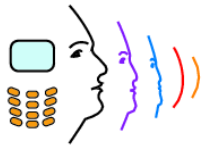

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Theme ICT-2007.1.4 [Secure, dependable and trusted Infrastructure]

WP 1: Management

Quarterly Report 4, 2009

Period: October-December 2009 **Submission date:** 02/01/2010
WP Manager: Sebastien Marcel **Revision:** 1

Author(s): S. Marcel (IDIAP), V. Devanthery (IDIAP)

Project funded by the European Commission in the 7th Framework Programme (2008-2010)		
Dissemination Level		
PU	Public	No
RE	Restricted to a group specified by the consortium (includes Commission Services)	Yes
CO	Confidential, only for members of the consortium (includes Commission Services)	No

Contents

1 Activities Overview of your WP

During this fourth reporting period, the MOBIO management team:

- finalised and distributed the newly signed MOBIO Consortium Agreement including VISIDON,
- answered the requests of the reviewers regarding their comments after the review meeting,
- updated the MOBIO PPM deliverable list for the European Commission,
- described a tentative implementation plan following the recommandations of the reviewers, and
- oversaw the implementation of the recommendations made by the reviewers.

2 Description of 3 month activity

- Newly signed MOBIO Consortium Agreement: a new MOBIO Consortium Agreement has been written to include the new partner VISIDON. VISIDON has been officially accepted by the European Commission (EC) during the Review Meeting in September, 14th 2009. The Consortium Agreement has been signed by all of the MOBIO partners and distributed during the Brno meeting, on December 9th and 10th 2009.

- MOBIO PPM deliverable list: in November 2009 we sent to the EC, as requested, a CD with the details of all MOBIO deliverables already submitted. Included in the details were the reports files and an Excel list highlighting the state of these deliverables.

- Implementation plan: after the review meeting, an implementation plan regarding the recommandations of the reviewers has been submitted to the EC for approval. This plan has been taken into consideration for the future decisions of the project.

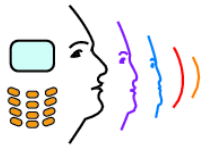
- Oversaw the application of the recommendations made by the reviewers to go in the right direction with the project: we keep in mind the recommandations and we are still making sure that all future developments are in the direction of the recommandations.

3 Publications

Not applicable

4 Miscellaneous

Not applicable



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WP 2: Use cases, Specifications and Databases
Quarterly Report 4, 2009

Period: October-December 2009 **Submission date:** 02/01/2010
WP Manager: Christopher Mc Cool **Revision:** 1

Author(s): C. McCool (IDIAP), S. Marcel (IDIAP)

Project funded by the European Commission in the 7th Framework Programme (2008-2010)		
Dissemination Level		
PU	Public	No
RE	Restricted to a group specified by the consortium (includes Commission Services)	Yes
CO	Confidential, only for members of the consortium (includes Commission Services)	No

Contents

1 Activities Overview of your WP

For the fourth quarter of 2009 the goals of this work package were to continue the collection of PhaseII of the database and define a protocol for PhaseI of the database. PhaseII of the data collection is proceeding almost on time, there are currently one or two week delays at some sites, however, the University of Manchester is much further behind schedule due to device failures which have been overcome. In addition to this data collection all of these partners associated with WP2 have processed some data using the initial PhaseI protocol and provided feedback, this feedback will be used to finalise the protocol to be used on Phase II of the database.

2 Description of 3 month activity

There were two priorities for the third quarter of 2009. The first was to continute the collection of PhaseII of the database and the second was to define a protocol to use with PhaseI of the database.

Phase II of the database is the final part of the database collection. Thus far the data collection has proceeded close to schedule, this means the database should be compiled on time. However, there have been setbacks particularly at the University of Manchester. For the data colleciton at Manchester there have been several issues with the acquisition devices which took one to two months to resolve. These issues have now been solved and recording has recommenced at Manchester, however, because of these problems there will be some delay in the recordings from Manchester. The delays in Manchester are acceptable and there was already a built in mechanism to deal with such delays, therefore, this will not impact on the delivery of the final database.

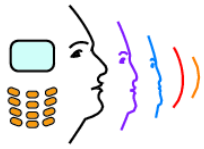
An initial protocol for PhaseI of the database has been developed and it has been checked by all the partners (except for IdeArk and Visidon). The associated partners have all sent some form of feedback regarding the protocol and it will now be used as part of the default protocol for PhaseI of the database, in particular it will be used for the Face and Speech Verification Competition held in conjunction with the 2010 International Conference of PAttern Recognition.

3 Publications

None

4 Miscellaneous

None



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WP 3: Uni-Modal Segmentation and Authentication
Quarterly Report 4, 2009

Period: October-December 2009 **Submission date:** 02/01/2010
WP Manager: T. Cootes **Revision:** 1

Author(s): Prof. T. Cootes (UMAN)

Project funded by the European Commission in the 7th Framework Programme (2008-2010)		
Dissemination Level		
PU	Public	No
RE	Restricted to a group specified by the consortium (includes Commission Services)	Yes
CO	Confidential, only for members of the consortium (includes Commission Services)	No

Contents

1 Activities Overview of your WP

Biometric authentication using mobile devices is becoming a convenient and important means to secure access to remote services such as telebanking and electronic transactions. Potential biometrics for authentication include facial appearance and speech characteristics. This work package addresses the need for improved accuracy in these two arenas by developing novel algorithms for: face detection; facial feature localization; face authentication; voice activity detection; and speaker authentication.

Later work packages address the problems of: fusing these two biometrics to improve authentication performance beyond that of either biometric alone (WP4); model adaptation for learning from unlabelled data and tracking changes in the biometrics over time (WP4); scaling each system to fit within the constraints of a mobile device (WP5); and integration into a working demonstrator (WP6).

1.1 Roles of the partners

The roles of each partner are as follow:

- **IDIAP**: Face detection and face authentication.
- **UMAN**: Facial feature localization.
- **UNIS**: Face authentication.
- **UOULU**: Face detection and face authentication.
- **UAPV**: Voice activity detection and speaker verification.
- **BUT**: Voice activity detection and speaker verification.

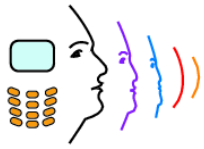
2 Description of 3 month activity

WP3 was completed on October 31st, concluding with the delivery of an evaluation of the advanced uni-modal systems (D3.4). Therefore, the principal work completed in this quarter consisted of UOULU leading the evaluation experiments, supported by all other partners, and writing the report on the evaluation.

As a result, no further research was undertaken as part of WP3 in Q4.

3 Publications

None



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WP 4: Joint Bi-Modal Authentication and Model Adaptation

Quarterly Report 4, 2009

Period: October-December 2009 **Submission date:** 02/01/2010
WP Manager: N. Poh **Revision:** 1

Author(s): Dr N. Poh (UNIS)

Project funded by the European Commission in the 7th Framework Programme (2008-2010)		
Dissemination Level		
PU	Public	No
RE	Restricted to a group specified by the consortium (includes Commission Services)	Yes
CO	Confidential, only for members of the consortium (includes Commission Services)	No

Contents

1 Activities Overview of WP4

Biometric authentication using mobile devices is becoming a convenient and important means to secure access to remote services such as telebanking and electronic transactions. Such an application poses a very challenging pattern recognition problem: the training samples are often sparse and they cannot represent the biometrics of a person. The query features are easily affected by the acquisition environment, the user's accessories, occlusions and aging.

The objectives of this WP are to tackle the above problems in two fronts:

- **Joint bimodal authentication**: to develop a novel fusion mechanism to combine the face and speech biometrics
- **model adaptation**: to investigate model adaptation techniques, or semi-supervised learning, i.e., learning from the vast unlabeled query/test data

The roles of each partners are as follow:

- **UNIS**: to coordinate the activities in WP4 and to design mechanisms for adaptive face and speech systems as well as experiments for their evaluation
- **IDIAP**: to study baseline fusion (D4.1 and D4.2) and joint bimodal fusion via feature level fusion (D4.3 and D4.4) as well as working with UNIS on and adaptive systems (D4.5 – D4.8)
- **UAPV**: to deliver an adaptive speech system for D4.5 as well as D4.7.
- **UMAN**: to provide a support for facial annotation needed for the adaptive systems (D4.7 – D4.8)
- **BUT**: to provide phoneme conditioning for speaker verification system (with no obligation)
- **UOULU**: none

2 Description of Three-month activity

- **Advanced fusion system (D4.3)**:
  Status: Planned (due m24)
  UNIS submitted a frame-score level based fusion technique combining both the face and speech modalities. IDIAP has tried different feature-level fusion techniques combining approximately synchronized face and speech modalites. Unfortunately, the system did not work better than the current baseline fusion system.

- **Advanced adaptive system (D4.7)**:
  Status: Planned (due m26)
  IDIAP will deliver a face system capable of adapting to changing acquisition environment using multiple models. UNIS will deliver a cotraining-based multimodal adaptive fusion using LIA's speech expert and UNIS's face expert. UMAN will provide support for facial alignment for multi-model representation.

- **Frame-based scores (D4.3)** LIA provided frame-by-frame scores using their GMM-based speaker system. This contributed to D4.3 of UNIS system directly.

3 Publications

Past contributions relevant to this work package include the following:

- Survey on the state-of-the-art biometric [1]
- Selecting a subset of biometrics system for fusion [3]
- Quality-based multimodal biometric fusion with cross-device matching [2]
- Four challenges and research directions for multimodal adaptive biometric systems have been identified [4]. This paper won the Best Paper awards in the past Int'l Conference on Biometrics (ICB2009).

References

[1] J. Kittler and N. Poh. Multibiometrics for identity authentication: Issues, benefits and challenges. In *IEEE Conference on Biometrics: Theory, Applications and Systems*, pages 1–6, Washington, D.C., 2009.

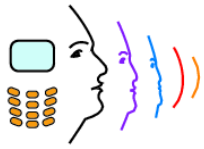
[2] N. Poh, T. Bourlai, and J. Kittler. Quality-based score normalisation with device qualitative information for multimodal biometric fusion. *IEEE Trans. on Systems, Man, and Cybernatics (part B)*, 2009. accepted for publication.

[3] N. Poh and J. Kittler. On Using Error Bounds to Optimize Cost-sensitive Multimodal Biometric Authentication. In *Proc. 19th Int'l Conf. Pattern Recognition (ICPR)*, 2008.

[4] N. Poh, R. Wong, J. Kittler, and F. Roli. Challenges and research directions for adaptive biometric recognition systems. In *LNCS 5558, Proc. of the 3rd Int'l Conf. on Biometrics*, pages 753–764, Sardinia, 2009.

4 Miscellaneous

None



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Theme ICT-2007.1.4 [Secure, dependable and trusted Infrastructure]

WP 5: Scalability

Quarterly Report 4, 2009

Period: October-December 2009 **Submission date:** 02/01/2010
WP Manager: J-F. Bonastre **Revision:** 1

Author(s): Christophe Lévy & Anthony Larcher (UAPV)

Project funded by the European Commission in the 7th Framework Programme (2008-2010)		
Dissemination Level		
PU	Public	No
RE	Restricted to a group specified by the consortium (includes Commission Services)	Yes
CO	Confidential, only for members of the consortium (includes Commission Services)	No

Contents

1 Activities Overview of your WP

The use of biometric authentication systems on mobile device requires high level of performance with limited resources. Limited processor performance, energy consumption and memory capacity are important examples of such limitations.

Development of biometric system scalability allows to deal with such constraints. The scalability study investigates a number of important parameters taking into account the cell-phone specifications or the amount of transferred data.

During this period, each partner provides an implementation of its uni-modal module allowing the scalability of every selected parameter. Sources of those modules are available on the MOBIO SVN server.

The consortium decided to join an additional report for internal use, in order to complete the delivery of the uni-modal scalable systems. This report contains a description of the impact of each scalable parameter in terms of computational time and memory consumption for each module.

2 Description of 3 month activity

A first common protocol was defined in order to study scalability of each parameter:

- to evaluate the gain in terms of memory occupation, it was decided to use the Valgrind program which is able to provide a lot of memory information such as number of allocated bytes.

- to estimate the computational cost, the *time* system-command was used to provide an approximation of the requirements.

Each partner submited a scalable version of its system as well as its documentation. In this section, a full description of each scalable parameters investigated is presented by each partner regarding each module.

2.1 Face detection: OULU & IDIAP

2.1.1 OULU

UOULU is still working on developing and evaluating a scalable face detection system (fixed-point implementation of Viola and Jones FD - Open CV FD cascades). The work is in progress and OULU plans to be on time according to the new schedule (*cf.* section Miscellaneous).

2.1.2 IDIAP

In Q4, IDIAP used an MCT face detection system. The system was developed at Idiap using Torch3Vision. Two points are study :

- the use of fixed point arithmetics instead of floatting point, and

- the original face detection algorithm has been altered to a face localisation algorithm by taking the best matching region (*scan window*) and then merging this with at most 10 other detections which have a surface overlap of more than 50%; the best matching region is considered to be the region which has the highest confidence score.

The baseline system provides accurate face localisation across a number of databases and conditions, as can be seen from the results in deliverable D5.1.

Scalability of the IDIAP face detection algorithm was evaluated on BANCA English, BANCA French, BANCA Spanish, Purdue, XM2VTS Frontal, XM2VTS Darkened and BioSign.

Floating point to integer

A major limitation with mobile devices is that the processors they use often have no support for floating point arithmetic. Even if floating point CPU is present its performance is lower than the fixed point one. There is currently no standard method to add these multimedia enhancements and no clear standard is expected for at least the next few years. IDIAP evaluated the performance of the MCT face detection system when converting the floating point values to integers. Experiment were performed by considering the different internal representation used by the CPU (8, 16, 32 or 64 bit number). Performance in terms of CPU time and accuracy were provided for each configuration.

Altered scanning algorithm

Another approach taken in this work is to alter the scanning algorithm so that it can stop as soon as a face is found. This method is very different to most scanning algorithms where the image is scanned exhaustively but with a very efficient algorithm. This change to the scanning process means that the first face that is found is assumed to be the face of interest. Considering the domain for this technology, which is a mobile device, it is fair to assume that the first face of interest would also be the largest face in the image, or the most prominent face.

Tests were then conducted to analyse the localisation accuracy and efficient of such an algorithm. It was found that this simple change to the scanning process reduced the computational time (when a face was found in the image) by an order of magnitude, however, it came at the cost of localisation accuracy. To improve the accuracy of the localisation X more scales were scanned to refine or improve the localisation result.

2.2 Face localisation: UMAN

In Q4, UMAN investigated the scalability of the advanced uni-modal system (*i.e.* its sensitivity with respect to accuracy, efficiency and memory requirements) for the XM2VTS dataset by varying the following design parameters:

- **Reducing the number of iterations** was shown to improve efficiency without compromising accuracy, provided that at least 2 iterations were completed;
- **Reducing the number of shape modes** improved efficiency of the system but at a considerable cost in accuracy and with little gain in memory usage.
- **Reducing the number of landmarks** had probably the greatest effect on performance, reducing memory requirements and processing time yet without compromising accuracy in most cases. However, we note that localizing fewer points impedes liveness detection and prevents a non-linear warping of the face to account for pose and expression.

- **Reducing the size of the template** was more efficient and required less memory but impacted heavily on performance. Increasing the size of the template was less efficient and required more memory (as expected) but provided no gains in accuracy.
- **Alternative texture models** such as the 'vanilla' normalized correlation and census transform-based models were applied. The CT-based method was both less efficient and less accurate whilst the normalized correlation model improved efficiency and memory usage but at a cost in accuracy (particularly around the 90th percentile of error).
- **Fixed point prediction** was applied whereby the features are initialized at fixed locations with respect to the bounding box of the face (rather than using image data) and was found to cause a dramatic increase in error, negating any gains in efficiency and memory usage.
- **No optimization** of the predicted points greatly reduced computation time but at some cost in accuracy, again around the 70th percentile of error for the eye points.

The scaled system localized only 7 points (including the eyes) at comparable accuracy but in one-third of the time and requiring just over half the memory.

Expanding on this work, UMAN will extend some of the existing experiments (*e.g.* further reducing the number of landmarks, using alternative predictors and optimizers) and add new experiments to investigate some further potential simplifications such as less expensive resampling of the image data at each iteration.

Furthermore, the outcome of the WP6 experiments has suggested that it is impractical to implement the full 22-point model within the mobile architecture. Therefore, it has been proposed that a reduced system that locates only the eye points should be implemented in the first instance. This being the case, UMAN will repeat the scalability experiments using the BANCA images dataset (where marked eye points are available) for consistency with the other partners.

2.3 Face verification: UNIS

UNIS submited a scalable version of LBP-based face system as well as its documentation. The scalability of two parameters of MLBPH descriptor was study to evaluate the algorithm performance.

Reducing the total number of multi-scale operators

The first parameter is the total number of multi-scale operators. A small number of operators not only reduces the dimensionality of the combined histogram, but also degrades the system accuracy because of the associated loss of information. In WP5, three different MLBPHLDA deescriptors were developed:

- The first system, called *9 LBP operators*, employs nine LBP operators by adjusting the radius of operator from 1 to 9;
- The second system, called *5 LBP operators*, employs five LBP operators by adjusting the radius of operator from 1 to 9 with step of two;
- The last system, called *3 LBP operators*, employs three LBP operators by adjusting the radius of operator from 1 to 9 with step of four.

Experiments were performed on two databases: Feret Image Database and Banca Video Database.

Varying the non-overlapping rectangle size regions

The second parameter determines the $k \times k$ non-overlapping rectangle size regions. A large number of regions increases the computation time and memory size as well as degrading the system accuracy in the presence of face localization errors. Therefore, the accuracy, robustness, memory consumption and time of the system were also evaluated.

2.4 Speaker recognition: UAPV & BUT

2.4.1 UAPV

The LIA speaker verfication system is based on a standard GMM-UBM approach.

Evolution of performance

In Q4, UAPV investigated the scalability of the advanced uni-modal system for the BANCA dataset by varying the following design parameters:

- **Reducing the number of Gaussian distributions in the model** was shown to strongly reduce the memory occupation as well as computational cost (-80% and -93% relatively to the advanced system) while keeping relatively good accuracy.
- **Reducing the size of the acoustic vector** had a less important effect on system efficiency but strongly impact performances when suppressing $\Delta\Delta$ coefficients.
- **Processing a subset of selected frames** allows to increase the computational efficiency by a factor 2 while keeping comparable results.

Minimal configuration and best compromise

Considering the results presented above, two configurations were selected in order to merge advantages coming from each scalable parameter.

The minimal configuration in which each scalable parameter was set to its minimal value in terms or resource consumption. With this configuration, the LIA scalable system allows to reduce the CPU time to 1.7% of the baseline consumption. At the same time, the memory requirement was also relatively reduced of 83%. However, this configuration hardly impact on performance (equal error rate increase from 3.48% to 7.72% on the BANCA dataset).

The best compromise allows to keep performance equivalent to the advanced system or to weakly degrade equal error rate. In this configuration, each scalable parameter was tuned in order to find a good compromise between accuracy and efficency. The best compromise system allows to reduce the CPU consumption of more than 70% and the memory requirement of 88% compare to the advanced system.

2.4.2 BUT

The BUT baseline system for speaker verification scalability is based on standard GMM-UBM paradigm.

Evolution of performance

BUT investigated the scalability of several parameters of ts GMM based system:

- **Reducing the number of states per phone in the NN-based Voice Activity Detector** allows to reduce the computational time of 35% while keeping similar performance as the baseline system.
- **Reducing the number of Gaussian distribution per GMM model** was shown to strongly reduce the memory consumption (-70%) and the computational time (-25%).
- **Reducing the number of vectors in eigenchannel matrix of Factor Analysis** from 50 vectors to 10 allows to reduce the memory consumption of 77%. But at the same time, the Equal error rate increases strongly. A good compromise is to use only 30 vectors. This solution allows to keep results equivalent to the baseline in terms of accuracy.

Best compromise

Considering performance of its GMM scalable system, BUT proposed an optimal configuration of this system. This configuration uses:

- a faster Voice Activity Detector;
- 512 Gaussian distribution per GMM;

- a smaller eigenchannel matrix (30 vectors instead of 50)

This configuration allows to keep performance equivalent to the baseline system when reducing the computational time of 47% and the memory consumption of 70%.

3 Publications

none

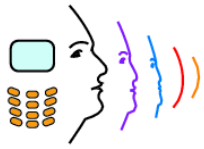
4 Miscellaneous

It was decided to revise the benchmarking procedure because of face processing that uses a lot of time for image/video loading with respect to the actual processing. Process will be timed within the program (using the C timing routine). This will allow to exclude image/video loading.

In addition to the study of each level independently, we decide to add a 'full chain' scalable evaluation. This approach will allow to study the influence of the side-effect: which consequences are involved when a step of face identification is downscaled.

According to these two points, a new schedule was fixed:

- the new benchmarking procedure have to be complete for the 12^{th} of february ;
- the 'full chain' evluation is plan for the 12^{th} of march.



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Theme ICT-2007.1.4 [Secure, dependable and trusted Infrastructure]

WP 6: Demonstration
Quarterly Report 4, 2009

Period: October-December 2009 **Submission date:** 07/01/2010
WP Manager: Markus Turtinen **Revision:** 1

Author(s): Dr Markus Turtinen (VISI)

Project funded by the European Commission in the 7th Framework Programme (2008-2010)		
Dissemination Level		
PU	Public	No
RE	Restricted to a group specified by the consortium (includes Commission Services)	Yes
CO	Confidential, only for members of the consortium (includes Commission Services)	No

Contents

1 Activities Overview of your WP

Biometric authentication using mobile devices is becoming a convenient and important means to secure access to remote services such as telebanking and electronic transactions. Potential biometrics for authentication include facial appearance and speech characteristics. Typically automatic methods for biometry are computationally expensive and require a lot of memory. This work package addresses the problems of integrating such algoritms for real mobile enviroments.

During the Q4, the suitable state-of-the-art mobile device was selected for MOBIO mobile experiments. Also the initial mobile framework for MOBIO biometry modules was developed and integration work was started.

2 Description of 3 month activity

In Q4, VISI entered officially to the MOBIO and started mobile integration work. The following tasks were performed:

- **Selection of the mobile device** was made based on extensive review of current available mobile phones. The new Nokia N900 Linux phone was found to be the most suitable for the MOBIO mobile expreriments.
- **A/V framework** and testbench applications were developed for helping each partner to compile their biometric modules for mobile device. The framework is based on Gstreamer and supports N900 mobile phones and Linux desktop computers. This work was submitted as part of the D6.4 delivery.
- **Revising the D6.2** was made to include the new A/V framework.

During Q4, each partner started using the new A/V framework for mobile and were able to build their own developing environments. The developing and initial testing can be made with a standard Linux PC. Furthermore, each partner should be able to run their own test application also with real mobile hardware using this framework.

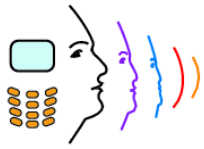
The actual integration of the biometric modules will start in Q1/2010. Visidon will support other partners to develope these modules for mobile using this framework.

3 Publications

None

4 Miscellaneous

None



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WP 7: Dissemination and Exploitation

Quarterly Report 4, 2009

Period: October-December 2009 **Submission date:** 02/01/2010
WP Manager: H. Cernocky **Revision:** 1

Author(s): Dr H. Cernocky (BUT)

Project funded by the European Commission in the 7th Framework Programme (2008-2010)		
Dissemination Level		
PU	Public	No
RE	Restricted to a group specified by the consortium (includes Commission Services)	Yes
CO	Confidential, only for members of the consortium (includes Commission Services)	No

Contents

1 Activities Overview of your WP

WP7 dissemination activities concerned mainly scientific publications, dissemination to general public, evaluations, Web pages, Community of Interest (CoI), trade fairs and projects related to MOBIO.

An important activity in WP7 was the organization of MOBIO Face and Speaker Verification Evaluation for ICPR 2010.

2 Description of 3 month activity

Description of 3 month activity

- The publication activity continued in this quarter, full account will be given in 2009 annual report, publications are also visible at MOBIO publication web-site[1].
- We have made progress in the preparation of **MOBIO Face and Speaker Verification Evaluation** for the next International Conference on Pattern Recognition (ICPR) to be held in 2010 at Istanbul on August 23. Phase1 of MOBIO database was distributed to the participants, the sites are required to provide their results on a development set before receiving evaluation data. This contest focuses on evaluating the performance of uni-modal face and speaker verification techniques in the context of a mobile environment, thus offering challenging recording conditions (adverse illumination, noisy background). See ICPR MOBIO competition web page[2] for details.
- MOBIO researchers gave several invited talks, notably:
  - December 2009: Josef Kittler (UNIS) gave a talk at Bristol Vision Institute Symposium.
  - Matti Pietikainen (UOULU) visited the Czech Technical University in Prague on December 2-3. He acted as a member of M.Sc. Jan Sochman's Dissertation Thesis Committee. Prof. Pietikainen also gave an invited talk "Motion and Activity Analysis with Spatio-temporal Local Binary Patterns" in conjunction with the Autumn 2009 Pattern Recognition and Computer Vision Colloquium.
  - Matti Pietikainen (UOULU) also gave a talk in a seminar arranged by the Pattern Recognition Society of Finland in Tallinn, Estonia, on December 4.
  - On December 7th, UMAN gave a presentation of the MoBio project to a focus group at King's College London, organized as part of the HIDE project. The aim of the focus group was to discuss the ethical issues regarding the capture and storage of biometric data, and included speakers from academia, industry and the civil service.
- IdeArk was present at the following events:
  - ITU World Telecom – Geneva
  - Biometrics2009 – London

  and continued in the organization of Community of Interest (CoI) by creation of LinkedIn group.

[1] `http://publications.mobioproject.org/`
[2] `http://www.mobioproject.org/icpr-2010`

- Phil Tresadern (UMAN) has enrolled as a UK STEM (Science, Technology, Engineering and Maths) Ambassador which will involve outreach work in local schools where he will present and discuss the MOBIO project with younger audiences aged 11-18.

3 Publications

Several papers were proposed to conferences and journals. According to the consortium agreement, the abstracts were sent to the MOBIO mailing list. MOBIO publication page was updated and reflects current status in accepted publications.

4 Miscellaneous

N/A.