GRAY MATTER AND WHITE MATTER RELATES TO HUMAN EMOTIONS

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***Abstract*—The brain is most complex and magnificent organs in the human body. Brain gives us awareness, environment, emotions, feeling, etc. It controls our muscle movements, the secretions of our glands, and even our breathing and internal temperature. Every creative thought, feeling, and plan is developed by our brain. The brain's neurons record the memory of every event in our lives. In this study we used on recent advances in magnetic resonance (MR) data acquisition and post-acquisition processing techniques to determine quantitatively in the living human premature and term infant developmental changes in total brain volume and in the total volumes of cerebral gray matter (GM), unmyelinated white matter (WM), myelinated WM and cerebrospinal fluid (CSF).**

"Emotion and economy" describes a relation that social scientists have recently begun to acknowledge. Outside of various fields of psychology, sociologists and economists often treat emotions as residual categories. In this paper we try to explain brain function of human and relation of GM and WM with human emotion.

***Key words: WM, GM, CSF, Globus, Pallidus, Striatum*.**

I. INTRODUCTION

Our brain directly controls almost all movement in the body. A region of the cerebral cortex known as the motor area sends signals to the skeletal muscles to produce all voluntary movements. The basal nuclei of the cerebrum and gray matter in the brainstem help to control these movements subconsciously and prevent extraneous motions that are undesired. The cerebellum helps with the timing and coordination of these movements during complex motions. Finally, smooth muscle tissue, cardiac muscle tissue, and glands are stimulated by motor outputs of the autonomic regions of the brain.

Brain cells can be broken into two groups: neurons and neuroglia. Emotions, rather than gone from sociological and economic analysis, have been, to put it moreaptly, in disciplinary exile. Multiple signs suggest that emotions are re-entering sociological and economic analysis. In the last few years, interest in emotions has flourished among sociologists who usually place their work on the macro rather than the micro level of analysis [17-21].

Neurons, or nerve cells, are the cells that perform all of the communication and processing within the brain. Sensory neurons entering the brain from the peripheral nervous system deliver information about the condition of the body and its surroundings. Most of the neurons in the brain's gray matter are interneurons, which are responsible for integrating and processing information delivered to the brain by sensory neurons. Interneurons send signals to motor neurons, which carry signals to muscles and glands.

Neuroglia, or glial cells, acts as the helper cells of the brain; they support and protect the neurons. In the brain there are four types of glial cells: astrocytes, oligodendrocytes, microglia, and ependymal cells. Astrocytes protect neurons by filtering nutrients out of the blood and preventing chemicals and pathogens from leaving the capillaries of the brain. Oligodendrocytes wrap the axons of neurons in the brain to produce the insulation known as myelin. Myelinated axons transmit nerve signals much faster than unmyelinated axons, so oligodendrocytes accelerate the communication speed of the brain.

Microglia act much like white blood cells by attacking and destroying pathogens that invade the brain. Ependymal cells line the capillaries of the choroid plexuses and filter blood plasma to produce cerebrospinal fluid. The tissue of the brain can be broken down into two major classes: gray matter and white matter. Gray matter is made of mostly unmyelinated neurons, most of which are interneurons. The gray matter regions are the areas of nerve connections and processing [4-6].

White matter is made of mostly myelinated neurons that connect the regions of gray matter to each other and to the rest of the body. Myelinated neurons transmit nerve signals much faster than unmyelinated axons do. The white matter acts as the information highway of the brain to speed the connections between distant parts of the brain and body.

Deep within the cerebral white matter are several regions of gray matter that make up the basal nuclei and the limbic system. The basal nuclei, including the globus pallidus, striatum, and subthalamic nucleus, work together with the substantia nigra of the midbrain to regulate and control muscle movements. Specifically, these regions help to control muscle tone, posture, and subconscious skeletal muscle. The limbic system is another group of deep gray matter regions, including the hippocampus and amygdala, which are involved in memory, survival, and emotions. The limbic system helps the body to react to emergency and highly emotional situations with fast, almost involuntary actions [1-3].

Automated segmentation of white matter (WM) and gray matter (GM) is a very important task for detecting human emotions. This paper segmented WM and GM so that it can help to detect human emotions. The method is based on binarization, wavelet decomposition, and convexhull and produce very effective results in the context of visual inspection and as well as quantifiably.

II. BRIEF REVIEW

There are different White matters (WM) and Gray matter (GM) extraction procedure that had been established in the past decade but research on accurate segmentation for different type of MRI of brain images and detection is still going on, but those methodologies have certain restrictions for the development of fully automated system. Vicente Grau ET. al. (2003) [1] proposed a method for accurate segmentation of GM, WM, cerebrospinal fluid (CSF) from the MRI of brain images, they proposed an improvement of watershed method and functions are based on probability calculation, normal distributions and Markov Random Field. The results show an accurate detection of the overall volumes and a clear development in recognition of the accurate location. P. Valsasina [2] ET. al. (2005) examined the progression of gray matter volume loss in 117 patients with relapsing–remitting MS, scanned monthly for a 9-month period. They studied and showed that gray matter damage is relapsing–remitting Multiple Sclerosis (MS) progress noticeably over a short period of examination, follow up the stability, and discover the different possibility of WM. P. Kochunov [3] ET. al. (2006) had been proposed a methodology with diffusion tensor imaging as measure of fiber integrity in aging, dementia, and other disease processes. The resulting data is understandable in which correlations are mediated by age-dependent atrophy and also persist in the presence of age correction of various complementary imaging techniques in the assessment of brain aging. Lucia van Eimeren (2008) [4] gives a description of white matter microstructure for the children. Individual differences in the performance in the Numerical Operation, but not the Mathematics Reasoning test correlate most strongly. Betty M ET. al. (2011) [5] proposed the procedure of gray matter volume, different tissue and edge connectivity of different tissue by the graph theory and the results describes with different situation [7-12]. They show the results in intracortical matches that can be used to provide a robust statistical description of individual gray matter morphology. An artefact removal methodology briefly described by S Roy ET. al. (2013) [6] which statistical and geometric approach. M. Masroor Ahmed [7] ET. al. proposed a methods to detect brain tumor, they use WM and GM extraction as a preprocessing steps, and shows all the steps for WM and GM extraction with the combines Perona and Malik anisotropic diffusion model for image enhancement and K-means clustering methodology and due to unsupervised learning it is very efficient and low error sensitive, also claim that unsupervised methods are better than that of supervised methods due to supervised methods needs some preprocessing [[13-16].

III. PROPOSED METHOD

Post-acquisition processing was carried out on workstations with the following developed software. A sequence of image processing algorithms was used to segment each of the MRI slices into separate tissue classes: cortical GM, subcortical GM, unmyelinated WM, myelinated WM and CSF. These algorithms were designed to reduce imaging system noise, identify a linear transformation to align the DE spin-echo images with the SPGR images to form a three channel data set, resample the DE spin-echo images according to this transform, classify tissue types on the basis of MR intensity in the three channels and identify tissue class surfaces for 3D visualization.

IV. ALGORITHMS FOR WHITE MATTER AND GRAY MATTER EXTRACTION

Begin

Step 1: Input a gray scale image I (x, y); x and y being spatial coordinates of the image.

Step 2: B = STATBIN(Image I);
/* compute the binarized image*/
Step 3: FOR i = 0 to x DO
FOR i = 0 to y DO
IF B(i,j) =1 THEN
set B(i,j) ← 0
ELSE
set B(i,j) ← 1
END IF
END FOR
END FOR
/* Complement of the image has been done */

Step 4: Compute two dimensional wavelet decomposition is done using ‘db1’ wavelet up to level two.

/* this step has been done using [c1,s1] = wavedec2(B,2,'db1') matlab function */

Step 5: Re-composition of the image is done using the approximate coefficient of previous step.

/* this step has been done using RC = appcoef2 (c1, s1,'db1', 2) */

Step 6: FOR i = 0 to x DO
FOR i = 0 to y DO
IF RC(i,j) =1 THEN
set RC(i,j) ← 0
ELSE

set RC(i,j) ← 1
END IF
END FOR
END FOR
/* Re-Complement of the image has been done */

Step 7: Labeling of the image RC is done using union find method and calculates area for each connected component and store in to ALLAREA.

Step 8: Z = MAX(ALLAREA);

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/* the maximum area of all the connected components is found out which represents the brain and the image obtained contains only the brain as 1 pixel */

Step 9: A quick hull algorithms for convex hull is applied.

/* Convex hull is computed for these 1 pixel and the entire pixels inside hull set to 1
*/

Step 10: GRAYIMAGE1 = I* BConvex
/* Convexed image is multiplied by original image */
Step 11: BIN2=STATBIN(GRAYIMAGE1);
Step 12: GRAYIMAGE2 = BIN2*GRAYIMAGE1
/* pixel wise multiplication has been done */
Step 13: set sum ← 0 and set count ← 0
Step 14: FOR i=0 to x DO
FOR j=0 to y DO
IF GRAYIMAGE2(i,j) > 0 THEN
intensity ← GRAYIMAGE2(i,j)
sum ←sum + intensity
count ←count+1
ENDIF
ENDFOR
ENDFOR
Step 15: average ← sum/count
Step 16: white←zeros(a111,b111)
/* set all pixel of the white matrix zero */
Step 17: gray←zeros(a111,b111)
/* set all pixel of the gray matrix zero */
Step 18: FOR i=0 to x DO
FOR j= to y DO
IF i6(i,j)>0 THEN
IF GRAYIMAGE2(i,j) >average
white(i,j)←1
ELSE
gray(i,j)←1
END IF
END IF
END FOR
END FOR
Step 19: white= GRAYIMAGE2*white;
Step 20: gray= GRAYIMAGE2*gray;
End

3.2 Procedure STATBIN(Image I)
/* procedure for binarize image*/
Step 1: INIT =zeros(a,b);
Step 2: threshold =std2(I);
/* threshold selection by standard deviation of the image intesity */

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Step 3: FOR I = 0 to x DO
FOR j = 0 to Y DO
IF I(i,j)>threshold THEN
Set INIT(i,j)←1
END IF
END FOR
END FOR
Step 4: RETURN (image INIT)

V. Conclusion

Most economists we talk to are curious about neuroscience but sceptical of whether we need it to do economics. The tradition of ignoring the inside of the ‘‘black box’’ is so deeply ingrained that learning about the brain seems like a luxury we can live without. But it is inevitable that neuroscience will have some impact on economics, eventually. If nothing else, brain fMRI imaging will alter what psychologists believe, leading to a ripple effect which will eventually inform economic theories that are increasingly responsive to psychological evidence. Furthermore, since some neuroscientists are already thinking about economics, a field called neuroeconomics will arise whether we like it or not. So it makes sense to initiate a dialogue with the neuroscientists right away.

Acknowledgment

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression, “One of us (R. B. G.) Thanks . . .” Instead, try “R. B. G. thanks”. Put applicable sponsor acknowledgments here; DO NOT place them on the first page of your paper or as a footnote.

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