



۲۰۱۸-۰۴-۱۸

Manuscript ID: IJMP-۱۷۱۲-۱۳۱۱ (R۳)

Authors: Ahmed Fadhil Almurshedi, Abd Khamim Ismail, Najwa Sulaiman

Dear **Dr. Ahmed Fadhil Almurshedi**

I am pleased to inform you that your manuscript entitled

**"Feature Extraction of Visual Evoked Potentials Using Wavelet Transform and Singular Value Decomposition"**

has now been accepted for publication in the

**Iranian Journal of Medical Physics**

and will be published in an upcoming issue.

Thank you for submitting your interesting work to this journal.

We are looking forward to receive reports of your future research work.

Your Sincerely

  
Prof. **M.T. Bahreyni Toossi**  
Editor-in-Chief of Iranian Journal of Medical Physics

Medical Physics Dept., Faculty of Medicine, Pardis Daneshgah,  
Vakilabad Blvd., Mashhad, IRAN Post Code: 9177948564  
Tel: +98-51-38002319 Fax: +98-51-38002320  
E-mail: [medical.physics.ir@mums.ac.ir](mailto:medical.physics.ir@mums.ac.ir)



## Feature Extraction of Visual Evoked Potentials Using Wavelet Transform and Singular Value Decomposition

Articles in Press, Accepted Manuscript , Available Online from 18 April 2018 **XML**

Document Type: Technical Notes

DOI: 10.22038/IJMP.2018.28583.1311

### Authors

Ahmed Fadhil Almurshedi<sup>1</sup>; Abd Khamim Ismail<sup>2</sup>; Najwa Sulaiman<sup>1</sup>

<sup>1</sup>Department of Medical Physics, College of Science, Al-Karkh University of Science

<sup>2</sup>Department of Physics, Faculty of Science, Universiti Teknologi Malaysia

Receive Date: 01 January 2018, Revise Date: 08 April 2018, Accept Date: 18 April 2018

### Abstract

**Introduction:** Brain visual evoked potential (VEP) signals are commonly known to be accompanied by high level of background noise typically from the spontaneous background brain activity of Electroencephalography (EEG) signals.

**Materials & Methods:** A model based on dyadic filter bank discrete wavelet transformation (DWT) and singular value decomposition (SVD) is developed to analyze the raw data of visual evoked potentials and to extract time locked signal with external visual stimulation.

A bio-amplifier (iERG 100P) and Data Acquisition System (OMB-DAQ-3000) have been utilized to record EEG raw data from human scalp. Matlab Data Acquisition Toolbox, Wavelet Toolbox and Simulink model are used to analyze the EEG signal and finally to extract the VEP responses.

**Results:** Results are verified in the Simulink environment for the real recorded EEG data. The proposed model has achieved a precise decomposition and classification of VEP signal by combined operation of DWT and SVD. The DWT has success to decompose the VEP signal to different frequency followed by SVD for feature extraction and classification.

**Conclusion:**

The visual and quantitative results indicate that the impact of the proposed technique, of combining both DWT and SVD was promising. Since by combining both techniques, the impact of Peak Signal to Noise Ratio (PSNR) of all tested signals was doubled with comparison of using each technique individually.

### Keywords

Visual Evoked Potentials (VEP); Discrete Wavelet Transform (DWT); Singular Value Decomposition (SVD); Classification; Feature Extraction

### Main Subjects

Biological Signal Processing; Laser and Optics; Medical Physics

### Statistics

Article View: 16

Articles in Press

Current Issue

Journal Archive

Volume 15 (2018)

Volume 14 (2017)

Volume 13 (2016)

Volume 12 (2015)

Volume 11 (2014)

Volume 10 (2013)

Volume 9 (2012)

Volume 8 (2011-in Persian)

Volume 7 (2010-in Persian)

Volume 6 (2009-in Persian)

Volume 5 (2008-in Persian)

Volume 4 (2007-in Persian)

Volume 3 (2006-in Persian)

Volume 2 (2005-in Persian)

Iranian Journal of Medical Physics	
Rejection Rate	20%
Average Time to First Decision (Days)	43.62
Number of Articles	350
Number of Contributors	1,080
Article View	327,552
PDF Download	299,516
PDF Download Per Article	855.76
Number of Reviewers	394