MapFace - A Graphical Editor to Support the Semantic Annotation of Medical Text

Theresia Gschwandtner, Katharina Kaiser, and Silvia Miksch (Faculty Mentor)
Institute of Software Technology and Interactive Systems
Vienna University of Technology
Vienna, Austria
Email: {gschwandtner,kaiser,miksch}@ifs.tuwien.ac.at

Abstract — *The mapping of medical texts to concepts of medical terminology systems is a prerequisite for many tasks of automatically processing these documents. Due to the complex nature of this task, the results of mapping systems still contain erroneous bits of information.*

Our editor visualizes the annotation of the text and provides means to easily navigate and modify it. Thus we are able to shorten a cumbersome and time-consuming task and subsequently provide reliable and well-defined information for further processing steps. Even more, the visualization features support a better understanding of the medical texts.

I. INTRODUCTION

Medical documents contain important information, but they are often difficult to understand. Mapping concepts from medical terminology systems to the text supports the intelligibility and disambiguation of the text by adding useful metainformation. To this end, programs such as the MetaMap Transfer (MMTx) program [1] create a rough mapping of concepts from the Unified Medical Language System (UMLS) Metathesaurus [2] to free medical text. Due to the complexity of unstructured text, it is not always possible to automatically create a correct mapping. However, the complete reliability of information is crucial in medical care - an extremely sensitive discipline - which makes it necessary for medical experts to control and correct these results. This led us to meet the following challenges:

- Enabling medical experts without special programming skills to handle the MMTx program.

- Providing means to assure the correct affiliation of UMLS concepts to text chunks.

- Supporting the understanding of medical concepts in the text as well as relations between them.

II. THE MAPFACE EDITOR

A variety of systems exist annotating text with medical concepts. In contrast to most other systems, MMTx not only supports exact matches between a text token and a UMLS concept, but also considers term variants as well as partial matches. Additionally, it computes match-scores of found candidates by combining specific measured values. For a detailed description of annotation systems we refer to [3].

The MMTx program automatically tokenizes the text into phrase chunks and concept chunks; additionally, it maps UMLS concepts to the text (see Figure 1).

Since manually correcting these results would be an extremely cumbersome and time-consuming task, and as there has been no satisfactory tool to support it, we have developed the MapFace editor (see Figure 2). By means of this editor we are able to

1. facilitate the handling of the MMTx program, by

   - providing a GUI, and
   - making the MMTx results easily navigable.

2. assure a correct mapping of the text to UMLS concepts, by providing means to

   - correct the tokenization of the text into concept chunks and phrase chunks (see Figure 3), and to
   - edit the affiliation of UMLS concepts to these concept chunks (see Figure 3).

3. support the better understanding of the text, by

   - color-coding of semantic types [4],
   - highlighting concepts or phrases accordingly, and
   - listing and highlighting relations among medical concepts in the text.

III. EVALUATION

In order to ensure the usability of the MapFace editor we conducted an evaluation study. In doing so, we went for a heuristic approach according to Nielsen and Molich [5]. Four evaluators were asked to solve typical tasks with the help of the MapFace editor. They noted and rated each usability problem they encountered.

The study discovered 32 usability problems, of which 78,12% could be fixed immediately. The other 21.88% either take more effort to fix or they require more general changes in the design. In any case, we will consider all problems carefully in order to improve the quality of the editor.
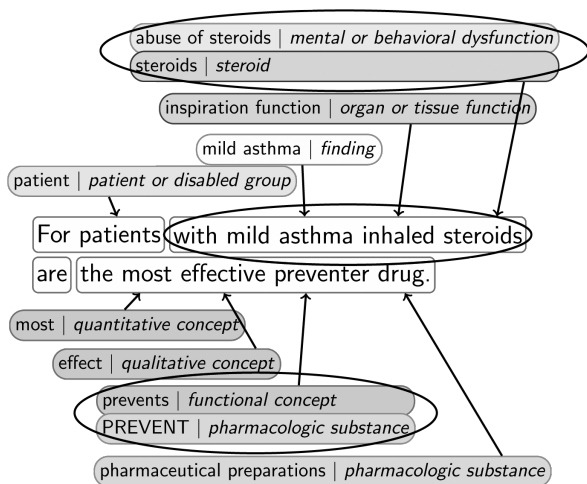
Figure 1: The MMTx program tokenizes the sentence into phrase chunks. A set of best matching UMLS concepts together with their associated semantic types (in *italics*) are returned for each concept identified within the text. The encircled objects are wrong or ambiguous results which have to be corrected by means of the Map-Face editor.
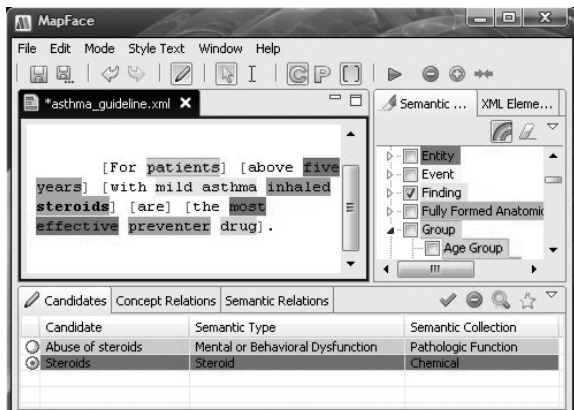

Figure 2: For a given concept chunk a list of best matching UMLS concepts is displayed in the bottom pane. In the right-hand pane the user can select color-coded semantic types to highlight associated text chunks.

IV. CONCLUSION

The MapFace editor provides important means to navigate, edit, and visualize the semantic annotation of medical documents automatically generated by the MMTx program. Enabling medical experts to easily control and correct the semantic annotation assures the quality of the outcome, which in turn improves the validity of any subsequent processing step.

With respect to the outcome of the usability evaluation we will ensure that the MapFace editor is not only an
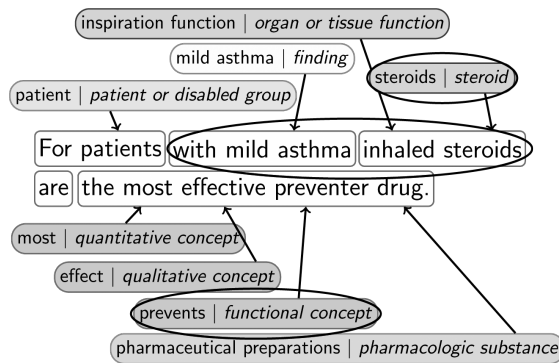

Figure 3: Corrections accomplished by means of the MapFace editor are encircled (compare Figure 1).

important and time-saving means, but also a convenient tool to work with.

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