MOBIO

Mobile Biometry

http://www.mobioproject.org/

Funded under the 7th FP (Seventh Framework Programme)
Theme ICT-2007.1.4 [Secure, dependable and trusted
Infrastructure]

WP 1: Management

Quarterly Report 2, 2010

Period: April - June 2010   **Submission date:** 02/07/2010
WP Manager: Sebastien Marcel   **Revision:** 1

Author(s): V. Devanthery (IDIAP)

Contents

1 Activities Overview of your WP

During the second quarter of 2010, the MOBIO management team:

- forwarded to the European Commission some other requested official documents regarding the annual report

- MOBIO movies to present use cases related to the MOBIO technology

- updated the website to publish the MOBIO public deliverables.
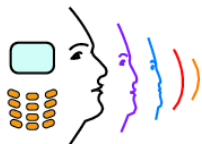
2   Description of 3 month activity

- After submitting the annual report at the beginning of February, we spent time on collecting different information requested by the European Commission regarding financial documents and other official files.

- We managed to do short movies to present 3 different use cases related to the MOBIO technology. They have been published on the page "Demonstration" of the MOBIO website http://www.mobioproject.org/demonstrations, and also on MOBIO LinkedIn to present them to the MOBIO Community of Interest, and on other LinkedIn groups related to the biometry topic.

- The MOBIO website is regularly updated with the new public deliverables.

3   Publications

Not applicable

4   Miscellaneous

Not applicable

MOBIO

Mobile Biometry

`http://www.mobioproject.org/`

Funded under the 7th FP (Seventh Framework Programme)
Theme ICT-2007.1.4 [Secure, dependable and trusted Infrastructure]

WP 2: Use cases, Specifications and Databases
Quarterly Report 2, 2010

Period: April - June 2010   **Submission date:** 02/07/2010
WP Manager: Christopher Mc Cool   **Revision:** 1

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

Contents

1   Activities Overview of your WP

For the second quarter of 2010 the goals of this work package were to: finalise the collection of Phase II of the database, and redefine the Use Cases. Phase II of the data collection was completed during the Quarter and is now being verified prior to distribution and Use Cases were submitted by external companies so as to reflect those Use Cases with market potential.
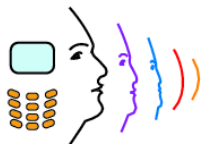
2 Description of 3 month activity

There were three priorities for the first quarter of 2010. The first was to finalise the collection of Phase II of the database and the second was to redefine the the Use Cases.

Phase II of the database is the final part of the database collection. This data collection has been finished and is now being verified. This include some manual verification and automatic verification by running some of the speaker and face recognition algorithms over the database. It is anticipated that the database will be verified by the end of July 2010.

The Use Cases have been revisited by illiciting Use Cases from external companies. These Use Cases were then discussed in the last MOBIO meeting where two Use Cases were agreed upon; one to reflect the use of embedded technologies and one to reflect client-server technologies. These two Use Cases will be added to D2.1 which will then be resubmitted.

3   Publications

4   Miscellaneous

MOBIO
Mobile Biometry

`http://www.mobioproject.org/`

Funded under the 7th FP (Seventh Framework Programme)
Theme ICT-2007.1.4 [Secure, dependable and trusted Infrastructure]

WP 3: Uni-Modal Segmentation and Authentication
Quarterly Report 2, 2010

Period: April - June 2010 **Submission date:** 02/07/2010
WP Manager: T. Cootes **Revision:** 1

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

Contents

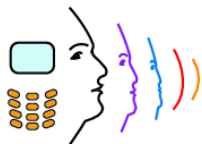# 1   Activities Overview of your WP

WP3 was concluded in M22; there has been no further activity in this WP.

2   Description of 3 month activity

WP3 was concluded in M22; there has been no further activity in this WP.

3   Publications

None

MOBIO
Mobile Biometry

WP 4: Joint Bi-Modal Authentication and Model Adaptation

Quarterly Report 2, 2010

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 (D4.4)**:
  Status: Completed
  UNIS submitted a frame-score level based fusion technique combining both the face and speech modalities. IDIAP delivered a feature-level fusion technique combining approximately synchronized face and speech modalites. The report deliverable, D4.4, was submitted on time.

- **Advanced adaptive system (D4.8)**:
  Status: Completed
  IDIAP delivered an *online* adaptive face system using multiple models. UNIS delivered several adaptive face and speech systems comprising of self-training (a system training itself), co-training (a system trained by fusion) and cross-training (a system trained by another system) systems. The report deliverable, D4.8, was submitted on time.

With the completion of the above deliverables, WP4 is formally concluded.

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 [4]

- Adressing the missing modality problem at the fusion level [9].

- Quality-based multimodal biometric fusion with cross-device matching [3]

- Four challenges and research directions for multimodal adaptive biometric systems have been identified [10]. This paper won the Best Paper awards in the past Int'l Conference on Biometrics (ICB2009).

- Score- and model-level adapatation for biometric systems (ICPR2010) [5].

- A procedure to integrate the quality information into an existing biometric system by compressing the quality measures via a linear projection (Locality Preserving Projection), presented in CVPR2010 [2].

- Other *adaptive* strategies via scores include cohort-based and client-based score normalization. The first approach relies on a set of cohort models (e.g., the state-of-the-art T-norm origniated from the speaker recognition community) whereas the latter relies solely on the claimed identity.

  - Cohort-based score normalization:
    * An improved version of a client-specific score normalization (F-norm) exploiting a set of cohort models, called "adaptive Fnorm" [7].
    * A score normalization procedure realized using logistic regression which combines T-normalized scores and quality measures [6].
  - Client-based score normalization: Rather than designing a score normalization for each client, we propose to identify the user groups by their score characteristics and design a score normalization at the group-level [8].

- Another way of adapting the system to the user is by means of human-computer interaction. In [11], we propose to feed the quality information about the quality of an acquired face image back to the user.
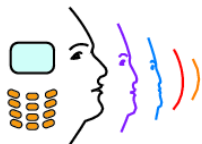
References

[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] K. Kryszczuk and N. Poh. Handling high dimensionality in biometric classification with multiple quality measures using locality preserving projection. In *IEEE Computer Society Workshop on Biometrics, CVPR2010*, 2010. accepted.

[3] 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)*, 2010. accepted for publication.

[4] 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)*, pages 1–4, 2008.

[5] N. Poh, J. Kittler, S. Marcel, D. Matrouf, and J-F. Bonastre. Model and score adaptation for biometric systems: Coping with device interoperability and changing acquisition conditions. In *Int'l Conf. on Pattern Recognition*, 2010. accepted.

[6] N. Poh, A. Merati, and J. Kitter. Making better biometric decisions with quality and cohort information: A case study in fingerprint verification. In *Proc. 17th European Signal Processing Conf. (Eusipco)*, pages 70–74, Glasgow, 2009.

[7] N. Poh, A. Merati, and J. Kittler. Adaptive client-impostor centric score normalization: A case study in fingerprint verification. In *Biometrics: Theory, Applications, and Systems, 2009. BTAS '09. IEEE 3rd International Conference on*, pages 1 –7, Washington, D.C., sept. 2009.

[8] N. Poh, A. Rattani, M. Tistarelli, and J. Kittler. Group-specific score normalization for biometric systems. In *IEEE Computer Society Workshop on Biometrics, CVPR2010*, 2010. accepted.

[9] N. Poh, D. Windridge, V. Mottl, A. Tatarchuk, and A. Eliseyev. Addressing missing values in kernel-based multimodal biometric fusion using neutral point substitution. *IEEE Trans. on Information Forensics and Security*, 2010. accepted.

[10] 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.

[11] R. Wong, N. Poh, J. Kittler, and D. Frohlich. Towards inclusive design in mobile biometry. In *Int'l Conf. on Human System Interaction (HSI)*, pages 267–274, 2010.

4   Miscellaneous

None.

MOBIO
Mobile Biometry

WP 5: Scalability

Quarterly Report 2, 2010

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

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 will investigate a number of important parameters taking into account the cellphone specifications or the amount of transferred data.

Two tasks are related to this second quarter of 2010:

- the D5.1 have been delivered: study of scalable parameters for each system and systems implementation

- start of D5.2: report concerning the work done in D5.1

2   Description of 3 months activity

The deliverable D5.1 concerning the study of scalability was finalised and delivered.

The D5.2 corresponds to the full report related to D5.1. During this period this document was started and will be end during the Q3 of 2010.

3   Publications

4   Miscellaneous

MOBIO
Mobile Biometry

http://www.mobioproject.org/

Funded under the 7th FP (Seventh Framework Programme)
Theme ICT-2007.1.4 [Secure, dependable and trusted Infrastructure]

WP 6: Demonstration
Quarterly Report 2, 2010

Period: April - June 2010   **Submission date:** 02/07/2010
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

For the second quarter of 2010 the goals of this work package were to continue mobile integration of biometric modules for achieving high quality person verification on Nokia N900 mobile. The main tasks were the following

- to test more comprehensively separate biometry modules

- obtain quantitative measurements about the system performance on mobile

- revise the system architecture for more user convenient behaviour

- update the user interface to support various configuration possibilites

- study requirements for client-server based applications

2   Description of 3 month activity

In Q2, VISI continued the mobile integration work on different biometry modules and furher developed the application framework for smoother running on Nokia N900 device. IDIAP, BUT and UMAN updated their biometry modules and they were integrated to the framework.

Additional work was done on evaluating the biometry module speed on mobile for obtaining information about the runtime performance. Initial developments for client-server application were also made including measurements of data transmission between mobile device and server.
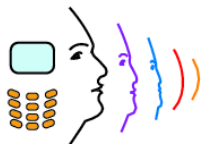
The mobile application user interface was improved for demonstration purposes for making it easier to show the application for members outside the consortium. WP6 demonstration was succefully demonstrated on CVPR 2010 conference on San Fransico in the June 2010.

3   Publications

None.

4 Miscellaneous

None.

MOBIO

Mobile Biometry

`http://www.mobioproject.org/`

Funded under the 7th FP (Seventh Framework Programme)
Theme ICT-2007.1.4 [Secure, dependable and trusted
Infrastructure]

WP 7: Dissemination and Exploitation

Quarterly Report 2, 2010

Period: April - June 2010   **Submission date:** 02/07/2010
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

During this second quarter of 2010, 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 presentation of the first MOBIO Prototype at Nokia Research Center Palo Alto (CA) as well as at CVPR 2010 in San Francisco, the NIST Speaker recognition evaluation (SRE) workshop and Odyssey: "The Speaker and Language Recognition Workshop", held at BUT.

2 Description of 3 month activity

2.1 MOBIO ICPR Evaluation – publications

In the previous quarter, MOBIO project organized ICPR MOBIO competition[1] for the International Conference on Pattern Recognition (ICPR) to be held in 2010 at Istanbul on August 23.

In Q2, two publications were produced as follow-up of this evaluation:

- full paper, summarizing the evaluation goals, data, metrics as well as details of all the submitted systems.

- a summary version (15 pages) for the conference.

2.2 MOBIO demo at Nokia Research Center

The project coordinator, Dr. Marcel, presented the MOBIO project and the first MOBIO demo at the Nokia Research Center in Palo Alto (California).

2.3 MOBIO demo at CVPR 2010

The project coordinator, Dr. Marcel, presented MOBIO demo at the 23rd IEEE conference on Computer Vision and Pattern Recognition (CVPR) in San Francisco. A short accompanying paper was written for this conference.

2.4 BUT

The 2nd quarter of 2010 was marked by very intense dissemination activity.

BUT first hosted the NIST (U.S. National Institute of Standards and Technology) Speaker Recognition Evaluation (SRE)[2] workshop on the (24th and 25th of June). The workshop is the closing event of every evaluation, where the results are announced, and the participants present the details of their systems. The workshop was attended by ≈110 participants from academia, industry and Government (mostly US, but several European countries were also present).

The following event, "Odyssey 2010 The Speaker and Language Recognition Workshop"[3], held at BUT from 28 June 1 July, is a small but prestigious event in the speaker and language recognition circles. Odyssey is organized as an ISCA Tutorial and Research Workshop and concentrates on the theory and applications of speaker and language recognition for commercial, forensic, and government applications. Odyssey 2010 attracted 130 participants and 3 excellent invited speakers:

---

[1] http://www.mobioproject.org/icpr-2010
[2] http://www.itl.nist.gov/iad/mig//tests/sre/2010/index.html
[3] http://speakerodyssey.com

- David Balding, from UCL Genetics Institute, London

- Michael Jessen, from Department of Speech and Audio Analysis (KT54), Bundeskriminalamt, Wiesbaden

- Patrick Kenny, Centre de recherche informatique de Montreal.

BUT was also preparing two research workshops:

- BOSARIS (Brno Speaker Recognition Summer Workshop 2010) — a 5-week research workshop aiming at increasing the speed and robustness of current speaker recognition technology and

- KALDI workshop that will focus on open and reusable sets of tools to speed up research and development of speech recognition systems.

2.4.1 Media coverage

BUT made efforts in publicizing the above events. In April, an article was published in the newsletter of IEEE Signal Processing Society Speech and Language Processing Technical Committee (SLTC)[4].

Before the NIST workshop (23 June), BUT organized a press conference on its own excellent results in NIST evaluation and on the forthcoming events. It was attended by ≈15 journalists from printed media, TVs and radios. Part of the coverage can be found on the web-versions of newspapers[5].

An important outcome of the conference was an offer from the Czech TV, channel CT 24, to turn a short documentary for the "Milenium" series, covering science and technology. The documentary is prepared for July.

2.5 UOULU

- UOULU contributed to the organization of a contest on 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.

- Dr. Abdenour Hadid (UOULU) lectured an invited talk on face recognition technologies and local binary patterns at the Algerian summer school on biometrics, May 23-27, 2010, Algiers, Algeria.

- UOULU presented its research to Prof. Maja Pantic (Imperial College London, UK) and Prof. Nicu Sebe (University of Trento, Italy), who visited the group in early and mid May, respectively.

---

[4]http://www.signalprocessingsociety.org/technical-committees/list/sl-tc/spl-nl/
2010-04/brno-speech-summer/

[5]http://www.ceskenoviny.cz/veda_a_technika/zpravy/vedci-z-brna-vyvijeji-system-jenz-rozpozna-hlas-ko
494917, http://www.novinky.cz/domaci/204204-brnensti-rozpoznavaci-hlasu-najdou-zlocince-ve-statisicich-h
html, http://digiweb.ihned.cz/c1-44432190

2.6 UNIS

- Norman Poh gave a lecture entitled "Adaptive Multimodal Biometrics: Quality-based, User-specific, and Beyond", in Algerian biometric summer school (ASSB), June 2010, Algiers, Algeria, May 2010.

- Norman Poh gave an oral presentation entitled "Groups-specific score normalization" at CVPR 2010 Biometric Workshop in San Francisco.

- Rita Wong gave an oral presentation entitled "Towards Inclusive Design in Mobile Biometry", in the 3rd Intl. Conf. on Human System Interaction (HSI). The paper associated with this talk received the Best Paper Award in the human-centered design track.

- Josef Kittler gave a lecture on quality-based fusion in the last biometric summer school 2010, Alghero, Italy.

2.7 UMAN

Tim Cootes was invited to give an invited talk at an International Summer School for Computer Vision, in Sicily, July 12-17.

2.8 IdeArk

- **Community of Interest (CoI):** The CoI welcomes a new member fitting exactly MOBIO's target: Mobbeel is a company that develops innovative biometric security solutions for mobile phones.

- **MOBIO LinkedIn group** Principal mean of communication with the Community and other interested individuals. Discussion topics and news are posted regularly on this new platform.

- **Use cases videos** 2 of the 3 videos picturing a possible MOBIO use case were released on the web via LinkedIn groups (summing up to a potential of 15000 viewers), social networks and YyouTube platforms. Positive comments were received.

  The videos were also featured on a newly launched web platform called `Planetbiometrics.com`.

- **Biometrics2010 – October 19-21** MOBIO will be present at this specialized event in London, with 2 talks and a booth which will display the demonstrators related to the project.

3   Publications

Several papers were proposed to conferences and journals. According to the consortium agreement, the abstracts were sent to the MOBIO mailing list.

4   Miscellaneous

N/A.