HCI Research in the Czech Republic

Václav Matoušek[1] & Pavel Slavík[2]

[1]) University of West Bohemia in Pilsen, Univerzitní 8, Plzeň, Czech Republic

[2]) Czech Technical University in Prague, Technická 2, Praha, Czech Republic

[1]) matousek@kiv.zcu.cz   [2]) slavik@cslab.felk.cvut.cz

Abstract: This paper presented a brief outline of hardware and software problems occurred at the beginning of HCI system developments (within the framework of last 25 years), research activities and results achieved by Czech academic institutions. The summary evaluates the reached stage and briefly suggests possible progression of HCI activities in the Czech Republic within next few years.

Keywords: HCI systems, user interfaces, GUI, speech and natural language understanding

The history of the science of communication between human and computer in the Czech Republic had similar characteristics as in technologically developed countries. To get an overview of the problems the Czech scientists were faced with, it is possible to follow a short outline of the history of man/machine communication in the Czech Republic (formerly in Czechoslovakia). The first computers appeared in the country in the second half of the fifties. In the mid of fifties the first computer SAPO was constructed by team led by Professor Svoboda who later emigrated to the US. The first commercially available computer MSP developed in Czechoslovakia was introduced to market in 1963. The first users of computers were scientists that used computers for their particular applications and they did not mind if they had to communicate with computers in a "non-user friendly" way. The situation started to change in the middle of the seventies when computers lost their exclusivity and they started to be used in many fields of human activity. The number of computer users started to grow significantly and these new users were not willing to learn the peculiarities of communications between human and machine. Later on, with the advent of minicomputers (in Eastern Europe with some delay – about at the end of the seventies) together with the wide usage of videoterminals the necessity of a good user interface emerged. In that time, the textual interfaces were the most common ones. The graphical interfaces were used in a wider scale much later on – in the eighties when microcomputers appeared and graphical user interfaces became a reality with all their accompanying problems.

The problems of human factors were mainly investigated in research institutes that covered the problems of psychology and ergonomics of human work related to the work with machines of many kinds. These machines were not necessarily computers but, for example, control panels in factories, power stations etc. The know how gained was extended to the design and implementation of (mostly) graphical interfaces (usually rather specialized ones). Creation of graphical interfaces was concentrated mostly in applications in the fields of geometric modeling and to 2D CAD. Besides that, textual interfaces were also investigated. This was especially true in the area of databases where the terminal users were inexperienced (naive) and good user interfaces helped them to overcome fear of computers.

A real boom of interest in user interfaces came with the first software packages that allowed in an easy way to design and construct universal graphical interfaces (MS Windows, X-Window and other systems). These systems are considered to be a sort of standard that makes it possible to design and implement user interfaces in a standard way.

Besides the use of these standards also research in the field of user interfaces was performed in the field of graphical user interfaces. Research activities of research groups (Prague, Pilsen, Brno) were mainly focused on general

computer graphics algorithms, rendering, animation in three-dimensional space, modern methods of interaction in three-dimensional space, image processing, digital signal processing, and applications like general manipulation methods in VE, molecular force field visualization, and haptic visualization of 2D and 3D objects for visually impaired people.

The first research groups for speech and language processing were established in seventies and at the beginning of eighties of the past century. The universities in Prague, Brno, Pilsen and Liberec as well as the Institutes of the National Academy of Science took place as leading institutions in the speech analysis and synthesis. Both areas have the common background in fundamentals of phonetics and linguistics, in digital signal processing and in the theory of pattern recognition and artificial intelligence. The key use of the speech recognition and synthesis is being prepared for human-computer dialogue systems and automatic translation systems. The research in the field of speech recognition was focused to improvement and design new types of descriptors for speech recognition with the aim of enlarging the number of recognized words and up to the recognition of continuous and spontaneous speech. The main goal was to prepare theoretical and technical background needed for applications of speech recognition systems.

The effort of Czech scientists was focused on the development of several "natural speaking" information dialogue systems in the last 10 – 12 years as well. The research in this area states the following goals:

- to work out methods for acoustic-phonetic segmentation of Czech spoken language,
- to create a representative database of continuous utterances that will cover the most frequent phonetic phenomena in Czech; several databases from different environments were already collected,
- to design and build a recognition system – such a system should be capable of operating with vocabularies of some hundreds or thousands of words, or with continuously uttered phrases for speech dialogue systems.
- to develop a bilingual "natural speaking" municipal information dialogue systems for the municipalities of partnership cities of Pilsen (Czech Republic) and Regensburg (Germany) – the goal is to build a dialogue system, that would allow users (tourists and guests as well as citizens of the town) to get information on cultural events in the city and surroundings.

Some research groups participated on several European Joint Research Projects (COST, Copernicus) and about ten information retrieval dialogue systems (some multilingual and multimodal) were developed and successfully implemented.

The Center for Computational Linguistics has been established and supported as a "Center of Excellence" by the Ministry of Education of the Czech Republic within the national scientific program aiming at a substantial and long-term support of the most advanced topical domains of research. The Center is attached to the Faculty of Mathematics and Physics, Charles University in Prague, and its research activities are divided into four areas – theoretical linguistic studies, with a special regard to the building of the Prague Dependency Treebank of Czech language, mathematical and computational methods, speech recognition, and applied and experimental systems.

At the present time there are no significant hardware or software problems in the Czech Republic in terms of availability. That means that the experts work in similar environments as their colleagues abroad. There is a lot of know-how related to local conditions that can be used when designing and implementing user interfaces. What is missing (and what needs some know-how from outside to get on the proper level): introduction of formal methods in industrial scale (especially verification and evaluation of UI) and the use of cognitive aspects of UI design. Unfortunately there is not enough contacts between experts in industrially developed countries and experts in the Czech Republic. Therefore, an establishing of more intensive contacts with research institutions and universities of these countries is needed. This concerns mostly the participation in joint projects and participation in international conferences. Only in this way would the integration of experts from different geographical regions be possible.

References

Matoušek V. (2002), Mensch-Computer Sprachkom-munikation mit VoiceXML. In: *Informationstag 2002 – Mobile Computing*, Universität Regensburg

Slavík P., Kolingerová I. (2002), History of Computer Graphics in the Czech Republic. In: *Journal of WSCG '2002* [CD-ROM], University of West Bohemia in Pilsen, pp. i-v