Newsletter

of the IFAC Technical Committee on Human-Machine-Systems

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In this issue

Welcome from the chair

During the last IFAC-world congress in Barcelona, the IFAC TC on Human-Machine-Systems (HMS) decided to extend its activities by going more public.

As the new chairman of this TC I would therefore like to welcome you to this new newsletter service.

Let me first introduce out TC to those who are not aware of its background. IFAC is a worldwide organization dealing with Automation Control theory, applications, education, and anyone of its technical and social implications. Its membership, based on the National Member Organizations (NMOs), provides a truly international participation, preserving the local customs in the development of its activities. On the working level, the IFAC is structured in 38 Technical Committees. Members of the Technical Committees (TC) are named either by NMO's delegation or by their own application based on recognized expertise.

This TC considers all conditions where humans (individuals as well as groups) use, control or supervise tools, machines or technological systems. Fosters analysis, design, modeling and evaluation of HM-systems and includes: decision making and cognitive processes, modeling of human performance (reliability, mental load, and predictability), real and virtual environments, design methodology, task allocation-sharing and job design, intelligent interfaces, human operator support, work organization, and selection and training criteria.

With this newsletter, we want to present our activities to a broader audience and invite everyone interested in Human-Machine-Systems to join our group. The electronic media will help us keeping in touch and share information easily. I would therefore appreciate if you will become an active member of our community. Please do not hesitate to inform your colleagues about this activity by forwarding a copy of this newsletter to them.

You are also invited to join the official TC meetings that will take place during the IFAC Symposiums in Goteborg / Sweden (September 2003) and in Atlanta / USA (September 2004).

In this issue, we present our current activities and remind you about some important events. Any input from you for future news letters is highly appreciated.

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HMI TECHNOLOGIES OF THE FUTURE - A SURVEY

Technological advancements in the field of electronics, communication and information technology have open a door to new interaction methods that were not though of before. This can be observed not only in the office application, but also in the industry, where machines are integrated with modern input and output devices in order to facilitate their operation. An online survey that was conducted by the IFAC TC HMS in 2002 by applying the Delphi-like survey technique had the aim of finding out the importance of these technologies for HMI in future (say in the next 30 years), the possible time for their state of the art as well as getting a measure of their impact in HMI.

Generally, the Delphi survey technique is suitable for finding future trends and their possible realization horizon in two feedback loops. In the first loop, a limited number of questions related to important research fields are asked to participants. Participants are able to answer questions and to add their personal view concerning topics that may not have been addressed. Results of this loop and extra inputs from participants are used to formulate questions properly, which are then used in the second loop. Results of the second loop are final and give a picture of the expected trends and horizons.

In this HMI survey, identified interaction technologies were tactile, gesture, gaze, speech, mimic, mind control as well as multimodal interaction that integrates more than one input mechanism. The survey revealed that **speech** will be the most important interaction technology in the future. This is probably because of the ease and flexibility it offers that makes resemble the natural human-human interaction. According to the survey, it will reach its state of the art by year 2010. Also as important as speech interaction was the **multi-modal** interaction which might lead to machines having artificial eyes, ears, mouth, skin etc.

Coming to visualization technologies **3D** as well as **augmented reality** will be more important than virtual reality, head-mounted display and free form display. These technologies should be fully implemented by year 2010 too, so the survey.

A recently emerged technology is that of wearable PCs like **intelligent clothes** and **wrist pc**, both showing significant importance in the future. As to how long it might take for them to reach their state of the art, most participants predicted year 2010.

As machines become complex with sophisticated functionalities, secure user authentification is needed. Though normal user authentification methods like password and chip card will still be in use, **biometrical methods** like iris scan, finger prints, and voice identification are getting more

important and might be fully implemented by 2015. They will replace or supplement common methods mentioned above.

New means of group interaction like shared workspaces and virtual control room have also emerged and the well known teleservice is being improved. Among them **shared workspaces** will be most important for group interaction in future. Shared workspaces might be fully implemented by 2005.

And intelligent UIs will be important for HMI in future? Will it be intelligent agents, avatars, emotional (affective) UIs or personalized UIs? Results showed that **intelligent agents** and **personalized UIs** could be important in the future of HMI. While intelligent agents will soon be fully realized, namely in year 2005, it might take 5 more years (2010) for personalized UIs to reach their state of the art.

And which role will emotional engineering (also known as affective engineering) play in future HMI? Will recognizing emotions and expressing emotions be important or not? The survey showed that technologies for **recognizing emotions** will be more important than those for expressing them. These technologies will reach their highest development state by year 2010.

According to the survey the year **2010** will be mark with most of the above technologies will reach their state of the art.

Besides knowing the importance and realization time span for most technologies, the survey also aimed at getting the degree of agreement for some assumptions. Most participants agreed with the statement that:

- there will never be absolute security

- lack of security is an obstacle for the use of mobile devices

- group software will lead to new working organizations

- one central interface will be used to control several devices

- tasks should be grouped and operated via separate devices in order to simplify information processing for user

- the application of multi-modal interaction will simplify the communication between human and machines

- machines will be able to recognize and express emotions

- culture-specific products are necessary for each user-culture

- products must be adaptable to culture-specific user needs for international markets

In short the survey proved that changes in the electronic, information and communication technologies have impact on the interaction and organization structures for the HMI.

Detailed survey results can be downloaded at http://www.uni-kl.de/pak/HMI/ifacdelphiresults.htm

LIST OF WORLDWIDE RESEARCH INSTITUTES IN HMI

After good experiences in Germany with a list of research institutes in the field of Human-Machine-Systems we try to establish a similar list on this IFAC-TC HMS server. If you are interested to be listed and present your lab and its special knowledge or service we would encourage you to contact us.

We are still experiencing with the proper form, so do not hesitate to send us not only your profile but also your ideas.

You can join the list of the HMI institutes by one of the following methods:

1: Send an Email to mukasa@mv.uni-kl.de with the following information:

Name of the institute, contact person, email address, mail address, research field, services

Or

2: Fill and submit an online form at http://www.uni-kl.de/pak/HMI/joinhmilist.htm. There, you can also download the form and sent it per mail or fax.

COMING EVENTS

- 8th IFAC Symposium on Automated Systems Based on Human Skill and Knowledge

September 22 - 24, 2003, Goteborg, Sweden

The symposium focuses the impact of automation on the human, throughout their lives.

The use of automation is constantly increasing — during work as well as recreation, in sickness and in health. Therefore, the creation of a sustainable synergy between people and the possibilities of automated systems is becoming a central task for the global society.

The main objective of this symposium is to arrange a future- and solution-oriented meeting between international scientists, application specialists, and industrial experts.

- 7th IFAC Symposium on Cost Oriented Automation (COA 2004)

June 7 - 9, 2004, Hull/Ottawa, CANADA

- **9th Symposium on Analysis, Design, and Evaluation of Human-Machine Systems**

Expected in September, 2004, Atlanta, USA

Further details will be published soon on this server and in the next newsletter.

EDITORIALS

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