الاية

قال تعالي :

((وأخفض لهما جناح الذل من الرحمة وقل ربي أرحمهما كما ربياني صغيرا))

صدق الله العظيم

Dedication

This dissertation is dedicated to my late father, HAMID who never lived to see this success.

To the warmest heart my mother

To my Husband, YASAR, for overwhelming support, encouragement and belief in me

To my dear daughters YARA and SAMA who were deprived of fatherly love and care while I worked on this thesis.

To My sister: AFRAA

To My brothers: WADAH & KEFAH

To My all family, friends and to all people those I love and respect

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Abstract

Multiple Sclerosis (MS) is the most common chronic autoimmune demyelinating inflammatory disease of the central nervous system, which can be diagnosed by magnetic resonance imaging (MRI) by evidence of multiple patches Wight of scar tissue in different parts of the central nervous system on T1 weighted images, T2 weighted image and FLAIR. Texture analysis evaluates interpixel relationships that generate characteristic organizational patterns in an image, many of which are beyond the ability of visual perception. The aim of this study was to characterize MS plaques in MR images using Texture analysis which facilitate pattern recognition that might not visible to human eye. This study is an analytical study, which conducted at Modern medical Centre and Omdurman military hospital in a period from December 2015 to March 2018.

The sample of this study was consisted from 200 MR brain (T1, T2 and FLAIR) images selected conveniently from patient with MS.

Computer based software Interactive Data Language (IDL) and stepwise linear discriminant analysis were used to generate a classification score and to select the most discriminant features that can be used in the classification of normal and abnormal brain tissues.

The results reveal that the MS areas were very different from the CSF, bones, white matter and gray matter. However, plaques can be identified and classified using textural analysis with high sensitivity of 90.9% for first order statistics and 96.9% using higher order statistics. In conclusion, textural feature can be used with some confidences to pin point the areas of MS in MRI brain images. Generation of image processing unit in each hospital is recommended to decrease the misdetection rate.

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LIST OF ABBREVIATIONS:

1H	Hydrogen
ADEM	Acute Disseminated Encephalomyelitis
B0	the magnetic field strength
CE	Contrast Enhanced
CIS	Clinical Isolated Syndrome
CM	Cerebral Microangipathy
CNS	Central Nerves System
CSF	Cerebro Spinal Fluid
CT	Computed Tomography
DICOM	Digital Imaging And Communication In Medicine
EPI	Echo Planer Imaging
FLAIR	Fluid Attenuation Inversion Recovery
FSE	Fast Spin Echo
GLCM	Gray Level Co-occurrence matrix
GLN	Gray-Level Nouniformity
GLRLM	Gray Level Run Length Matrix
GRE	Gradient Echo
HGLRL	High Gray-Level Run Emphasis
HN	Histogram Normalization
IDL	Interactive Data Language
LDA	Linear Discriminant Analysis
LGLRE	Low Gray-Level Run Emphasis
LR	Logistic Regression
LRE	Long Run Emphasis
LRHGLE	Long Run High Gray-Level Emphasis
LRLGLE	Long Run Low Gray-Level Emphasis
MHz	Mega Heartez
MRI	Magnetic Resonance Imaging
MS	Multiple Sclerosis
Mz	Magnetization
NAWM	Normal Appearing White Matter
NDA	Nonlinear Discriminant Analysis
NWM	Normal White Matter
PD	Proton Density
RDA	Raw Data Analysis
RF	Radio Frequency
RLN	Run Length Nouniformity
ROC	Receiver operating characteristic
ROI	Region Of Interest

RP	Run Percentage
SE	Spin Echo
SPSS	Statistical Package Social Science
SRE	Short Run Emphasis
SRHGLE	Short Run High Gray-Level Emphasis
SRLGLE	Short Run Low Gray-Level Emphasis
SS	Single Shot
SVD	Small vessel disease
T1	T1-Weighted MR Imaging
T2	T2-Weighted MR Imaging
TIFF	Tagged Image File Format