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Textpatterns in a computer assisted translator's workstation

Abstract

A software package for a computer-assisted translator's workstation should contain a special module which consists of a database of preferred textual structures in the source and target languages, (TEXTPAT I), as well as a processor of typical translation cases (TEXTPAT II). TEXTPAT I includes micro- and macrostructures at four levels (text type, text type variants, chunks, syntactic and lexical structures). TEXTPAT II consists of lists of items for which translation rules have to be applied. Both textpats contribute to the idea of a translator's expert system.

0. HUMAN TRANSLATION and SOFTWARE

Numerous attempts to using computer technology in the translation process have been recorded by translators and analysts in relevant journals (e.g. Lebende Sprachen, Machine Translation, Fremdsprachen and others). The software enables the user to better and more effectively prepare a document through the help of text processing and desktop publishing functions. With a number of commercial data bases available, computer assisted translation exceeded the limits of text processing systems. Despite all the progress in software development there is one main problem: a lack of expertise about the real decision-making processes during translation. Many translation theorists have demonstrated that the translation process is not easily decomposed. It is almost impossible to break translation into discrete units, because it is a non-linear process. This seems to be one of the most decisive obstacles for the development of useful software. On one hand, the computer can only support problem solving effectively, if a linear algorithmic strategy is applied, on the other hand the translation process follows heuristic principles which are difficult to represent and implement (cf. Wilss 1989). It seems as if computer assisted human translation is a compromise. Systems of this kind would have a modular software structure, but the modules would contribute to translation knowledge in a more or less "complex" way by providing functions for the translator to apply that knowledge more effectively. The complexity of it will be explained later in this paper.

To put it bluntly, a computer assisted translator's workstation should offer information to the translator and assist him in carrying out the technical tasks of translations (cf. Tong 1987, Freigang 1988). At this stage, the translator's routine work is the focus of the workstation's modules and not his creative activities. Based on these preconditions the modules to be put together in a software package are the following: automatic dictionary, automatic lemmatization, textpatterns, and the text processor. Integrating these four basic modules in an automatic translator's assistant system will be a difficult problem. No suitable software package has been developed yet and translators use several partial solutions. A new technology that might be applied to the problem is HYPERTEXT, the non-linear text (cf. Conklin 1981, Neubert 1990, Shreve/Scherf/ Vinciquerra 1990).

1. TEXTPATTERNS — Reasons and Feasibility

Of the four modules of an integrated automatic translator's assistant system, we will focus on textpatterns here. They are the result of applying textlinguistic findings to the translation process. The diversity and identity of the structures of source language (SL) and target language (TL) texts determines the design of the textpattern module. Its main aim is to make the translator aware of textual structures on different levels of his SL- and TL-texts. These correspond to processing levels which could be accessed whenever requested. The original idea of a textpattern is to store textual information in a "text-dictionary" or "textlexicon" as a mechanism to help process a translation (cf. Neubert 1968, 1973, Gommlich 1987). The textpattern should be composed of two basic data bases: (i) text structures in source and/or target language in several textual levels and (ii) assignment rules for the SL and TL structures. The two data bases are related because both are generated by results of empirical comparative studies. The main difference, however, is the character of the assignments. In fact, part of their content comes from SL and TL comparisons, but part of it reflects generalizations about the results of good translations (cf. Gommlich/Bohm/ Zachert 1988).

1.1 TEXTPAT I

The TEXTPAT I data base contains an inventory of text structures on different textual levels. It is based on the premise that the translation process is determined both by the situational/pragmatic conditions under which the translation is carried out and by the internal structure of a text which find its expression in specific linguistic means.

It is known that the translation of a text largely depends on its textual parameters (situationality, intentionality, acceptability, informativity, coherence, cohesion and intertextuality — cf. Beaugrande/Dressler 1981, Neubert 1985). These parameters reflect the questions: what by who to whom, when, where, and for what purpose. These determinant factors influence both the decoding and recoding process. In understanding the SL-text the translator analyzes the sequential and hierarchical structure, while considering the set of communicative factors. The result of analyzing the SL-text is a text meaning which is to be reconstructed in a TL-text. This is done with regard to the communicative setting which may or may not be identical with the SL-setting. If we accept a textual model of sequences and hierarchies, this entails the possible recurrence of structures. An analysis of a representative text corpus yields typical structures of sequences and hierarchical levels. That is to say, a certain configuration of determinant factors will imply similar structures on the macro- and microlevel of the text. When consulted, the textlexicon should display SL and TL structures independently. The set of structures typical of a group of texts has an orientation function in the translation process. It helps to focus the translator's attention to distinctive features. The listed structures may contribute to assessing and understanding the SL-text, to writing the TL-text, or to assessing an existing TL-text. Assessing a text is a comparison of a stored "pattern" with an actual structure with the pattern exerting a certain heuristic control over translation decision-making. As an aid to comprehension the variety of preferred linguistic means helps the translator select structures and meanings. Monitoring the production of a TL-text is just the opposite, preceding structures on a higher or the same level may determine subsequent structures.

1.2 TEXTPAT II

Confining the textpattern module to these two functions under-utilizes the power of a computer assisted system. TEXTPAT I should be supplemented by TEXTPAT II consisting of two submodules which would (i) list equivalence rules and (ii) process those rules and (iii) provide examples. The rules are derived by comparative studies of SL- and TL-structures and real SL- and TL-texts (the latter being translations). The difference between the two comparisons is evident. TL-structures might either be derived from TL parallel texts or translations. Contrary to this, no separation but an actual connection of SL- and TL-texts leads to the second method. As both methods — one being a more deductive, the other an inductive one —

yield results important in the translation process, they should be regarded as complementary in corpus analysis and system compilation.

The decision to differentiate between (i) listing and (ii) processing the set of rules is justified by the character of the human decision-making process during translation. An automatic solution of the problem would exclude the translator's conscious participation and thus evade his influence on maintaining the sets of rules. Only specially trained operators would be able to fulfill this task. Apart from maintenance, the translator might regard it as more efficient or useful to apply an analogy rule rather than blindly following an automatic mechanism.

Generally, the internal structure of a textpattern module should be determined by the requirements of different approaches to the translation process. The software should enable the user to create, update and display textpatterns. All necessary data manipulations would become possible with these three basic functions. The creation and manipulation of data bases as described above should be user-friendly. Transparency of the rule-governed portion of the data bases is likewise important, although theory specificity implies a certain opacity for the user.

2. Approach to TEXTPAT I

The content of TEXTPAT I is a corpus of sequential and hierarchical structures of SL- and TL-texts.

2.1 Textlinguistic background

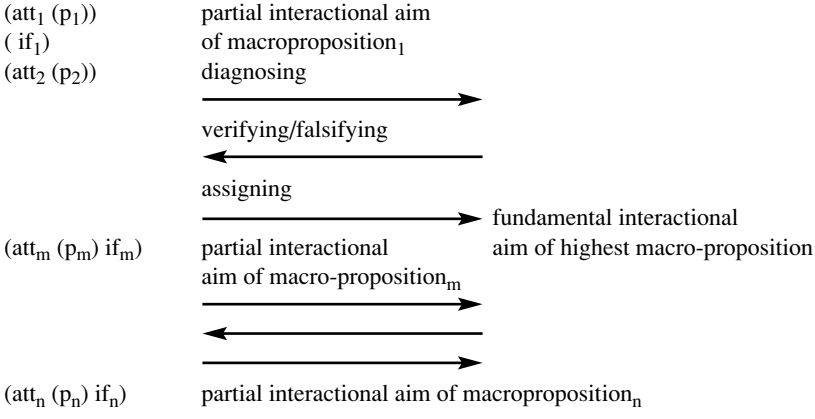
Every text can be ascribed a meaning as a dynamic phenomenon which is determined by several factors. In the translation process the SL-text meaning is identified in a dynamic way, but used as a temporary static structural guideline in codifying a TL-text. The translator conceptualizes the text meaning as lexical and syntactic meanings forming

- propositions on a microlevel,
- attitudinal and illocutionary meanings forming non-propositional meanings on a microlevel,
- propositions, partly as associations or conclusions on a macrolevel,
- interactional meanings on a macrolevel.

The highest meaning level is an assignment of the highest (most abstract) interactional aim of a text and its highest macroproposition, both forming the global structure (cf. Isenberg 1984). Whether on a micro- or macro-

level, meanings can be described as either interactional or propositional. Proceeding from this assumption, linguistic means are then used to represent these meanings. According to Isenberg (1984), interactional aims on the macrolevel are identified as partial interactional aims, with the most abstract interactional aim of a text representing its fundamental interactional aim. Although abstract, both fundamental interactional aim and highest macroproposition support the grouping of texts according to similar or identical meaning partitions. The most general way of grouping is based on interactional aims. Grouping of texts is indispensable for comparisons in the identification and reformulation processes. One basic difficulty with grouping texts for a textpat module is again theory specificity.

All kinds of text meanings are bound to a sequence of linguistic signs and decoded on the basis of a presupposed complex of knowledge which is of linguistic and non-linguistic character. A decoded text meaning of this kind becomes the pivotal portion of the translation process, although it is modifiable for the TL-text under certain circumstances. Modification of the TL-text meaning might be brought about by a TL-text aim different from the SL-text aim. If meaning identification and TL-coding are supported by textpatterns, their internal structure, viz. user surface, should correspond to the phases of human textprocessing typical of a translation, thus allowing a parallelism between human textprocessing and the structures offered for comparison. Tab. 1 shows a block scheme of meaning identification in the translation process.



Tab. 1

With this block scheme **att** stands for attitudinal meaning, **p** for proposition and **if** for illocutionary function. The scheme shows that the macrostructures are only assigned after they have been diagnosed with respect to the anticipated highest text structures and verified in the course of linear text comprehension.

2.2 Processing steps and user surface

Using this model a method for investigating groups of texts in order to empirically analyze SL- and TL-texts was developed. The results were entered into the TEXTPAT I databases. The user of TEXTPAT I is offered the following access through a specifically designed user surface. Its processing levels are:

(i) text type
(ii) text type variant
(iii) text chunks of variants as typical macrostructures
(iv) typical lexical and syntactic structures as microstructures.

2.2.1 Text type

The user enters the system at the text-type level, thus bridging the gap between his/her pretheoretical understanding of text type and the system's theoretical basis. The first decision the user has to make is to determine the type of the text to be translated by selecting from several presented options. These options are not theoretical constructs but traditional types, compiled with reference to the contents of texts, such as scientific articles, standards, technical product brochures, popular science texts on different topics, political speeches etc. As the system evolves, it requires a compromise between these traditional forms and textlinguistically defined forms. These distinctions are not necessarily apparent to the user. When he chooses a text type, the user prompts the system to automatically select a pattern of fundamental interactional aim and macroproposition. If the translation pursues the same goal as the SL-text, the system can connect the SL-text structures to a TL-pattern of identical parameters. Otherwise the system has to compile a pattern corresponding to the different requirements.

To sum up: in stage (i) the translator selects the text type, thus making a decision about the contents of the subsequent stages.

2.2.2 Text type variants

Empirical evidence suggests that a second decision is required, because the text type decision is on a very high level. The groups of texts forming a text type normally branch into variants. Depending on the text type, some variants are constituted by the text type analyst, others are prescribed by regulations. For example, British standards come in four variants defined by the British Standard Organization: specifications, codes of practice, glossaries and methods. With technical product brochures we are faced with the following arbitrarily defined variants: brochures for single products or processes, brochures for one group of products or processes. With political speeches, however, a differentiation for variants is made according to the audience to which the speech is directed: large audiences, parliament or comparable institutions, high-ranking guest, the press, etc.

2.2.3 Text chunks

Text chunks correspond to macrostructures consisting of partial interactional aims and macropropositions below the global structure. There are no clear-cut methods of defining and describing text chunks. For some texts, as with text variants, the aim and contents of chunks is predetermined and overtly expressed, for others the chunks have to be determined by the text analyst on the basis of recurrent meanings.

Although for the TEXTPAT user chunk analysis is of little interest, we shall briefly discuss it (for further detail cf. Gommlich/ Jäger, in press). The method for determining chunks is dependent on the rigidity of textual structures and the level on which recurrences can be observed. First of all, some groups of texts are characterized by a highly specialized fundamental interactional aim which, in turn, is realized by a limited number of linguistic expressions as recurrent surface structure elements of the text. According to van Dijk (1980) these structures are the so-called superstructures or conventional schemata. They do "not only involve functional categories for the macropropositions of a text and rules for ordering and combination, but also require that these categories and rules be socially accepted, learned, used, commented upon, etc." (van Dijk 1980, 109). Examples of this group of texts are e.g. patents, standards, legal documents, etc. Partial interactional aims along with its propositional contents only slightly differ from one another. With standards, the variant **specification** has an expected chunk sequence **contents, foreword, scope, reference, definitions and symbols, materials and design, performance requirements, test requirements and methods, marking**. These chunks are

clearly superstructural terms and are presented as such in a textpattern. Somewhat more difficult to determine are chunk variants for the "looser" text groups. These are two possible approaches: either we determine them according to their macrostructures, or we determine them according to their partial interactional aim. We prefer macrostructural analyses for texts with recurrent macropropositions within the scope of a partial interactional aim. If, however, few, if any, common features in the propositional content of texts can be observed, partial interactional aims are left as the only grouping principle.

A macrostructural analysis was applied to technical product brochures. The resulting chunks were **introduction, description, advantages, technical data, maintenance, sales preparations**. Political speeches, however, share no other common features than their generalized interactional aims: **contacting the addressee, naming a problem/argument, solving the problem and conclusions**.

Despite these three analytic methods for determining chunks, the user of a TEXTPAT module expects an easy and coherent choice of options. The more rigid the structure of a text the more obvious it is to be selected.

2.2.4 Microstructures

With microstructures, the TEXTPAT designer faces the basic problem of set completeness. If the set of microstructures is to be complete, the whole spectrum of linguistic means for all possible meanings should be accounted for. As this is rather impractical, only a limited but characteristic choice of typicalities is given.

Principles of order are either:

- expressions for a specific class of meanings, e.g. modality, irrespective of the chunk where they occur (only if negligible),
- expressions for a specific class of meanings with respect to the chunks where they occur most frequently.

The meanings to be represented might cover the whole range of aforementioned possibilities, propositional and non-propositional meanings included. Expressions to be listed might be frequent expressions for introducing partial interactional aims, representing attitudes as sentence types, representing real-world or fictional objects and their relationships etc.

2.2.5 An example

We choose this example from the less rigid group of texts — political speeches — which illustrates the two different dependent categories of microstructures. To make it a bit more transparent the following is a possible sequence of tables of reference. It comprises textual information about English political speeches and can be used as reference material for translating into English, or as a reading or writing aid.

We assume the following situation: a translator is seeking information about frequent microstructures in political speeches. After entering the TEXTPAT module for political speeches, a first display appears.

political speeches

> This is a prototypical pattern of political speeches which can occur in a variety of forms.
>
> Which variant are you seeking information about? There are the following types of speeches directed at:
>
> large audiences
> parliament or comparable institutions
> high-ranking guest
> the press.

After selecting the option **large audiences** the following display is prompted, defining the texttype variant and enumerating a choice of possible chunks.

large audiences

If **solving the problem** is selected the next window informs the user

> Speeches directed at large audiences follow the principle of a fundamental interactional aim, which is normally to convince the audience of a political goal, to activate the masses, to win support for measures etc.
>
> Political speeches of this kind normally exhibit the following chunks:
>
> contacting the addressee
> naming a problem/argument
> presenting a problem/argument
> solving a problem

about the typical structures that could be used.

solving a problem/argument

A problem can be solved using the following structures (in all of these, addressing the partner is possible):

(i) appeal directed to addressees, the speaker being included or not
(ii) conclusions possibly enumerating conditions for the solution or naming acts to be undertaken, possibly within the presentation of a problem/argument or immediately following topic identification.

(i) and (ii) might be preceded by gambits expressing the speakers attitude towards the solution
(i) and (ii) might occur as: enumerations, orders, rhethorical questions, direct speech, iterations.

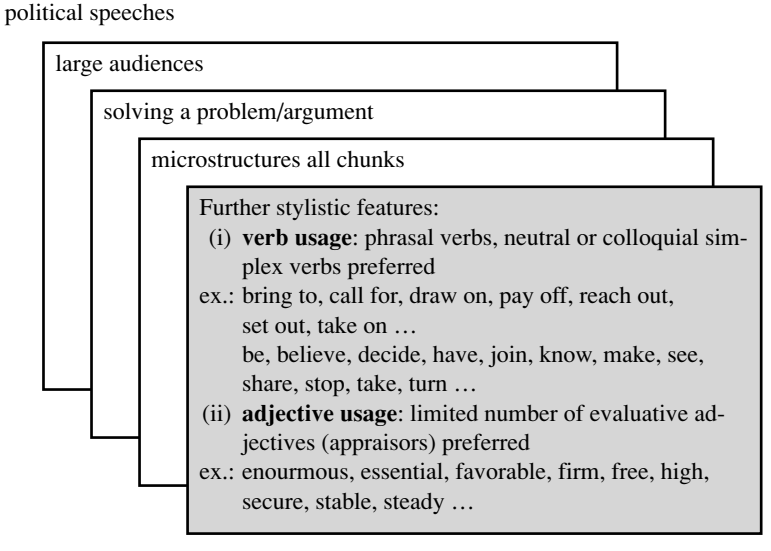
remark: With the presentation being retrospective the solution must refer to it at its beginning.

For preferred expressions choose **S.**

For further information choose A**.**

The two options **A** and **S** select microstructures applicable to **ALL** chunks or just to the **SOLUTION** chunk.

Technically, the dependencies are made evident by a hypertext-like window overlay structure tracing the decision path.



Typical structures for the chunk **solution of a problem** are given in the next window.

microstructures **solving**

(i) Conclusions might be introduced by "(And) so".
(ii) Conditions necessary for the solution of a problem can be introduced by "only when …"
(iii) Appeals are preferably expressed by "Let us …"

3. Approach to TEXTPAT II

TEXTPAT II consists of (i) lists of items for which rules have to be applied during the translation process and (ii) an automatic mechanism. Special emphasis is laid on developing TEXTPAT II as an expert system consisting of "software packages that incorporate the knowledge base of experts within a particular domain" (Schon 1989, 38). Such an expert system for translators processes the experienced translator's knowledge in order to solve a translation task. However, little is known about the **translator's knowledge**, i.e. its components and determining factors. First of all, no satisfactory method for empirical investigation has been found and second, there is still doubt whether generalizable solutions for translation tasks can be formulated. A certain generalization is necessary, if the system is to provide more than a list of real translation cases. The latter would fall short of the requirements of an expert system "to augment existing information systems and to build entirely new applications" (Sviokla 1986, 5). Meeting the basic requirements of a translator's expert system means to search for a general information structure applied by a translator confronted by a translation task by breaking down the translation process into generalized levels, thus guaranteeing a comparison and analogous solution. According to the findings of TEXTPAT I, one source of the data is the relations between SL- and TL-structures, reflecting the expert's textual knowledge. A second source of the data are the translators themselves. Think-aloud protocols (cf. Krings 1986) can be used to gather evidence of a translator's decision-making process.

A third method searches for translation regularities by analyzing examples of "good" translations, thus filtering out strategies by generalizing single cases. The strategies should be differentiated on some basis: either similar cases occurring in different texts or sequences of decisions in one text. To abstract from single cases demands, of course, a large enough em-

pirical basis. The steps to be undertaken are very simple: comparing SL-text and TL-text structures, monitoring and grouping all differences. Different structures are grouped according to the following criteria:

– differences between the systems of SL and TL,
– differences between text type conventions,
– differences required by different mutual knowledge bases.

As our empirical analyses have not proceeded far enough, the following TEXTPAT II descriptions should be regarded as hypothetical. We do not know yet how many strategies are to be expected, under what concrete conditions they are to be applied, and whether our methods are specific enough.

3.1 Potential operation modes

(i) The user is given a list of items to be considered when translating a text. These items are either on a macro- or on a micro-level. On the macro-level they contain: information about typical interactional aims and macropropositions along with their sequence of occurrence, and knowledge about the preferred flow of information (if different from the SL-texts). On the micro-level, the information offered might be very broad ranging from meanings to special expressions. The information subsumed under (i) is an explicit description of what might be needed when translating a text of a given type. It represents an information package to be processed by the human translator himself.

(ii) The user is given a list and automatical support for potential solutions for decision making during the translation task. The mechanism presupposes an intelligent hypertext system, capable of automatically indicating those parts of an SL-text to which a translation strategy might be applied. The user traces a path through a SL-text by moving the mouse along the text. Whenever the system detects an item for which a translation strategy exists, it marks this by a special sign (highlighting, arrow marking etc.). This method presupposes a rather sophisticated description of the linguistic structure of an SL-text and likewise of the TL-means. Such a description is necessary for automatic hypertext linking. For this purpose, hypertext nodes have to be prepared in a special way. In most cases, the nodes would be represented by actual text units with additional information about translation strategies underneath.

At the current stage of investigation it is impossible to survey all potential analyses to be applied in a translator's expert system. According to the

aforementioned criteria and their combination, we achieve a variety of methods, no doubt, the sequence and hierarchy of which is still far from being complete.

3.2 An example

Following is an extract of strategies to be applied in translating popular scientific texts (articles in papers or journals). Of the two above mentioned methods, the first one for translations from English into German is described.

3.2.1 Macro-level

Explicit expression of the fundamental interactional aim and highest macroproposition at the text beginning is normally established by superstructural means (e.g. subheadings). Additional information has to be searched for in other text chunks and dislocated, ex.:

Why Challenger Failed?
NASA will begin tests of its new design of shuttle boosters next year. But a design that accounts for all the problems that led to the loss of Challenger is not easy to find.

Die Challenger-Katastrophe — Ursachen einer Tragödie
Im nächsten Jahr wird die NASA Tests mit einer neuen Konstruktion der Feststoffbooster für ihre Raumfähren beginnen. Die Entwicklung neuer Booster, bei denen alle zur Katastrophe führenden Schwachstellen beseitigt sind, stellt Wissenschaftler und Ingenieure vor große Probleme. **Im folgenden Artikel setzt sich Dr. David Baker, Direktor einer Beraterfirma für Raumfahrtprojekte und langjähriger Berater der NASA, mit den Ursachen der Challenger-Katastrophe auseinander.**

3.2.2 Micro-level

On this level, the classification principles involve SL-structures that trigger specific translation strategies.

3.2.2.1 Verbs as they occur in foreground or background sentences

A decisive difference in verb usage can be observed, depending on whether information elements contribute to the story itself or give commentaries to it. Hopper (1979) and Hopper/Thompson (1980) discovered a correlation of information value and grammatical structures, and it seems that their findings are applicable here.

(i) Verbs in foreground sentences

Verbs in foreground sentences tend to require a specification strategy if not translated on the same level. Foreground topics are normally introduced when naming a problem and then developed

throughout the text. If the system itself is not intelligent enough to decide whether a given topic is foreground or background the user can interfere and support the algorithm, because the decision is knowledge-based. If decided, TEXTPAT II will indicate the verb and mark it as prone to specification.

ex.: When the Shuttle Challenger *fell apart* on 28 Jan., it signaled …
Als das Space Shuttle am 28. Januar 1986 explodierte, …
Die Explosion des Space Shuttle Challenger am 28. Januar 1986 …

After determining this clause as foreground the verb *fall apart* is marked and a specification mechanism is prompted.

(ii) Verbs in background sentences

Contrary to the aforementioned cases, verbs in background sentences tend to require a generalization strategy.

ex.: The presidential Committee set up to review the events leading to the loss of Challenger, *discovered* a game of Russian roulette, …
Die vom Präsidenten zur Untersuchung der Ereignisse, die zum Verlust der Raumfähre Challenger führten, eingesetzte Sonderkommission *stellte fest*, daß es sich …

Here, the semantic-stylistic level of *discovered* comes into play in comparison to *stellte fest*. The generalization strategy is brought about by the evaluation of the clause as background and the compatible structure of the verb not having the same valence in German in a sentence like this. A tendency to generalize verbs in evaluative sentences could be observed throughout this texttype.

A second general feature that occurs in text chunks having the function of presenting a problem are metaphors. These are demetaphorized in most cases. Again, to find out whether a verb is used metaphorically presupposes either a special knowledge base or a linguistic algorithm supported by a dictionary.

3.2.2.2 Nominalizations of verbal structures

Some verbal structures result from nominalization. Unlike the examples mentioned under 2.1 the following are determined by a different knowledge source, i.e. not by special background knowledge representations, but by knowledge about preferential syntactic structures. For this purpose

the expert system should contain a syntactic transformation submodule to process cases like the following one:

(i) Function verbs with infinitive structures of the pattern
v + N + v

ex.: … while the boosters in full thrust would cause the shuttle to break apart.
… ein Auseinanderbrechen der Raumfähre zur Folge hätte.

(ii) belief-verbs in subordinate clauses

ex.: … and engineers believed that they would take less time to develop.
… und nach Ansicht der Ingenieure kürzere Entwicklungszeiten benötigen.

(iii) temporal preposition + N + v

ex.: Before Challenger blew up…
Vor der Explosion von Challenger…

4. A short outlook

Our fragmentary survey of examples in 2. and 3. makes it obvious, that both TEXTPAT I and TEXTPAT II require further large-scale investigations. TEXTPAT I presupposes text-type specific analyses whereas TEXTPAT II calls for comparisons of SL and TL texts. As our analyses evolve we will have to develop them into complex knowledge representation models capable of solving a translation task. Modelling translation knowledge will become one of the main focuses in the development of a translator's expert system.

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