Issue N° 45 / May 2008

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INTERACTIVE MULTIMODAL INFORMATION MANAGEMENT

IM2 Newsletter

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News

MLMI 2008
5th Joint Workshop on Machine Learning and Multimodal Interaction
8-10 September 2008
Utrecht, The Netherlands

2008.03.04
Klewel Award: European Seal of e-Excellence

Klewel received the 2008 European Seal of e-Excellence award at the CeBIT International Trade show on information technology and telecommunications (Hannover, Germany) from the European Multimedia Forum federation.

Cover Story

IM2 in the European Network of Excellence PetaMedia

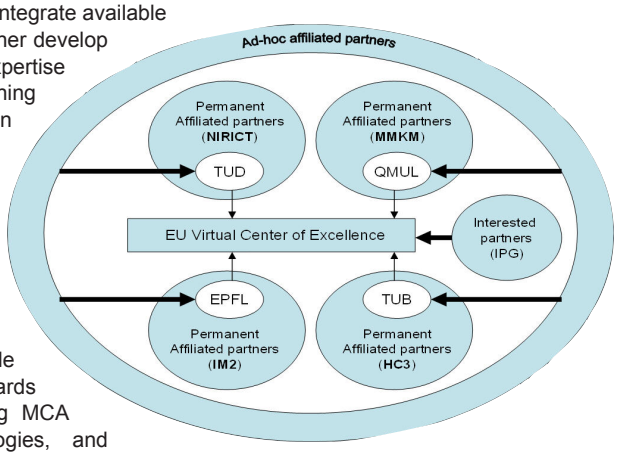
In addition to IM2 in Switzerland, the Netherlands, UK, and Germany have also created national centers of excellence for their national research groups active in the areas of multimedia content analysis (MCA) and social and peer-to-peer (SP2P) networks.

The Network of Excellence PetaMedia (NoE Peer to Peer Tagged Media) brings these four strong national networks together, at first to form a European network of national networks, and to establish a sustainable European virtual center of excellence to which research groups throughout Europe and active in the above fields, can connect. The four core partners of this NoE, TUD, QMUL, TUB and EPFL, represent and coordinate activities between and within the respective national networks. The purpose of joining four national networks is to achieve larger momentum, to integrate available resources, and to further develop complementary expertise necessary for pushing new paradigms in enabling efficient and effective access to multimedia content in emerging network structures.

The collective research effort that thus comes available will be directed towards integration of existing MCA and SP2P technologies, and towards identification and exploration of potentials and limitations of MCA/SP2P combinations. A particular scientific challenge that binds the partners is the synergetic combination of user-based collaborative tagging, peer-to-peer networks and multimedia content analysis. IM2, as one of the four pillars of PetaMedia, is involved in this NoE through IP.MCA, with participation of research groups from EPFL, IDIAP and University of Geneva.

The kick-off meeting of PetaMedia took place in Delft on 13-14 March 2008, where IM2 was represented by a number of researchers from the above mentioned institutions, as well as HEIG-VD from Switzerland. The first day of the meeting was devoted to presentation of the activities of each national network, whereas the second day focused on face to face parallel meetings which led into creation of four special interest groups on content distribution, processing, indexing, and social content retrieval. In the next months, each of the special interest groups will work towards a detailed plan of collaboration with well defined objectives and deliverables.

More information about PetaMedia can be obtained from: *http://www.petamedia.eu*



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IM2 is the Swiss National Centre of Competence in Reseach (NCCR) on Interactive Multimodal Information Management, lead by the IDIAP Research Institute in Martigny, Switzerland. The National Centers of Competence in Research are managed by the Swiss National Science Fundation on behalf of the Federal Authorities.

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New Head of the individual project «Human-Machine Interaction»

Due to the departure of Alex Jaimes, head of the individual project (IP) «Human-Machine Interaction» (HMI), the IM2 Technical Committee had to vote a new IP head. After taking into account the suggestions of each IP Head, Denis Lalanne (former HMI deputy head) was elected as new head of HMI by the majority of the Technical Committee members.

Denis Lalanne, University of Fribourg

Denis Lalanne is a senior researcher in the DIVA group of the Department of Informatics of the University of Fribourg, Switzerland. He received his B.Sc. degree in Computer Science from the University Joseph Fourier (Grenoble, F, 1993), M.Sc. degree in Cognitive Science from INPG (Institut National Polytechnique de Grenoble, F, 1994), and a PhD in Computer Science from the Swiss Federal Institute of Technology in Lausanne (EPFL, CH, 1998). Before reaching the University of Fribourg in 2002 to work on the NCCR IM2, Denis has worked as research scientist in the USER group (User System Ergonomics Research) of IBM Almaden Research Center (1999, California, USA), as assistant professor in the University of Avignon (LIA, 2000, F), and as usability officer in Iconomic systems, a swiss startup that no longer exists (2001, CH). At the University of Fribourg, Denis currently teaches a course on multimodal interfaces and coordinates several HCI projects among which the MeModules project, on tangible and multimodal user interfaces, the NetSecurity & Risk manager dashboard projects, on information visualization for network intelligence, the ToTalRecall project, on personal information visualization, and participates to several European initiatives (e.g. TIVIPOL on interactive systems to support elderly people, VISMASTER CA on Visual Analytics). His expertise covers the field of Human Computer Interaction, and more specifically multimodal user interfaces, information visualization, and usability engineering.

Miroslav Melichar has completed his doctoral degree in the IM2 framework

TITLE : DESIGN OF MULTIMODAL DIALOGUE-BASED SYSTEMS

Miroslav Melichar, EPFL

Miroslav Melichar obtained his masters degree in computer science (specialization in natural language processing) in 2003 at the Faculty of Informatics, Masaryk University, Brno. His diploma project was partially solved during his 6-months stay in 2002 at the Artificial Intelligence Laboratory (LIA) at the Swiss Federal Institute of Technology in Lausanne (EPFL). During this stay at EPFL, he followed an intensive postgraduate course in Language and Speech Engineering. In 2003 he became a doctoral school student at the EPFL and as of 2004, he is an assistant in the LIA. He has been participating in the European Masters in Language and Speech (Euromasters) summer schools (as a student and lecturer) since 2002. Early 2008, he obtained his PhD which is described below:

Multimodal dialogue systems integrate advanced (often spoken) language technologies within human-computer interaction methods. Such complex systems cannot be designed without extensive human expertise and systematic design guidelines taking into account the limitations of the underlying technologies. Therefore, this thesis aims at reducing the time and effort needed to build such systems by creating application-independent techniques, tools and algorithms that automate the design process and make it accessible for non-expert application developers.

The thesis proposes an interactive system prototyping methodology, which (together with its software implementation) allows for rapid building of multimodal dialogue-based information seeking systems. When designed with our methodology, even partially implemented system prototypes can immediately be tested with users through Wizard of Oz simulations (which are integrated into the methodology) that reveal user behavior and modality use models. Involving users in early development phases increases the chances for the targeted system to be well accepted by end-users.

With respect to dialogue system design, we propose a two-layered dialogue model as a variant of the standard frame-based approach. The two layers of the proposed dialogue model correspond to local and global dialogue strategies. One of the important findings of our research is that the two-layered dialogue model is easily extendable to multimodal systems. The methodology is illustrated in full detail through the design and implementation of the Archivus system -- a multimodal (mouse, pen, touchscreen, keyboard and voice) interface that allows users to access and search a database of recorded and annotated meetings (the Smart Meeting Room application).

The final part of the thesis is dedicated to an overall qualitative evaluation of the Archivus system (user's performance, satisfaction, analysis of encountered problems) and to a quantitative evaluation of all the implemented dialogue strategies.

Our methodology is intended (1) for designers of multimodal systems who want to quickly develop a multimodal system in their application domain, (2) for researches who want to better understand human-machine multimodal interaction through experimenting with working prototypes, (3) for researches who want to test new modalities within the context of a complete application, and (4) for researches interested in new approaches to specific issues related to multimodal systems (e.g. the multimodal fusion problem).

Keywords:

- multimodal systems
- dialogue systems
- dialogue management
- rapid dialogue prototyping
- Wizard of Oz experiments
- human computer interaction (HCI)
- graphical user interface (GUI)
- system evaluation

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New SNF project related to IM2 at UniGE

LED BY VIPER GROUP

The Viper group at University of Geneva was recently granted a new support for the project SwiftLink «Machine Learning Strategies for Adaptive Multimedia Navigation». Via the SwiftLink project, the group wishes to explore new directions for the automated creation, adaptation and maintenance of information networks.

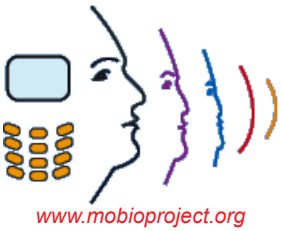
Research will be placed from a perspective arising from the shortcomings of information search. While efficient information search paradigms such as the Query-by-Example paradigm have been designed, systems still do not fulfill user needs. In many applications, the user tends to be oriented towards navigation rather than directed search.

The aim is to design a system that, starting from a rather classical and pragmatic content-based analysis of the media collection is able to setup an initial useful browsing environment. At this stage, experience from the design of multimedia content-based search systems is exploited for the representation and organization of the data along this network. The most innovative aspects of this research will be the online and long-term system adaptation, offering new challenges such as the design of interactive adaptation techniques inherited from traditional learning framework.

This research is directly relevant to IM2 for the management of multimedia collections (IM2.MCA) and also in relation to offering efficient and adaptive interaction modes to the users (IM2.HMI). Close collaborations will be sought throughout the development of the SwiftLink project with an initial granted duration of 2 years.

MOBIO, new FP7 STREP project

A STRONG LINK WITH IM2



www.mobioproject.org

MOBIO concept is to develop new mobile services secured by biometric authentication means. Scientific and technical objectives include robust-to-illumination face authentication, robust-to-noise speaker authentication, joint bi-modal authentication, model adaptation and scalability.

These days, portable personal devices such as PDAs or mobile phones are indeed widely used. They provide the mobile worker or the customer with portable computing and wireless access to Telecom networks and to the Internet. It is then possible to provide anywhere anytime a natural access to any service, such as PIN code replacement, phone card reloading, remote purchase, telephone banking or voice-mail. Most of these services involve micro payments that can currently be done only using PIN codes or passwords.

To win wide consumer acceptance, their friendly, personalized, interactive interfaces must recognize people in their immediate environment and, at a minimum, know who they are. The conventional means of identification such as passwords, secret codes and personal identification numbers (PINs) can easily be compromised, shared, observed, stolen or forgotten. In view of this, it appears that the required optimal reliability in determining the identities of users may only be achieved through the use of biometrics (automatically recognizing a person using distinguishing traits). Since more and more portable devices are equipped with a microphone and a video camera (while very few devices are equipped with fingerprint or iris scanners), MOBIO (Mobile Biometry) will thus focus on multiple aspects of biometric authentication (ranging from research to development and scalability) based on face and voice authentication.

Starting from the state-of-the-art systems available from the MOBIO partners, the goal of this project is thus to further study, develop, and evaluate bi-modal (face and voice) biometric authentication (BMBA: Bi-modal biometric authentication) technologies in the context of portable and networked devices. Although biometric authentication is a complex problem, and is still not reliable enough to be widely accepted, it has also been shown that the use of multiple modalities increases the performance of biometric systems. However, most of the current multi-modal biometric systems simply perform fusion (of the outputs resulting of the independent processing of the modes) and do not actually take advantage of temporal correlations between modalities. As a matter of fact, very little work in the research community has been done on joint multi-modal fusion to perform joint authentication of several modalities (in our case face and voice).

In MOBIO, we shall carry out research on joint bi-modal biometry under various realistic conditions. More precisely, this project will investigate the following technologies: robust face localisation and speech segmentation in noisy environments, video-based face authentication (in order to avoid replay attacks using pictures of the face we should perform face authentication over the video), speaker authentication, bi-modal authentication (both expert fusion and joint face/speaker authentication to take full advantage of the correlation between modalities) and unsupervised model adaptation thought time. MOBIO will thus address several innovative aspects in the framework of mobile devices, including:

- Advanced research and development on joint bi-modal authentication (as opposed to bi-modal fusion), involving the development of new statistical models actually processing both channels simultaneously and in a principled way.
- Investigation of model adaptation techniques to reduce the degradation of biometric systems over time.
- Analyzing the scalability of the proposed solutions by studying how the performance of the system degrades while the complexity of the model is reduced.
- Providing common evaluation tools and baseline results to the research community in order to evaluate and compare the developed technologies.

The project will also address the development of a demonstration system. Two main scenarios will be investigated:

- Embedded biometry where the BMBA system is running entirely on a mobile phone. The system is designed to maximize the authentication performance and to minimize resources such as CPU, memory and speed.
- Remote biometry if the BMBA system needs too many resources to reach the required performance it will be hosted on a server while a minimum of essential functionalities would stay on the mobile phone such as capture, segmentation, preprocessing and feature extraction.

Several key technologies developed in IM2 are relevant to MOBIO: face detection and recognition (IM2.VP), speech/silence detection and speaker recognition (IM2.AP) and bi-modal person recognition (IM2.MPR). These technologies will be further studied toward MOBIO targeted applications: mobile services secured by biometric authentication means.

Partners: IDIAP, University of Manchester, University of Surrey, University of Avignon, Brno University of Technology, University of Oulu, EyePmedia (CH), IdeArk (CH)

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Partner News

Start-ups of IM2 keep surfing on the way of success

April 18, 2008
kooaba (ETHZ's spin-off) selected as Red Herring 100 finalist:
kooaba is named a Finalist of Red Herring 100 Europe, an award given to the top 100 private technology companies based in the EMEA (Europe, Middle East and Africa) region each year. Red Herring's lists of top private companies are an important part of the publication's tradition of identifying new and innovative technology companies and entrepreneurs. Companies like Google, eBay, and Skype were spotted in their early days by Red Herring editors, and touted as leaders that would change the way we live and work.

Red Herring's editorial staff rigorously evaluated several hundred private companies through a careful analysis of financial data and subjective criteria, including quality of management, execution of strategy, and dedication to research and development.

More information about Red Herring is available on the Internet at: *www.redherring.com*

January 18, 2008
kooaba among winners of Venture 08:
We are happy to announce that kooaba belongs to the 10 winning teams (out of over 200) for the venture 08 startup competition.

More information about the challenge and the 10 winning teams can be found here: *http://www.venture.ch/teams_2008_phase1_d.asp*

March 21, 2008
Klewel (IDIAP's spin-off) among winners of "venturelab":
"venturelab", an initiative of the Agency for Innovation CTI, selected the 20 winners of the third edition of the award « venture leaders », after two days of presentations et the PSE, EPFL, Lausanne and at the Technopark, Zürich.

The winners are selected on the basis of their entrepreneurial personality, quality of their project and the potential impact of the Award for their personal development and commercial. This award offers an intensive program of entrepreneurial development and commercialization of high-tech products in the Boston area (USA) for 10 days.

Selected publications

Calibration-Free Eye Gaze Direction Detection with Gaussian Processes.
B. Noris, K. Benmachiche, and A. Billard
In Proceedings of the International Conference on Computer Vision Theory and Applications. In Press, 2008

Machine Learning for Multimodal Interaction
A. Popescu-Belis, H. Bourlard and S. Renals (Eds.)
4th International Workshop, MLMI 2007, Brno, Czech Republic, June 28-30, 2007, Revised Selected Papers

Dimensionality of Dialogue Act Tagsets: An Empirical Analysis of Large Corpora
A. Popescu-Belis
Language Resources and Evaluation, vol. 42, n. 1, 2008, p.99-107

Adaptive Beamforming with a Maximum Negentropy Criterion
K. Kumatani, J. McDonough, D. Klakow, P. Garner and W. Li
The Joint Workshop on Hands-free Speech Communication and Microphone Arrays (HSCMA), Italy, May, 2008

Ensemble methods to improve the performance of an english handwritten text line recognizer
R. Bertolami and H. Bunke.
Arabic and Chinese Handwriting Recognition, LNCS 4768, pages 265–277. Springer, 2008

Strengths and weaknesses of software architectures for the rapid creation of tangible and multimodal interfaces
B. Dumas, D. Lalanne, D. Guinard, R. Koenig and Rolf Ingold
Proceedings of TEI'08, Bonn, Germany, Februrary 2008, pp. 47-54

Prototyping Multimodal Interfaces with SMUIML Modeling Language
B. Dumas, D. Lalanne and Rolf Ingold.
Proceedings of CHI 2008 workshop «User Interface Description Languages for Next Generation User Interfaces», Florence, Italy, April 2008, pp. 63-66

Graphical representation of meetings on mobile devices
L. Matena, A. Jaimes
Accepted demo at MobileHCI 2008 (10th Int. Conf. on Human-Computer Interaction with Mobile Devices and Services), Amsterdam

Error-Related EEG Potentials Generated during Simulated Brain-Computer Interaction
P. W. Ferrez and J. del R. Millán
IEEE Trans. on Biomedical Engineering, 55(3): 923–929, 2008

Brain-Computer Interfaces for HCI and Games
A. Nijholt, D. Tan, B. Allison, J. del R. Millán, M. Moore and B. Graimann
26th Annual CHI Conference on Human Factors in Computing Systems. Florence, Italy, 2008

Combined Handwriting And Speech Modalities For User Authentication
A. Humm, J. Hennebert and R. Ingold
In IEEE Transactions on Systems, Man, and Cybernetics, Part A: Systems and Humans, 2008, accepted for publication

Characterizing the EEG Correlates of Exploratory Behavior
N. Bourdaud, R. Chavarriaga, F. Galán, and J. del R. Millán
To appear in IEEE Trans. on Neural Systems and Rehabilitation Engineering, 2008

Building Mobile Spoken Dialogue Applications Using Regulus
N. Tsourakis, M. Georgescul, P. Bouillon and M. Rayner
To appear in the 6th International Conference on Language Resources and Evaluation, LREC 2008, Marrakech, Morocco

Non-Invasive Brain-Machine Interaction
J. del R. Millán, P. W. Ferrez, F. Galán, E. Lew and R. Chavarriaga
To appear in International Journal of Pattern Recognition and Artificial Intelligence, 2008

World-scale Mining of Objects and Events from Community Photo Collections
T. Quack, B. Leibe and L. Van Gool
To appear in Conference on Image and Video Retrieval, Niagara Falls, Canada, 7.-9. July, 2008

Spatially-consistent partial matching for intra- and inter-image prototype selection
S. Kosinov, E. Bruno, S. Marchand-Maillet
To appear in Signal Processing: Image Communication special issue on «Semantic Analysis for Interactive Multimedia Services»

Reference-based vs. task-based evaluation of human language technology
A. Popescu-Belis
To appear in Proceedings of LREC 2008 ELRA Workshop on evaluation: «When automatic metrics meet task-based and performance-based approaches», Marrakech, Morocco, 26-31. May, 2008

When a Mismatch Can Be Good: Large vocabulary speech recognition trained with idealized Tandem features
A. Faria and N. Morgan
To appear in Proceedings of the ACM Symposium on Applied Computing, Fortaleza, Brazil, March, 2008

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