

DEDICATION

To my mother, whose strength and positive attitude toward life inspires me.

To my father, who taught me the importance of education.

ACKNOWLEDGMENT

I would like to thank my thesis supervisor, Dr. OMER E. H. HAMID, for giving me the chance to explore a research career in biomedical engineering. His continual support, technical insight, and dedication to this research has made this opportunity most enjoyable.

ABSTRACT

Eye blinks and movements of the eyeballs produce electrical signals that are collectively known as Ocular Artifacts (OA) and these are 10-100 times stronger than EEG signal which is being recorded. Removing artifacts from EEG signal may aid the work of doctors, because artifacts disturb their attention. This research presents a new method to remove automatically ocular artifacts in contaminated EEG signals. The method is based on Recursive Least Square (RLS) Adaptive Filter through stationary wavelet transform (SWT). The stationary wavelet transform (SWT) is used as a pre-stage before the Recursive Least Square (RLS) Adaptive Filtering, to produce ocular artifact free EEG signal. The results show that, in some cases, the method is 20 times better when compared to the use of the traditional FFT method of removing ocular artifacts.

المستخلص

إغماض وفتح العين وحركة العين يُنتج إشارات كهربية تعرف بتشويش العين. وهذه الإشارات أكبر من إشارات المخ بقاربتراوح بين 10 إلى 100 مرة. التخلص من هذا التشويش عند تسجيل وتخطيط إشارات المخ يسهل من عمل الأطباء. هذا البحث يقدم طريقة اتوماتيكية جديدة لإزالة هذا التشويش من إشارات المخ. تُبنى هذه الطريقة على المرشحات التكييفية التكرارية من خلال تحويل المويجات الثابت. تحويل المويجات الثابت أستخدم كمرحلة أولية قبل مرحلة المرشحات التكييفية التكرارية للحصول على تسجيل إشارات مخ خالٍ من تشويش العين. وُجد أن النتائج تعطى ترشيح أفضل 20 مرة في بعض نطاق التردد لإشارات المخ مقارنة بالطريقة التقليدية التي تعتمد على تحويل فورير السريع.

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ABBREVIATIONS

CWT	Continuous wavelet transform
DWT	Discrete wavelet transform
ECG	Electrocardiogram
EEG	Electroencephalogram
EOG	Electrooculogram
FFT	Fast fourier transform
FIR	Finite impulse response
FT	Fourier transform
GUI	Graphical user interface
ICA	Independent component analysis
LMS	Least mean square

PCA	Principal component analysis
RLS	Recursive least square
SOS	Second order statistics
STFT	Short time fourier transform
SURE	Stein's unbiased risk estimate
SWT	Stationary wavelet transform
TFA	Time frequency analysis