IST-2000-25420 FASTY

Faster Typing for Disabled Persons

Summary

The goal of FASTY was to create a system for increasing the text generation rate of disabled persons by employing so-called predictive typing and dedicated advanced input devices. In contrast to existing prediction systems, FASTY is able to predict compounds and proper inflectional forms based on the use of parsing, which is very important in many highly inflectional languages. The prediction power is utilized in conjunction with pressure sensitive input devices, which further speeds up the typing process and/or lowers user stress.

Setting the Scene

Communication is a primary need for humanity. While this holds true for mankind in general, the need for effective communication is even more critical for disabled people. It is also true that computers play an increasingly vital role as a communication tool. However, in this on-going process disabled people are at a disadvantage.

In particular, motor impairments make the use of standard text input devices to the computer difficult and hence slow. For instance, while non-disabled writers have a typing speed of some 200-300 characters per minute, the typing speed of a user operating the keyboard with a mouth stick is not higher than 75 - 120 characters per minute and for a single-switch user this rate is somewhere around 3 to 10 characters per minute.

Motor impairment often goes hand-in-hand with articulation deficiencies. Thus, alternative methods based on speech input will not solve the problem. Providing methods for accelerating keyboard text input is a better way to go. This is the strategy that was chosen in the FASTY project.

When the project was initiated, there were already a number of word predictors on the market. However, they had been typically developed for English, which meant that they were not well suited for morphologically rich languages such as Dutch, French, German and Swedish. Simply adapting the English programs to these highly inflecting languages by replacing the English dictionaries usually implies a massive reduction in the keystroke saving rate. These effects are due to the simplistic language description that is used for predicting English text and that fails to predict the correct inflectional form of a word as required by inflectional languages. As a rule, the English language description is, as a rule, limited to frequency data on individual words (unigrams) and sequences of words (bigrams and trigrams).

An additional problem with most of the languages FASTY was designed to work with, was the fact that new compounds could be created on the fly, thus making it hopeless to strive for a complete lexicon. Other methods needed to be employed for coping with dynamic word formation processes. Being able to cope with compounds, even if they are new, is of great importance, since compounds are usually rather long words and failing to predict them can cause a significant drop in the keystroke saving rate.

Approach

In order to follow a user-centred design approach, the initial project phase saw user involvement in technical development from the outset of the project by setting up panels of end-users in four countries: Austria, Belgium, Germany, and Sweden. These panels consisted of 35 primary users and 5 secondary users.

The specification was created, based firstly on general research, results of discussions with the user panel (using a rapid prototype), test results done with a developed user ability test tool and results obtained from intense market research.

The first prototype was then tested with 20 users coming from four countries and was revised and enhanced based on the user feedback.

During the development, the user panel was involved and different beta versions were given to the users. The feedback was immediately used for further development.

Results and achievements

A functional prototype system was developed with English, Dutch, French, German and Swedish user interfaces. This prototype system also included four prediction languages: Dutch, French, German and Swedish. A speech output system (part of the user interface) was developed for Dutch, French, German and Swedish.

A pressure sensitive keyboard and different pressure sensitive single switches were developed to work in concert with the software.

Furthermore, several development tools for user feedback enhancement, language resource building and data processing were developed.

The achieved innovations in the final prototype are:

- prediction of compounds
- prediction of proper inflectional forms based on the use of parsing
- generic algorithms to ensure cross-language portability
- dictionaries based on general language corpora and on the users' own texts
- adaptation of the dictionaries based on actual use of the predictor
- initially supported languages: Dutch, French, German and Swedish
- user interface that is an integral part of the predictor and is adaptable by primary and secondary users, capable of using different kinds of input devices and which provides automatic adaptation to the performance of the user
- new input devices: pressure sensitive switch, pressure sensitive keyboard

The final prototype was evaluated in four countries with 75 users. The results were documented for further improvements.

A project Web Site has been established at

http://www.fortec.tuwien.ac.at/fasty

Conclusions

The project results confirmed the approach of the prediction system and the goal of keystroke saving rates above 50% was easily achieved.

The evaluation proofed the positive impact of the new features of the predictor (e.g. compound prediction, grammar based selection, Part of Speech prediction, …) and the good integration of the prediction system and user interface.

A cooperation with an Italian University will show further test results and Italian will be part of the FASTY supported languages in the near future.

Tests with the pressure sensitive devices showed very promising results and the integration of such devices in other software products seem to be a next step for the Ingenieurbüro Jörg-Michael Lindemann.

IGEL is now searching for developers, who are interested in licensing the prediction engine itself (without user interface) for their own software products.

fortec uses the results and the knowledge of the FASTY project in other research projects. Furthermore, fortec has developed a prediction system based on the project results, which is already on the market.

The Österreichisches Forschungsinstitut für Artificial Intelligence, the Uppsala University, Multitel ASBL and the Forschungsinstitut Technologie-Behindertenhilfe der Evangelischen Stiftung Volmarstein are using the results and the developer tools for further research projects in the field of prediction systems.

The user partners are using the test results in the form of the prototype with their users.

Research Area keywords

Prediction Systems, Disabled and Elderly, User Interface Design, Input Devices

Timescale

1 Jan. 2001 to 31 Mar. 2004

Budget

Overall cost: 2.461.676€
EC contribution: 1.730.956 €

Project partners:

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