

The (IM)2 Newsletter

Every month the (IM)2 Newsletter brings you the latest and hottest scientific and administrative news about the (IM)2 NCCR and related topics

More Individual Project Workshops

Following (IM)2.SA in February (see issue 12), two other IPs have organized topic-related workshops: IIR in Geneva and ACP in Bern. These workshops are especially important for large IPs grouping teams from various institutions. The "(IM)2 rhythm" of having one common workshop in autumn, and IP-specific workshops in spring is becoming regular.

The (IM)2.IIR workshop

(IM)2.IIR holds, about once a month, a meeting where one of the participating researchers presents his/her current work. On April 15th, a larger meeting was held with about 20 participants. In the first part, the following talks were presented:

- Ivana Arsic (EPFL/ITS): Optimal feature selection for efficient multimodal indexing and retrieval;
- Maria Georgescu (UniGe/TIM): Interactive query of dialogue database;
- Andrei Popescu-Belis (UniGe/TIM): Use of relevance feedback for dialogue database queries;
- Florent Monay and Daniel Gatica-Perez (IDIAP): Auto-annotation of images: a baseline method and its evaluation;
- Stéphane Marchand-Maillet (UniGe/CVML): demonstration of a video browsing and annotation tool.

In the second part of the meeting, a general exchange ensued on the topics of multimodal relevance feedback management, of the need for optimal features selection, on the use of MRML - Multimedia Markup Language, and on defining a common demonstrator. More details can be found on the (IM)2.IIR website: vipr.unige.ch/research/projects/IM2/.

The (IM)2.ACP workshop

The first (IM)2.ACP workshop was held at the University of Bern on April 16, 2003. There were 13 attendees from the participating institutions (IDIAP, University of Bern, ETH Zurich) and from other institutions, showing interest in a potential future collaboration with (IM)2.ACP (EPF Lausanne, University of Fribourg). Five talks were presented, giving an overview of current activities in speaker verification, face

recognition, fingerprint analysis and related topics. There was ample time for discussion and particular attention was directed to the identification of possibilities for software exchanges and the use of common databases. In the long term the goal of the (IM)2.ACP project is to build a system that uses multiple modalities, such as speech, facial images, fingerprints, handwriting, and others to allow for robust biometric person identification under a variety of circumstances. For such a system being developed and tested it will be important to have a database with a sufficiently large number of individuals covering all the involved modalities.

Copies of the slides of all talks will be made available on the (IM)2 website. The next (IM)2.ACP workshop is planned for January or February 2003.

Quarterly IP Status Reports

The Quarterly IP Status Reports for the period January - March 2003 are available from the local (IM)2 web pages. These internal reports list the achievements of the individual projects during the period under review and provide links to further material such as web pages and publications. They are a good way to keep up with the activity of other IPs.

DEWS

On Thursday May, 1st about 30 worldwide correspondents of DEWS - Development Economic Western Switzerland, www.dews.ch - visited IDIAP and discovered the past and current research themes of the institute as well as the latest developments in the framework of the (IM)2 NCCR. This unique opportunity, an immediate consequence of the Canton du Valais recently joining DEWS, means that (IM)2 can now rely upon a worldwide network of local contacts. The mission of these contacts is to attract new or existing companies to Western Switzerland (Canton de Neuchatel, Vaud and Valais). To achieve this, they build upon the unique characteristics that our region has to offer, and according to their first impressions, IDIAP and (IM)2 have great potential to attract companies and research branches in the field.

2003 Call for White Papers

This year again, a portion of the (IM)2 funding will be distributed to the partners on the basis of short, focused, white paper project proposals. Delayed because of external reasons, the procedure and objectives for this year have just been sent to the potential proposers. It is expected that this year's proposals will mainly fill the remaining gaps in the (IM)2 landscape, as the core research components of (IM)2 are already well funded. The deadline for submitting the proposals is May, 30. Notification will follow in June with accepted projects expected to start in July. White papers are expected to last at most 2 years.

Events

(IM)2 seniors meeting 15.5.03

A meeting of all seniors involved in IM2 will take place on Thursday May 15, from 10h00 at IDIAP to discuss

- possible IM2 White Paper proposals
- synergies between IM2 members through the definition of common goals, etc

Please send an email to ferrez@idiap.ch if you plan to attend the meeting.

ICSI Visitor fellowships

As announced in the last newsletter, ICSI offers a number of visitor fellowships in the framework of the ICSI-(IM)2 exchange program. The deadline for applications is **May, 16**.

GL'2003 at UniGe 15-17.5.03

Second International Workshop on Generative Approaches to the Lexicon, University of Geneva (ETI, Uni-Mail building), May 15-17, 2003 www.issco.unige.ch/gl2003.html, organized by Dr. Pierrette Bouillon, ISSCO/TIM/ETI/UniGe.

Please use the registration form on the web site, or contact Pierrette.Bouillon@issco.unige.ch, if you would like to attend the workshop or some of the talks.

The Swiss Center for Electronics and Microtechnology

The Swiss Center for Electronics and Microtechnology (CSEM) is divided in several divisions among which the System Engineering one, and several sections one of which is the industrial control involved directly in the (IM)2 program. CSEM aims at bridging the gap between these highly complex, still academic topics, and potentially attractive market-oriented prototypes.



A system is a set of inter-related components working together towards some common objectives. Systems we are dealing with may include software, mechanical, optical or electrical hardware and be operated by people. The properties and behavior of system components are inextricably inter-mingled, and we aim at analyzing, designing, implementing and installing complex miniaturized systems. It requires a great deal of coordination across disciplines. This is necessary to find the best among a nearly infinite set of possibilities of tradeoffs between components. Systems are designed to last many years in a changing environment. A complex system comprises a high number of degree of freedom and/or a time dependent possibly nonlinear multi-input multi-output relationship. The complexity is also emphasized by the high degree of miniaturization and limited available resources. In our group, we focus mainly on:

1) Basic technologies

- Advanced signal processing and nonlinear phenomena, control and adaptive systems,
- Learning processes and Digital Signal Processor aided decision systems.

2) Applications-oriented technologies

- Biomedical engineering,
- Complex high-performance thermal systems,

CSEM involvement in (IM)2

CSEM is involved in the (IM)2 NCCR program through the Brain Machine Interface ((IM)2.WP.BMI) project ((IM)2.MI). One PhD student, Ms. Elly Gysels, and a supervisor, M. Patrick Celka, are involved in the project at CSEM. The problem of accessing brain information is essential in any mid- to long-term human-machine interface development. The very fast communication channel of the brain is the paradigm for very innovative and unchallenged new interfaces between humans and non-humans. The particular problem addressed in this project is the improvement in terms of quantity of information or bits/min that could be extracted from scalp EEG signals when the subject is performing specific mental tasks. In this way, the user should be able to think about a particular, previously learnt symbol, and the system should classify that thought according to a predefined alphabet of possible symbols. A symbol could be a particular geometric shape, a song, a mental image, an action, etc. The advanced in signal processing techniques as well as in innovative machine learning algorithms permits to open the doors to the access of brain information. The aim of the project is to focus on the development and validation of a brain pattern extraction machine.

The low signal-to-noise-ratio, high dimensionality of the data stream, and complexity of the underlying system (brain) is making this problem very challenging. In order to extract reliable and reproducible patterns, it is essential to develop robust basic signal processing techniques for signal enhancement and feature extraction using linear or nonlinear time series analysis tools. None or very few of these techniques have been applied successfully to scalp EEG due to the problems described above.

The solutions provided by this project will allow to improve the basic understanding between brain generated patterns and specific mental tasks of the subject, and therefore improve potential applications of BMI. Signal processing techniques and machine learning algorithms developed in this project will also contribute to other sciences and engineering disciplines. Indeed, the developed techniques will apply to any multidimensional nonstationary, possibly nonlinear time series such as multichan-

nels speech signals or video sequences.

Three-dimensional brain source reconstruction has been used widely in clinical application like functional brain analysis of evoked potentials, or epileptic foci localization. Using this technique in the framework of a brain machine interface will also be one major step towards improvement in achievable bit rate. The project will focus on the design of the entire processing chain, from sensors to classification and interpretation, with an over all performance goal of enhancing the number of correct bits transmitted per second.



The BMI setup at IDIAP

CSEM is involved in two particular tasks within (IM)2.WP.BMI

- Low-level signal processing techniques for artefact removal and noise cancellation
- Low-level feature extraction techniques using linear and nonlinear time series analysis

Artefact removal in biosignals is a particularly challenging task and is essential for any further feature extraction. Artefacts appears more often randomly in EEG signals are complex in shape; change from trial to trial, and from subject to subject. As a reference signal is often lacking, the task of designing an automatic method for detection and removal of these artefacts is difficult. Moreover, the BMI is aimed to work real-time and thus dedicated signal processing methods have to be designed accordingly. Real-time feature extraction from noisy and time-varying time series is in itself a difficult task. CSEM will develop original signal processing methods for multi-channel feature extraction. Channels can either be original EEG signals or reconstructed brain sources activities. None or few works have been devoted to these tasks in known literature.