IMPROVING ACCESSIBILITY TO BUSINESS PROCESSES FOR DISABLED PEOPLE BY DOCUMENT TAGGING

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Abstract: Although many companies and governmental institutions have provided their costumers with access to electronic information systems and to their processes, there still remains widespread use of paper-based communication. In this paper we present an approach, which we use in the FABEGG system to make these documents accessible to handicapped users. We discuss a prototypical system with both an administrative and a user front-end to work with printed forms in business processes. Compared to purely electronic solutions we can also cope with forms, which contain already process related data like for instance name, address and other personal information of the recipient. The prototypes presented here will be evaluated in local governmental authorities.

1 INTRODUCTION

In recent years much effort has been spent in Human Computer Interfaces to improve access for handicapped persons to computer systems (Mulleret al. 1997). To a major extent these activities are enforced by legislative constraints that exist in the US (e.g. the Americans with Disabilities Act (United States of America, 1990)) as well as in the European Union (European Commission, 2000), and in its member countries, like in Germany (Bundesrepublik Deutschland, 2006).

In this paper we focus on the interfaces to information systems for humans with visual impairments. In general, there exists a variety of hardware or software components to enable access to computer systems for this group of users (for early approaches see e.g. (Edwards, A. D. 1988, Ballenger, W. L. 1979)). These tools are either delivered as part of the operation system, e.g. screen magnifiers in the Windows operation systems, or by companies specialized in assistive technologies, e.g. ScreenReader, Braille displays and text-to-speech software, or they may be included as an additional feature of a standard software system, like the speech input/output facility in the Opera Internet browser. We refer to http://www.barrierefrei-kommunizieren.de for an overview of such tools. For the design and implementation of such software systems there exist guidelines, frameworks and tools, e.g. (Sun Microsystems, 2006), (W3C, 2006). These tools improve accessibility on the client side for visually impaired users. However, they do not consider the complete activity of information processing. For instance, accessibility can be improved by including additional information within the document of interest or by special classification algorithms to classify these forms.

From a process related point of view we may observe that particularly governmental institutions have been active to be present also in the Internet and they have started to provide their services for electronic access. However, when looking closer at this development we may recognize that many of these realizations only allow the citizens to download particular forms, usually in PDF-format, that have to be printed, filled and sent back to the governmental institution. Furthermore, when an institution contacts a citizen this usually happens by paper mail. Often, these documents are forms that are partially filled with personal data of the recipient who is in charge to complete the form. It is obvious that this process step is difficult to handle for visually impaired people, elderly or dyslexic people, or immigrants.

In the following we present an approach to improve this situation by exploiting different

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technologies e.g. from the fields of document analysis and language processing.

2 FABEGG SYSTEM ARCHITECTURE

The FABEGG system consists of different components. The most important ones for the underlying paper are on the one hand the component that allows construction of a document repository by a company or a governmental authority. We will stretch the possibility to insert forms into the repository and hence, refer to this component as the *forms front-end* hereafter. The second component is the one that enables the use of the repository and will be referred to as *user front-end* in the following.

The document insertion is organized as follows: A governmental authority feeds documents and forms into a document and template repository via the FABEGG forms front-end. For the discussion within this paper we mainly focus on the insertion of forms that are part of processes within the authority. The FABEGG forms front-end allows the authority to enhance the forms with metadata that is necessary to process them later on. Furthermore, it allows adding metadata to support visual impaired users to understand and to process these forms.

The FABEGG user front-end builds on this information to present documents. The user can scan a document to process and he will then have different modes of access to it. For example the document can be displayed in certain colour combinations, in an enlarged mode or it can be read to the user (cf. section 5).

In the next sections we will describe these two components in more detail.

3 FORMS FRONT-END

FABEGG provides an interface to insert forms or general documents into a repository. This repository can be used like an information centre for a company or a governmental institution where relevant information can be found and downloaded. In the following we focus on the insertion of forms that are usually presented to the citizens as printed documents. For digital forms a similar procedure is possible.

In order to guide a blind or visual impaired user through the form a set of help texts can be associated with the document. This comprises text to explain the general processing steps of the form as well as help texts for each field to explain the user the kind of information that is expected to complete a field.

To enable the forms recognition step from the digital image a set of *anchors* is associated with a document or form. In general, anchors are areas where certain content is expected or which have special features that allow identifying the form or the form template, respectively in the repository.

4 DOCUMENT REPRESENTATION

Documents and templates are contained in the document repository. The information that is necessary to process a document is stored in an XML-format that is partially depicted in figure 3. The left-hand side of the figure shows an excerpt of a form, which students have to maintain during a practical phase of their education.

In this example there is one anchor, namely the word “Laufzettel” in the headline of the document. When this anchor is found the upper left-hand corner of the surrounding box of the anchor will serve as origin for the positions of the fields in the document. Then completion of the form can start. The information for the relevant input fields is stored in the XML-format file, which is partially depicted on the right-hand side of figure 1. Here, the definition of the data fields is shown in some detail. For each field the distance to the anchor is given and additional information like a field id and a fieldname is also available. The element <FieldValue> contains the corresponding value filled in the form on the left-hand side. This value is determined at runtime when the particular form template is processed. The FABEGG system will try to read the text at the specified position in the document. In a first step the text read can be checked for syntactical correctness. In this case the system can check the text whether it coincides with the type given in the <FieldType>-Element. The function that should be used is specified in the <ValidateFunc>-Element referring to a function called “Check4ValidName” in our example.

5 USER FRONT-END

The user interface consists of a camera unit, speakers, and a display. The camera unit enables easy document handling and fast document capture.

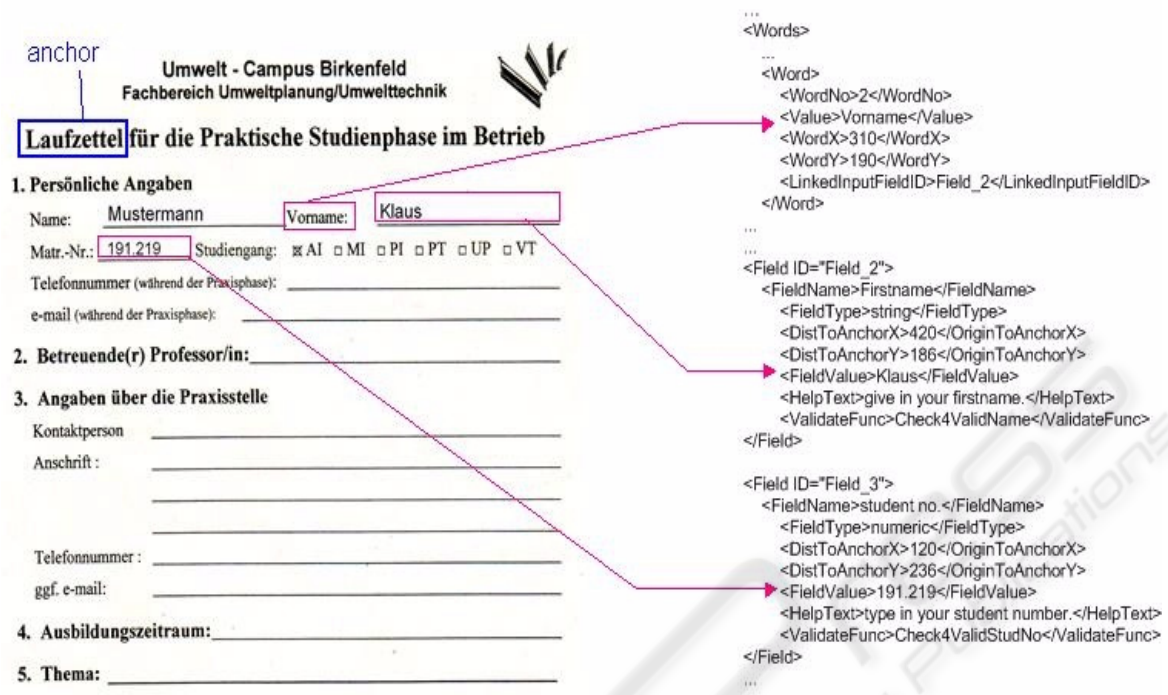

Figure 1: XML document representation.

The interface consists of standard hardware only and hence, such a user terminal could be placed in any major administrative department. In a real environment the speakers could be headphones due to privacy considerations.

On the display the document image captured by the camera is displayed, where . different colour combinations can be chosen. The image processing is done in real-time (Hennen, C., 2004). Moreover, after the document has been processed by an OCR software it can be read by using a speech synthesis software allowing text output in different velocities. While reading the text the system highlights the word which is actually spoken by drawing a coloured rectangle around it. This enforces auditive understanding. Other features like reading word by word or sentence by sentence are already included or can easily be considered. Along with this features the FABEGG system provides humans with visual impairements, dyslexic people or people with problems in reading comprehension with better access to printed information. The system is also able to process common electronic formats like PDF or HTML. The overall process is scetched in figure 2.

In order to process a form based document the user hands over a digital image to the FABEGG system, e.g. by taking a picture with the camera in the FABEGG station or by using a scanner. Then, FABEGG automatically determines the type of the form and retrieves the matching template. Thus, it knows which fields should be already filled e.g. by an authority and which ones have to be completed by the actual user. The regarding control information is given with the help of the XML-document in the repository. FABEGG guides the user through the process of document completion. Therefore, it can read any information contained in the form and provide help information on the expected input for the fields.

After all required fields of the form are filled it is transformed into a representation that can be inserted into a further workflow. In some contexts it is necessary therefore to print the document for having the possibility to sign the form. In other cases the form can be transmitted electronically to the next recipient. For this purpose FABEGG supports common electronic formats like PDF or XML. These documents may then be sent by E-mail. Another possibility is transferring the information by using public interfaces, e.g. based on HTTP or even Web Services. Hence, FABEGG also achieves an improvement by avoiding media disruption in process chains.

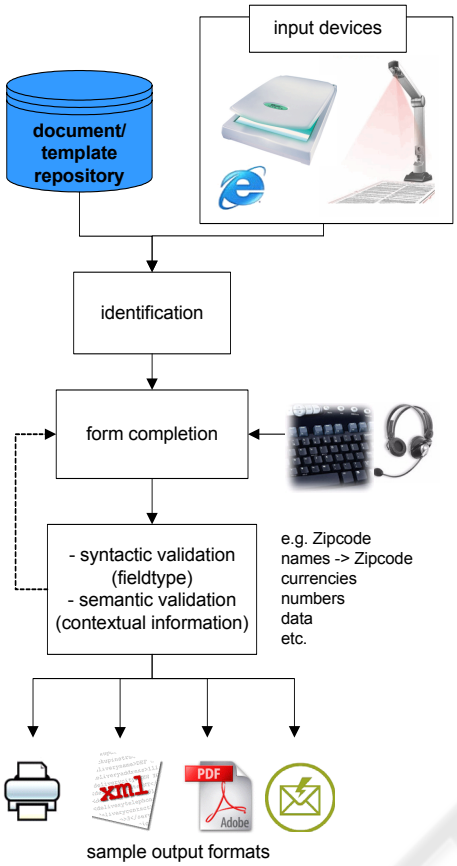

Figure 2: Detailed process for user client.

6 CONCLUSION AND FUTURE WORK

In this paper we have presented the FABEGG system, which provides humans with reading disabilities with much better access to information systems. In particular, access to printed documents, which are still important in business processes or in government applications, is substantially improved. We have shown how the form-handling component allows inserting forms into the system and how to retrieve them later on. By identifying the corresponding process using the information in the document template repository FABEGG integrates paper documents into electronic process chains. As electronic forms can be processed as well, FABEGG also helps to prevent media disruption. Furthermore, we can cope with documents where form fields have already been filled with individual information in the process before the user receives the form. This type of communication is quite general in nowadays business processes and cannot be replaced easily by switching to an electronic version.

We will evaluate the FABEGG system together with some local government authorities in Germany. This will give further insight to needs of the intended user groups. Furthermore, we consider to implement FABEGG as a client / server application thus giving more possibilities for the user front-end. This will enable the users to have access to the system from their home. Then they can also maintain their documents in their personal document management system.

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