

Accepted Manuscript

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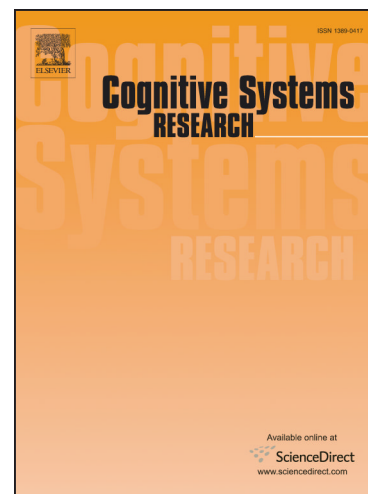
PII: S1389-0417(18)30059-7
DOI: <https://doi.org/10.1016/j.cogsys.2018.07.021>
Reference: COGSYS 672

To appear in: *Cognitive Systems Research*

Received Date: 16 February 2018
Revised Date: 23 May 2018
Accepted Date: 14 July 2018

Please cite this article as: Gavas, R.D., Tripathy, S.R., Chatterjee, D., Sinha, A., Cognitive Load and Metacognitive Confidence Extraction from Pupillary Response, *Cognitive Systems Research* (2018), doi: <https://doi.org/10.1016/j.cogsys.2018.07.021>

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Cognitive Load and Metacognitive Confidence Extraction from Pupillary Response

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Abstract

Spontaneous pupillary fluctuations are indicative of the cognitive load imposed while doing a task involving memory resources. However, the fluctuations are also dependent on other factors like lighting conditions, uncertainty or the level of confidence while performing the task and so on. This paper aims to separate various components of pupillary response in order to assess the cognitive load and the confidence with which the task is performed. Hybrid decomposition models using ensemble empirical mode decomposition followed by independent component analysis is found to effectively reconstruct the original signal. The variational Mode Decomposition has been used in order to overcome the limitations imposed by empirical mode decomposition. Results show that variational mode decomposition outperforms existing state-of-the-art methods. Further, we attempted to identify the hidden components of pupillary response during cognitive tasks like mental addition and the anagram test. We obtained F_{score} of 0.67 in the detection of cognitive load and F_{score} of 0.99 for the detection of confidence level from the single channel pupil data.

Keywords: Cognitive load, confidence level, eye tracking, pupil size, EMD,

^{*}This work has been carried out as part of TCS Research and Innovation by using the infrastructure of the company.

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