Improving Access to E-Government Processes

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ABSTRACT

Much effort is spent in governmental institutions to provide citizens with access to government processes. However, there are still a lot of steps in these processes that rely on the exchange of printed paper. This is a problem for all people who have difficulties to read, among them humans with visual impairments, elderly people or immigrants. In this paper we present an approach followed in the FABEGG-System. It allows transforming either electronic or paper based documents, particularly forms into a representation that can be read by a computer. Furthermore, it provides the possibility to guide the citizen through a document or form. Thereby, FABEGG improves accessibility for many E-Government processes.

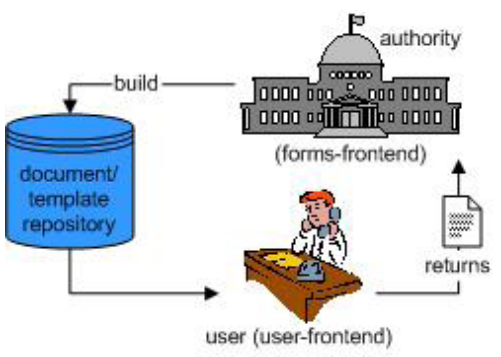
1. INTRODUCTION

In recent years governmental institutions have spent much effort in Human Computer Interfaces to improve access for handicapped persons to computer systems [1]. To a major extent these activities are enforced by legislative constraints that exist in the US (e.g. the Americans with Disabilities Act [2]) as well as in the European Union [3], and in its member countries, like in Germany [4],[5].

Looking closer at many of these systems we may recognize that many of these realizations allow citizens to download particular forms that then have to be printed, completed, and sent to the governmental institution. In processes where an institution contacts a citizen this usually happens by sending paper documents. Often, these documents are forms that are partially completed with data of the recipient related to the processes. The citizen is then asked to complete the form with additional information. This process step is clearly difficult to handle for visually impaired people, elderly or dyslexic people, or immigrants.

In this paper we present an approach which we pursue in the FABEGG system where we try to develop new techniques to improve access to this documents for the humans mentioned before. Figure 1 gives an overview of the document flow supported by the system.

Figure 1. Prozess overview



The document and template repository serves as an interface between citizens and authorities. An authority feeds the repository with relevant information (e.g. statutes of communal companies) or forms. In the latter case we speak of document templates. FABEGG provides modules to support the input of documents into the repository as well as modules to process these documents or templates. In the following we describe these modules in more detail.

2. THE USER FRONT-END

The FABEGG user front-end is an innovative terminal that could be placed in any administrative department. Figure 2 shows a possible configuration of the system with a digital document camera unit to capture printed documents, and a touch screen which is used as display and as an input device.

FABEGG allows to present documents on the display with special effects. For example a document can be enlarged, or different combinations of colours can be chosen, which provide better visibility for humans with particular visual defects. Furthermore, the document can be read by the computer in different velocities. Therefore, speakers are also included in the system. Due to privacy considerations they could be substituted by headphones in a real environment. While reading, the system highlights the text, which is actually spoken, e.g. by drawing a coloured rectangle around the text. This enforces auditory understanding. With a pointing unit (e.g. a mouse or a finger when a touch screen is available) the user can start/stop reading at any arbitrary position within the document.

A citizen who wants to process a governmental document gives a digital image to the FABEGG system, e.g. by taking a picture with the camera in the FABEGG station or by the camera in his mobile phone and sending it via Bluetooth or UMTS. FABEGG uses a component to automatically identify the type of the form. From

Figure 2. Prototype of the FABEGG system

its database it determines the fields that should be already filled by the sender and then guides the citizen through the process of filling the document. The system can read any information contained in the form and provide help information on filling the fields. FABEGG can perform validity checks for the input and can support the user to correct invalid inputs.

After the form is completed it is transformed into a document, which can be inserted into the workflow of the government department. Hence, FABEGG also achieves an improvement for the department, which is responsible for the next step in the process.

3. THE FORMS FRONT-END

The forms front-end is the interface for the governmental institution to insert documents or forms into the repository. It comprises digitalisation and indexing of a document in order to enable users to retrieve the document easily. In our discussion here we focus on the insertion of forms that normally would presented to the citizen as printed forms. An administrator or an official in charge who wants to deploy a form for the system starts with a digital image of the form. He attaches administrative data to the document, i.e. a unique ID, a name, a type etc. Then the official marks the input fields relevant for that form. There may be fields that are already filled when an instance of that form is sent to the citizen; other ones have to be completed by the recipient. The editor can specify the type or format of the requested input, like date, City Code, currency or numbers and he can specify functions to validate the input. This may be known from web-based formulas with JAVA-script. In the FABEGG environment one can do even more tests because we are not restricted to client-side computing. For each field a help text can be associated which can guide the user during completion of the field.

To be able to identify such a template given a scanned document image by a user the editor must define at least one unique anchor for a document. This can be a textual anchor, a barcode or an arbitrary image/pattern on the form. Of course, in large repositories choosing a unique anchor may be difficult. Therefore, we will work on an automated procedure for the anchor definition. This routine could crosscheck all possible anchors on a form with the database to prevent double entries in the database. Having done all this, the document template is stored in the document repository. We use an XML-format to glue together all the different information mentioned above. In this description it is possible to integrate layout information and procedural information (cf. [6]). The layout information includes for example words and their positions in the text, or reading order of fields in a form. Procedural information includes specification of validation functions for user inputs or a strategy to identify an anchor for a specific document.

Another core activity will be the development of an ontology for the application domain. In a first step we will represent the major departments and processes in such an ontology. This will provide a structure, which can be used to insert new documents and forms into the repository automatically. Furthermore, the hierarchical structure can be used to implement an ontology-based retrieval of documents as described in [7].

4. IMPLEMENTATION

The FABEGG system is implemented as a modular system. It contains components for processing and manipulating the document image, components to produce spoken output and components that establish control features, e.g. validity checking or the connection to other components as databases or workflow management systems. Many of these components, in particular the image processing components and the OCR software are only available for Windows based operating systems. Thus, FABEGG is currently a desktop application running only within this environment. Furthermore, we use a commercial speech synthesis component to generate the audio stream while reading the document that is also only available for Windows. For the form recognition we use techniques as described in [7]. Some modules for the image manipulation and for the system design may be found in [8], [9], [10].

The OCR is implemented as a component, which analyses the whole image. It yields the layout structure of the document, including the number and the position of all paragraphs, the position of images or graphical sections, position, style, and recognition confidence for all words in the text with. The result of this process is stored into the XML-file, which is adapted to the structure of the text (paragraph-block-sentence-word).

To capture a paper-based document we use an innovative digital document camera. The application shows a live stream of this camera until the user presses a button to take a snapshot of the actual document. Many of the components we use were developed in a project of the German Ministry of Economics and Labour, called LiveReader [11]. These components contain functions to process digital images, i.e. for zooming or colour manipulation. They also provide us with a software layer for accessing Text-To-Speech synthesis.

5. CONCLUSION AND FUTURE WORK

In this paper we have presented the FABEGG system, which significantly improves accessibility to documents for people with reading disabilities. Together with its form-handling engine which allows inserting forms into the system and retrieving them later on it implements a new functionality to present governmental forms to those citizens. A major advantage of FABEGG is that it can process either electronic or printed forms, which the user receives from the governmental institution. Thus, FABEGG avoids media disruption and integrates paper documents into electronic process chains. Furthermore, FABEGG copes with documents that have already been filled before with individual information before the user receives the form. This type of communication is quite general in nowadays business and governmental processes and cannot be replaced easily by switching to an electronic version.

We will evaluate FABEGG together with some local governmental departments in Germany. This will give further insight into the requirements of our specific user group. Furthermore, we consider implementing FABEGG as a client-server application thus, giving more possibilities for realizing the user front-end.

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