University of Kent

Kent Academic Repository

Miguel-Hurtado, Oscar and Guest, Richard (2016) *Users-Centric Design: introducing remote usability evaluation in mobile implementations.* In: International Biometric Performance Testing Conference 2016. .

Downloaded from

https://kar.kent.ac.uk/55475/ The University of Kent's Academic Repository KAR

The version of record is available from

This document version

UNSPECIFIED

DOI for this version

Licence for this version

UNSPECIFIED

Additional information

Versions of research works

Versions of Record

If this version is the version of record, it is the same as the published version available on the publisher's web site. Cite as the published version.

Author Accepted Manuscripts

If this document is identified as the Author Accepted Manuscript it is the version after peer review but before type setting, copy editing or publisher branding. Cite as Surname, Initial. (Year) 'Title of article'. To be published in *Title of Journal* , Volume and issue numbers [peer-reviewed accepted version]. Available at: DOI or URL (Accessed: date).

Enquiries

If you have questions about this document contact ResearchSupport@kent.ac.uk. Please include the URL of the record in KAR. If you believe that your, or a third party's rights have been compromised through this document please see our Take Down policy (available from https://www.kent.ac.uk/guides/kar-the-kent-academic-repository#policies).

Users-Centric Design: introducing remote usability evaluation in mobile implementations

Oscar Miguel-Hurtado, Richard Guest, Chiara Lunerti, (University of Kent, Canterbury, United Kingdom)

Introduction: The presence of fingerprint sensors in an increasing number of high-end smartphones has made biometric authentication mainstream. Through this many companies are starting to look at biometrics as an opportunity to enhance security and trust from their customers. Currently, many financial institutions are testing face and voice biometric solutions in order to add a layer of security to its current mobile applications. Mobile implementations are challenging for biometrics implementations as subjects can use apps in many different ways and environments (for example, use of the device in the hand, on a table, whilst walking or stationary, in portrait or landscape mode, etc.). All these different possibilities and their numerous combinations, along with the great demographic variability across a population, make the usability evaluation of mobile biometrics implementation a key factor in implementation. Usability evaluation has attracted the attention of the biometric community since [1] and nowadays is generally acknowledged as a key factor for both user's acceptance and biometrics performance. Additionally, these topics have attracted the attention of the International Standardisation Organisation (ISO) within JTC1 SC37, where different standards are currently being developed on mobile biometrics and usability evaluation methodology by (ISO) within JTC1 SC 37. Some of this work is based on the Human-Biometric-System-Interaction (HBSI) framework [2], devised by Purdue University in order to assess the interaction performance of a biometric system. HBSI defines several metrics related to satisfaction, efficiency and effectiveness (usability), cognitive and physical metrics (ergonomics) and sample quality and processing capabilities (biometric system). Many of the HBSI metrics depend on either identification of correct or incorrect presentation of the biometric sample from the user, which may be time consuming across a large population, and difficult to analyse when the collection device is outside of an observation area.

Mobile Evaluation Tools: In our current work, we propose an integration methodology for the evaluation of mobile biometrics systems interaction. Our proposed method uses a series of tools to ensure the sufficient information to enable an HBSI analysis: i) *Online surveys* integrated within the app or hosted on a website, allowing collection of information about user demographics, degree of satisfaction, preferences, feedback from participants, etc. ii) *Mobile analytics tools* logged information on how, what and when the users do within the app, enabling the calculation of HBSI metrics related to effectiveness and efficiency. These tools provide powerful visualization tools and users segmentation capabilities. Furthermore, the analysis of the timing information enables cognitive HBSI evaluation such as "how the user learn to use the sensors" or "how the uses remember how to use the sensor". iii) *Logged information at the server*: metrics related to the sample quality, segmentation and feature extraction errors and comparison scores (enabling the calculation of traditional biometrics metrics such FAR, FRR, ERR, etc.) Furthermore, the storage of the biometric sample will allow developers to understand the different capturing environment they are facing, and tailor its quality algorithms to them. iv) *User's feedback*: in order to be able to calculate the HBSI interaction metrics, the participant of the evaluation should provide feedback about the biometric presentation. After each presentation the participant should provide enough information to be able to automatically label the presentation as correct or incorrect. The automatically labelling can be enhanced by machine learning algorithms based on user's feedbacks, sample quality metrics and other potential data gathered from the mobile phone (i.e. from accelerometers, light sensors, etc.). These machine learning algorithms can also help on the final version to provide feedback for the users about wrong presentations. With this information, a range of HBSI interaction metrics can be calculated.

Evaluation Experimentation: If usability evaluations are expected to be carried out with a large participant group, a semi-automatic or manually analysis of a sub-set of participants should allow an estimation of the trust-level of the information provided by the users. This analysis will be extrapolated to the whole population in order to detect misbehaviours and/or misuses. Our framework forms part of an on-going mobile platform evaluation using face and voice biometrics as part of the EU CIP PIDaaS (Private Identification as a Service) project [3]. Three usability evaluations are planned: *Phase 1:* a common HBSI usability evaluation in a controlled scenario laboratory with subjects using the PIDaaS app. Video and audio recordings are captured in an operator controlled environment. Mobile analytics tools are implemented within the app which provide logged information to be analysed along with information logged at the server. These data are used to calculate HBSI metrics. *Phase 2:* again captured under controlled conditions but without the presence of the operator. Participants provide biometrics interaction feedback that will be checked against the video/audio recordings. *Phase 3:* Using three PIDaaS end-partners with real participants plus a control group from the University of Kent, remote usability evaluations tools are implemented and the HBSI evaluation are performed based solely on logged information. These three phases will enable an assessment of remote usability evaluation. By using the same mobile application and having different participants from the a similar population (University of Kent staff and students) we will be able to compare the results from the three phases undertaken at the university, along with the comparison with the real participants from the three PIDaaS end-users.

[1] M. Theofanos et al "Does Habituation Affect Fingerprint Quality?", Proceedings of ACM CHI , *2006*

[2] M. Brockly et al "Human-Biometric Sensor Interaction," *Encyclopedia of Biometrics*, 2014

[3] "Private Identity as a Service (PIDaaS)," *EU CIP Project* , 2014. [Online]. Available: www.pidaas.eu.