English to generate the types of sentences found in instructional manuals, and are using the flexible environment it provides to develop a French grammar KPML, a descendent of Penman [Mann, 1983], is based on Systemic Functional Linguistics (SFL) [Halliday, 1978], expressing its grammar in terms of system networks The rules dictated by the general standards of technical writing which are formally defined can be added to the linguistic resources available to constrain the general potential of the generators

The output of the strategic planner is passed through the text plan interface which constructs statements in the Sentence Plan Language (SPL) [Rasper 1989], KPML *B* input language This interface takes into account the discourse tree and the potentially different forms of expression appropriate in English and French

4 Working with DRAFTER An Example

Suppose the author wishes to generate instructions for scheduling an appointment with the OpenWindows Calendar Manager He or she mu6t specify the exact steps a user must carry out This might be done by defining all the objects the user will Bee in the *Appointment Editor Window* (using the Drafter Window Description Interface), and specifying the method proper The author can then ask for the instructions to be drafted for this action At this point, DRAFTER calls the strategic planner with the discourse goal make the user competent to perform the action of scheduling an appointment The strategic planner builds a discourse tree, which provides the deep representation of the text to be generated This tree is passed through the text plan interface, and then

5 It is possible that there will be different plane for the different languages

6"We are currently working to allow the specification of the input to the generator to be at a level of abstraction such that this interface would built the same structure regardless of the language and the differences in syntactic realisations would be dealt with within the tactical generator proper

French

Entree d'un rendez-vous

Choisir Edition→Rendez-vous pour afficher la fenetre Edition de Rendez Vous CM
La fenetre Edition de Rendez-Vous CM apparait
Introduire la description du rendez-vous
Choisir l'heure de début, ensuite choisir l'heure de fin
Cliquer SELECTIONNER sur le bouton Insertion
Le rendez-vous apparait dans la liste dans la fenetre Edition de Rendez-vous CM

English

To schedule an appointment

Choose Edit→Appointment to display the CM Appointment Editor window
The CM Appointment Editor Window appears
Type the description of the appointment
Choose the start time, then choose the end time
Click SELECT on Insert
The appointment appears in the list in the CM Appointment Editor window

Figure 4 Generated drafts of the instructions in French and English

French

Entree d'un rendez vous

Il faut etre dans la fenetre Edition de Rendez Vous CM
Choisir Edition→Rendez-vous pour afficher la fenetre Edition de Rendez-Vous CM
Dans la fenetre Edition de Rendez-Vous CM
Introduire la description du rendez-vous

English

To schedule an appointment

You must be in the CM Appointment Editor Window
Choose Edit→Appointment to display the CM Appointment Editor window
In the CM Appointment Editor Window
Type the description of the appointment

Figure 5 Alternative texts

to KPML The generator is called using the linguistic resources for English and for French The generated drafts are shown in Figure 4

In these texts, we see that the top-level action (or the goal of the method) is given as a title to the series of steps Then, the steps to be performed to achieve this goal are given Recall that the method for scheduling an appointment had four sub-steps and a precondition (as shown in Figure 3) The strategic planner chose to express the precondition as the first step to perform when scheduling an appointment But instead of simply stating 'Open the CM Editor Window it told the user how to achieve this step 'Choose Edit It also described the result of achieving it The CM Window appears The four sub-steps for scheduling an appointment are then listed Finally, the side-effect is explicitly provided ('The appointment appears in the list '), so that the user can monitor whether the action has been performed correctly

Some differences between French and English are apparent in these texts First, the title is expressed as a to-infinitive clause in English, and as a nominalisation of the goal verb in French (literally 'The scheduling of an appointment') Another difference appears in the way to which the interface objects are being referred While, in English, it is acceptable to refer to a button simply by its name (i e click on insert) this is less common in French, and the type of the object, here Bouton , has to be explicitly stated Finally, the user is being addressed in a slightly different manner while the English employs a direct address (the imperative), the French uses a more distant form of address the infinitive form Such variations, although not impossible in a translation paradigm, are less likely there than they are in a multilingual generation paradigm

4 1 Producing Alternative Texts

One of the requirements for a support drafting tool was the flexibility to produce several texts corresponding to the same set of instructions In our approach, the strategic planner can be told to re-plan the text If other discourse strategies are available, they will be employed, and a different discourse tree will be produced This new tree is again passed to the text plan interface and KPML For example, there are several strategies available to express a precondition one can either include it as if it was the first sub-action to achieve a goal (as was done in the drafts shown in Figure 4), or, alternatively, one can express it explicitly as a precondition The modified text resulting from using this alternative strategy are shown in Figure 5 Note also that in French, in order to be consistent with the distant form of address, the indirect formula 'il faut' ('one must') was chosen instead of the more direct 'vous devez ('vou must)

4 2 Update and Re-use

Suppose the author decides that the specification of the procedure for scheduling an appointment is not appropriate, and that there is no need Tor a precondition Instead of having to update the instructions themselves (and risk inconsistency between the two texts) he or she can simply change the underlying specification for this procedure, removing the precondition The change made, DRAFTER can be asked to re-generate the instructions in the two languages These will automatically reflect the change, and the precondition will be absent from both texts The rest remains the same

5 Summary

In this paper we have discussed DRAFTER, a tool we have developed to support the technical author in the drafting of multilingual software manuals based on a user requirements analysis We described the facilities which allow the author first to specify the procedural knowledge necessary for using the software and then to generate drafts in English and French and illustrated them with an example In our future work we will be developing additional tools to provide a richer drafting environment and evaluating the system with professional technical authors

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