European Association for Biometrics
eab
Human Identity in Europe

CONFERENCE REPORT

EAB RPC 2019

EAB Research Projects Conference

Darmstadt, Germany,
16-18 September 2019

The leading voice for digital ID & biometrics, in Europe

6th EAB Research Projects Conference 2019

Day 1

The 6th edition of the EAB Research Projects Conference (EAB-RPC) took place on the 16, 17, and 18 September 2019 at the premises of Fraunhofer IGD in Darmstadt, Germany. The conference was organized by the European Association of Biometrics (EAB) in cooperation with the Joint Research Centre (DG JRC) of the European Commission, through its Cyber and Digital Citizens' security Unit.

The conference is the largest event on European research in the area of Biometrics and Identity Management, and it is endorsed by Matthias Oel (Director of Directorate B "*Migration, Mobility and Innovation*" of DG HOME from the European Commission) and by Dan Chirondojan (Director of Directorate E "*Space Security and Migration*" of DG Joint Research Centre from the European Commission).

EAB-RPC has become the main forum in Europe where attendees can simultaneously: promote research carried out in biometrics, forge new links and networks, and identify the appropriate partners for possible future project applications.

This year's edition featured presentations by 19 European funded projects in the fields of biometrics, border management and identity management: RHUMBO, TReSPAsS (ITN), PriMa, H-Unique, PROTECT, BODEGA, LIGHT^{est}, SMILE, FOLDOUT, TRESSPASS, SWAN, PYCSEL, Stellar i-ris, QUARDCARD, SpeechXRays, SOTAMD, AMBER, PERSONA, D4FLY, RESPECT.

The conference started with the keynote of Richard Rinkens (DG HOME, unit B.3) who addressed the difficult topic of interoperability among the large European IT systems with special attention to biometrics. He reported about the impact of the regulations (EU) 2019/817 and 2019/818, which were published on May 22, 2019: With these regulations on European Systems and Interoperability, the EU hopes to overcome the historic silo architecture of previous biometric services, which cover the different categories of travellers crossing European borders and also criminal and civil applications: (i) EU citizens (EU passport control), (ii) the visa-exempt Third Country Nationals (covered by ETIAS), (iii) Visa applicants (covered by VIS), (iv) asylum seekers (covered by EURODAC), (iv) both civil and criminal alerts on persons (covered by SIS). The new European Search Portal will link these services in one back-end infrastructure system, which eventually will provide to border guards one single user interface, through which information captured from a data subject can be searched against all background databases. Richard Rinkens promoted the concept of storing data items of similar characteristics in the same location rather than in a distributed fashion and to access every record by a single unique Identifier. This access is regulated by article 20 of the legislation, which now allows a police officer to capture from a data subject biometric data and search that data against the EU common identity repository.

Of interest is article 22, which supports the law enforcement access in a two-step approach: In a first step, a law enforcement request based on probe data can just retrieve the response of whether or not data in the central system is available. With a positive response, an investigator can then ask for legal authorization by a judge to retrieve the data records and thus more detail. This is expected to speed up forensic processes significantly.

Also new is the concept of the Multiple Identity Detector (MID) link, which can be used to detect a possible link between various data records but also to determine the type of link. For data subjects there will be functionality to clarify the stored data, e.g. to correct a link that was wrongly created.

The full picture of the new European system will also contain a central repository for reporting and statistics. With that functionality for instance the effective details for over-stayers can be analysed.

The following session presented new Innovative Training Networks (ITN), whose main objective is to form new researchers specialised in different biometric-related fields. Project examples presented are the ITNs PriMa (*Privacy Matters*), which has its research focus on the analysis of privacy risks, privacy protection and impact

assessment. Another project that is starting up is the project TReSPAsS (*TRaining in Secure and PrivAcy-preserving biometricS*), which looks at privacy preserving biometric technologies and security protection in biometric systems.

The first day concluded with the report about the European Research Council Advanced Fellowship Project H-Unique, which is related to the search of uniqueness harnessing anatomical hand variation. The talk provided by Prof. Dame Sue Black (Lancaster University) was a real highlight of the day. The project is focused on crimes such as indecent assaults and child abuse, which are judged based on digital image evidence displaying the hand of the offender. The project investigates anatomic feature mapping directed by aetiological anatomical intelligence. Features that are investigated are hand/finger shape, skin colour, pigmentation, vein patterns, knuckles, scars to name just a few. The project will seek manual and automated methods to support forensic decisions.

Day 2

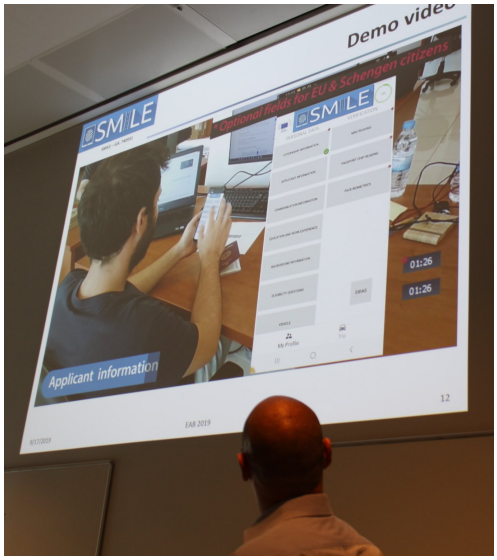
The second day started with two sessions of recently finished projects, or very close to their end. The first session was entirely dedicated to the project PROTECT, focused on the use of biometrics in border controls. Susanne Kränkl (VERIDOS) started the session speaking about the project demonstrators. The number of passengers in airports have doubled in recent years, so improving passenger throughput and experience is a priority. Making use of the PROTECT application, users can enrol themselves with their smartphone, and enrolment data from the smartphone is transmitted as the user approaches the “verification corridor”. At the same time, live biometric data is captured on the fly as the data subject walks, for example anthropometrics information, face or periocular data. In addition to biometrics, the subject is tracked while s/he is in the corridor, for example to perform Presentation Attack Detection based on the face. The demonstrator of this scenario was implemented in St Pancras Train Station in London. A second demonstrator was implemented in Poland for land border control of passengers arriving by car. The modalities used for “verification in the car” were face, and hand vein, with data subjects captured through the vehicle window using a dedicated kiosk situated before the guard cabin. Qualitative surveys of the demonstrators found that users were positive with the solutions proposed, as long as they helped to reduce the time spent in border checks, or even not requiring stopping at all. Simon Kirchgasser (University of Salzburg) continued the session talking in detail about the biometric modalities evaluated during the project. These included 2D face (including thermal images), 3D face (with light field cameras), iris (including a new NIR sensor that connects to the smartphone), periocular (cropped from face images), finger-vein (including two new sensors developed in the project to capture palmar and finger images in the NIR spectrum respectively, and one contactless finger/hand-vein NIR scanner), and anthropometric information (using multiple Kinect sensors interconnected for a higher reliability). Finally, James Ferryman

(University of Reading) spoke about the lessons learnt and future recommendations. He mentioned that legal issues are currently a barrier to the deployment of the PROTECT innovations within the EU, and policy changes are necessary if solutions as those proposed in the project are to be implemented. Accessibility (e.g. assisting blind persons) and children enrolment (safeguarding) are also aspects that need further attention, and concerns about security of smartphones regarding data protection and template security were also expressed. A technical problem faced was the distance needed between people in the biometric corridor, which is not suitable for small groups (like families) moving together. With current technology, 3D face and thermal face were not suitable due to capturing and processing speed requirements. Iris on-the-move has also been found to be impossible to integrate in the biometric corridor due to lightning and sensing restrictions, impacting severely on data quality. Other studies (like the DHS Biometric Technology Rally 2019) also has found that iris on-the-move does not meet the performance criteria needed at least in the border control scenario. As future recommendation, it was highlighted the need for further work on a longer-term evaluation of the PROTECT solutions in real operational scenarios with real travellers, paying also attention to sensing technologies on e.g. iris on the move, contactless finger-vein, or 3D vascular data.

The second session of the day featured the projects BODEGA, LIGHT^{est}, and SpeechXRays. Sirra Toivonen (VTT) started the session presenting results of BODEGA, focused on human factors to enhance border guard's performance of critical tasks, supporting an appropriate decision-making. Ethical, societal, legal, human, organisational and technical factors were taken into account during the project, both from border guards and traveller perspectives. The work in BODEGA resulted in a number of recommendations affecting the border guard's and passenger's well-being, and the management of border control operations. Next, Heiko Roßnagel (Fraunhofer IAO) presented the results of the project LIGHT^{est}, which is aimed at creating a standard global way for publishing Trust Lists. The system should allow transparent and easy verification of electronic transactions, with different levels of trust policies as defined by the involved parties.

To conclude the session, Dijana Petrovska (Telecom Sudparis) and Claude Bauzou (IDEMIA) presented the main results of SpeechXRays. This project deals with voice and face biometrics for logical and physical access control. During the presentation, details about biometric solutions and experiments carried out with the voice and face modalities were shown, which also included spoof detection and template cancelability solutions. Three use cases were evaluated regarding (i) workforce, (ii) eHealth, and (iii) consumer applications. Each

use case was situated in a different country, so users spoke different languages. The expectations and difficulties of users were found to be different in each use case. The project also made significant efforts for the solutions to be GDPR compliant.



In the third session, the on-going projects SMILE and FOLDOUT were presented. Georgios Stavropoulos (Information Technologies Institute ITI of the Centre of Research & Technology Hellas CERTH) spoke about SMILE, which is aimed at enhancing security at land borders, increasing flow of people & goods. The proposed system is to be used for first line authorization, involving pre-registration of the traveller prior to travelling (mobile or web-based), which is then checked off-line for risk analysis using national and international databases (e.g. VIS, SIS). If no alert is found, the traveller will be allowed to go through the fast lane. For group travellers (e.g. buses) it is possible to create a single registration, and capture/verify several people simultaneously at the border. The project will develop all necessary back- and front-end modules and applications, plus pilot demonstrations in two sites (Romanian-Hungarian and Bulgarian-Romanian). Then, Maj Grzegorz Kostecki (Polish Border Guard) spoke about the FOLDOUT project, whose focus in on the detection of illegal activities at borders, even under dense foliage and difficult weather conditions. The project will combine various sensors both on the ground and on high rising platforms, including e.g. synthetic aperture radar, LIDAR, IR cameras, acoustic/seismic sensors, radio frequency, etc. Some scenarios of study will be irregular border crossing in forested terrain, rescue scenario in forest, or detection of illegal transport and entry of goods (human trafficking, goldmines in mixed terrain.

After lunch, the on-going projects TRESSPASS, SWAN and PYCSEL were presented in the first session of the evening. Dimitrios M. Kyriazanos (DEMOKRITOS) started the session talking about the TRESSPASS project, which main objective is the development of a single cohesive risk-based management concept for border control (including all possible cases: air, maritime and land crossing). The greatest challenge is the estimation of the risk of each

individual traveller, for which the project proposes a systematic approach. It includes a distributed system that will make use of collected (live) and background data (national databases) from individuals regarding their identity and behaviour, mental states, capabilities, possessions (e.g. luggage), and their travel group (if any). Another challenge faced by the project regards the legal and regulatory framework. In this sense, there is an absence of regulation facilitating risk-based screening of passengers at the EU. In addition, processing of personal information needs to be justified and full transparency of data processing is necessary (following the GDPR). Next, Raghavendra Ramachandra (NTNU) spoke about SWAN. Its main objective is to develop and demonstrate a fast, trustworthy, secure, and real-time biometric solution for banking transactions and other services over mobile networks. The modalities in use are all produced by smartphone sensors, including face video, ocular, fingerprint, fingerphoto and voice. The project also intends to enable a privacy-preserving solution over wide area networks via template protection, and PAD detection. A database with the modalities mentioned above has also been captured, including indoor/outdoor conditions, a variety of illumination control levels, assisted/self-capture mode, and presentation attack samples. The database will be made available through the BEAT platform. Finally, Jean-Francois Mainguet (CEA) and Marina Pouet (IDEMIA) presented the project PYCSEL, which is aimed at building a new flexible active thermal fingerprint sensor. The sensor must have high resolution (500 dpi) and a large surface (76mm x 81 mm), allowing 4-finger acquisition. The sensor must also work on rigid glass substrates, and on flexible laminated glass with a thickness of 15µm. During the presentation, the speakers showed the difficulties found in the prototype construction regarding factors such as image quality analysis, image defects and their removal (e.g. to avoid the creation of false minutiae), or noise from the electronic board. As future work, the project will evaluate the performance of the sensor in terms of verification accuracy, using traditional optical sensors as baseline.

Then, a session was dedicated to the on-going SME projects Stellar i-ris, and QUADCARD, which were presented by Johannes Junggeburth (STELLAR) and Frank Sandelov (CARDLAB)

The second day concluded with a demo session of the projects STELLAR I-RIS, QUARDCARD, SOTAMD, SWAN, PYCSEL, and LIGHT^{est}.

Day 3

The keynote on the third day was provided by Andrea De Candido, Acting Head of Unit of Unit B.4 at DG HOME "*Unit of Innovation and Industry for Security*". The unit is responsible for the security calls in H2020 and the forthcoming new research programme Horizon Europe. Mr De Candido addressed the priorities of the Commission in this field and the new pillars of Horizon Europe. He illustrated the security research strategy of the EU and conducted an impact analysis of security research including the market uptake challenge, which requires hard evidence. It was highlighted that research is not a stand-alone process but must be integrated in a wider capability development process, which should involve next to the researchers other main actors such as policy makers, practitioners, industry and citizens. Such process should be structured with a capability development cycle including analysis of need, assessment of options and implementation of solutions. The talk also emphasized that security research should support the transition from a reactive to a proactive anticipatory approach in addressing the different security challenges. Finally, the keynote discussed biometric related considerations such as: (i) the compliance with GDPR and Fundamental Rights issues to ensure the societal acceptance of new solutions, (ii) data driven innovations should always take into consideration data protection, and (iii) ensure to maintain the strong industrial basis in biometrics. It is important to consider that future biometric research projects should not only focus on border crossing applications but also on applications in order security domains. The talk concluded with a discussion on the upcoming Horizon Europe, which will be strongly impact oriented. Now it is the window of opportunity, to identify the gaps and to have them confirmed by national authorities.

The session on the project SOTAMD (*State of the art of morphing detection*) presented the problem of Face Morphing Attack and the current state of research in this young area. The project is focused on the vulnerability of enrolment processes of face biometric systems, such as the application process of identity documents. In such attacks, biometric samples of multiple subjects are merged, in order to allow an unlawful but successful verification of all contributing subjects against the created artificial identity. The project mimics the automated border control gate

scenario, where the live face image of the gate is compared against the image in the chip of the passport. By collecting a dataset of bona fide images and creating hundreds of morphed face images the SOTAMD project will evaluate, if current state-of-the-art is sufficiently mature to be deployed as immediate response to the threat. An important result of this project is an open access evaluation platform (hosted by the University of Bologna) such that governmental agencies, research institutes and others can test and compare Morphing Attack Detection (MAD) mechanisms and determine whether and when a solution is mature for deployment at border control points.

A parallel session on the project AMBER (*enhAnced Mobile BiomEtRics*) presented the EU Marie Skłodowska-Curie Innovative Training Network, which is addressing a range of current issues facing biometric solutions on mobile devices. AMBER comprises ten integrated Marie Skłodowska-Curie Early Stage Researcher (ESR) projects across five EU universities and has the direct support of seven Industrial Partners. The aim of the Network is to collate Europe-wide complementary academic and industrial expertise, train and equip the next generation of researchers to define, investigate and implement solutions and theory to ensure secure, ubiquitous and efficient authentication whilst protecting privacy of citizens. The themes for investigation include: mobile platform usability and reliability, novel solutions for mobile biometric interaction, and privacy, security and confidence in mobile biometric interaction.

The last project presentation session introduced the recently started projects PERSONA, D4FLY and RESPECT.

At the end of the conference, a round table discussion entitles "Operational Needs Meet Research" with panellists coming from different European law-enforcement agencies provided a chance for attendees to explore the needs of national operators and other key end-users of biometrics technologies that have not yet been addressed by past and current research. A key-problem identified by the operators is the still limited deployment of biometrics, where biometric applications are clearly relevant for many more societal challenges. This lack of deployment is related to a lack of understanding regarding the potential and limitations of biometric technologies. In general, infrastructure developments have stayed behind. Where systems are deployed, operators experience that staff (e.g. front-line staff, facial comparison experts) need more dedicated training on biometrics. Related to training is also the accessibility of data sets with known ground truth. This is needed for validating the recognition performance in in-house solutions. From a technical perspective the lack of image quality metrics was also identified as a key problem. As for areas of future operations, which will require biometrics and related research and development efforts a number of aspects were mentioned. New technologies are needed that can improve efficiency, help crime-prevention and solve crime. Biometric core functionality, which is needed urgently, contains morphing attack detection to maintain border control security. In the context of migration flow management, reliable face-based age estimation is needed, which would lead to both more efficient migration processes and reduced operational costs. The research community was also asked to come up with ideas for future operations. The discussion touched also the limits of use cases, such as the application of biometric technologies for citizen classification in China, which are not likely to be adopted within the European context.

Concluding Remarks

The presentations and complementary information from the speakers are available on the EAB-website.[1]

The EAB-RPC and the Darmstadt Biometric Week was well attended. Thus, a new edition of EAB-RPC will take place next year, on 14, 15, and 16 September 2020. The EAB Research Projects Conference 2020 will again be co-located with the IEEE BIOSIG conference during the Darmstadt Biometric Week.[2]

About EAB

The EAB is the leading voice for biometrics and digital identity, for Europe.

As a non-profit organization, EAB represents and connects a growing community of biometrics and digital ID stakeholders from across Europe. Our purpose is to foster innovation, support networking across markets and stakeholders, and provide trusted and impartial advice. The EAB's membership includes the European Commission, business leaders, governments, institutes and academia. Members meet regularly at EAB hosted and partnered events and networking opportunities, across Europe.

[1] See https://www.eab.org/events/program/177
[2] Please read more at: https://www.eab.org/events/program/195