

Accepted Manuscript

Don't Just Sign Use Brain Too: A Novel Multimodal Approach for User Identification and Verification

Rajkumar Saini, Barjinder Kaur, Priyanka Singh, Pradeep Kumar, Partha Pratim Roy, Balasubramanian Raman, Dinesh Singh

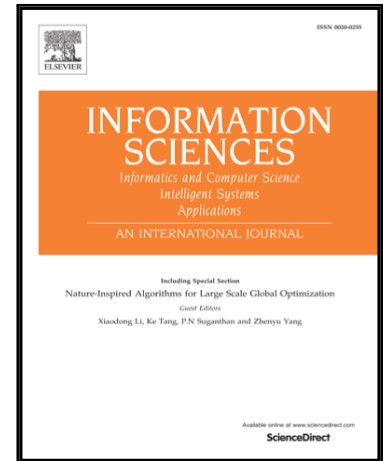
PII: S0020-0255(17)30359-6
DOI: [10.1016/j.ins.2017.11.045](https://doi.org/10.1016/j.ins.2017.11.045)
Reference: INS 13273

To appear in: *Information Sciences*

Received date: 27 January 2017
Revised date: 21 October 2017
Accepted date: 22 November 2017

Please cite this article as: Rajkumar Saini, Barjinder Kaur, Priyanka Singh, Pradeep Kumar, Partha Pratim Roy, Balasubramanian Raman, Dinesh Singh, Don't Just Sign Use Brain Too: A Novel Multimodal Approach for User Identification and Verification, *Information Sciences* (2017), doi: [10.1016/j.ins.2017.11.045](https://doi.org/10.1016/j.ins.2017.11.045)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Don't Just Sign Use Brain Too: A Novel Multimodal Approach for User Identification and Verification

Rajkumar Saini^{*,a}, Barjinder Kaur^{*,b}, Priyanka Singh^a, Pradeep Kumar^a,
Partha Pratim Roy^a, Balasubramanian Raman^a, Dinesh Singh^b

^aDepartment of Computer Science and Engineering, Indian Institute of Technology, Roorkee, India.

^bDepartment of Computer Science and Engineering, Deenbandhu Chhotu Ram University of Science and Technology, Sonapat, India.

Abstract

In this paper, we propose a novel multimodal user identification and verification scheme combining two inter-linked biometric traits, i.e., signature and brain signals (Electroencephalography (EEG)). Moulding handwritten strokes for signature stimulates EEG signals in the brain. The response of the brain signals during signing is unique for each user and this brain signal-signature relation is utilized in the proposed scheme. To the best of our knowledge, there exist no authentication approach combining these two inter-linked biometric traits. The proposed multimodal scheme uses Hidden Markov Model (HMM) based sequential classifier to model features extracted from signatures and EEG signals individually. Pyramid Histogram of Orientation Gradients (PHOG) features are extracted from the signature-images and next PHOG features are used to build user specific signature-HMM models. Similarly, user wise EEG-HMM models are built with Daubechies-4 (DB4) wavelet analysis. Finally, a score combining classification scores of signature-HMM and EEG-HMM models is used to perform user identification and verification. To evaluate the effectiveness of the proposed scheme, we have developed a dataset collecting these two traits simultaneously using the Emotiv EPOC+ device and pen-paper for 70 individual subjects. Thereafter, user's identification is performed with individuals' signature and EEG signals as well as their combined traits. The identification accuracy of the proposed multimodal approach has been achieved upto 98.24%. The effectiveness of the verification scheme is validated

*These authors contributed equally

Download English Version:

<https://daneshyari.com/en/article/6856843>

Download Persian Version:

<https://daneshyari.com/article/6856843>

[Daneshyari.com](https://daneshyari.com)