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Proposed Method for Human Decision making using Neuroeconomics

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Abstract

Neuroeconomics is defined as human decision making from the viewpoints of economics, brain science, and psychology. This subject guides new economic models that attempt to explain actual human activity. It is true thatemotions influence our decisions and also some human can control emotional responses in certain situations.

A better understanding of how the mechanisms underlying emotional responses interact with those responsible for rational thought and the control of behavior may help to guide the development and implementation of better social policies In this paper it is intention to show how human brain imaging studies correlates with decision making behavior of human nature.

KeyWords: Brain Image, MRI, Human Beha vior , Edge Detection, contour detection, and PFC

I. Introduction

The standard economic conjecture in economic theory: people make decisions that maximize their utility. We need to study positive and negative emotion in the human brain. Emotion guides action for decision and organizes behaviour towardsprefrontal cortex (PFC) and the amygdala as two key components guiding the emotion. There are certain flaws in brain for making proper decisions in some situations.

First, behavioral economic research indicates that our brain make many cognitive errors. Second, our brain inherently have limited cognitivecapacity to deal with the complexity of the real world. Also our brain often fail in decision making when strong negative emotions have been aroused. Additionally, our minds indecision making are too often oriented to seeking what we want or desire, not what is really better for us.

But there are some importantreasons for believing that human economic decision making is not always give proper decision. This paper will try to explain the different major behavioraleconomic findings considering how the mind works in economic decision making.

The ventromedial sector of the PFC is most directly involved in the representation of elementary positive and negative emotional states while the dorsolateral PFC may be involved in the representation of the goal states towards which these elementary positive and negative states are directed. The amygdala has been consistently identified as playing a crucial role in both the perception of emotional cues and the production of emotional responses, with some evidence suggesting that it is particularly involved with fearrelated negative affect. Individual differences in amygdala activation are implicated in dispositional affective styles and increased reactivity to negative incentives. The ventral striatum, anterior cingulate and insular cortex also provide unique contributions to emotional processing.

Among the most recent and exciting developments in neuroscience has been the introduction of methods for imaging the function of the intact human brain. This in turn has opened up the opportunity to study the involvement of the brain in uniquely human activities, such as reasoning and complex forms of decision making. These studies provide support for a view of the brain as a confederation of systems and behaviour as the outcome of an interaction among these.Consider the example of an adult choosing a diet. In theory, this could be very complicated. One can choose among thousands of foods that vary along dimensions such as nutrition/healthfulness, taste, stimulation, preparation time, expense, degree of processing, commercial availability, and so on. Foods can be combined and prepared in many different ways. According to economic theory, people will want maximum satisfaction from their food consumption or minimum cost. Finding the optimal diet is clearly too complex for our brain.However, it is possible to alter the decision-making process in order to drastically simplify things. For instance we can start by choosing from a set of foods or dishes that is familiar to us due to our cultural/ethnic/familial upbringing.

II. Brief Review

In these different brain regions, research shows that decisions result from rapid and complex probability calculations in brain cells called neurons. In one study, monkeys played a video game that required them to determine which of two possible directions a moving display of random dots was headed. If a monkey guessed the direction correctly — by gazing at one of the two targets — it received a reward. As the monkey made its decisions, researchers recorded the electrical activity of neurons in the parietal lobe, and found that it closely correlated with the monkey's decisions. In fact, the researchers could predict the monkey's choices based solely on brain cell activity [1].

Neuronal activity in the parietal lobe not only accurately predicted the monkey's choice, but also the certainty with which the decision was made. In addition to trying to select the correct target for a big reward, the monkeys were able to choose a fixed target, which guaranteed a smaller, less desirable reward. When the monkey lacked confidence in its target selection, it chose the sure bet, and the brain cell activity in its parietal lobe changed, suggesting these cells also indicate the monkey's confidence level.

III. Proposed Method

Medical economics has been undergoing a revolution in the past decade with the advent of faster, more accurate and less invasive devices. This has driven the need for corresponding software development which in turn has provided a major impetus for new algorithms in signal and image processing.

The human brain structure is morphologically similar to that of other mammals, but is larger in comparison to other mammals on the basis of body size ratio especially in comparison to other primates. It also contains an estimated number of 80 to 120 billion neurons (nerve cells) in the human brain. The larger size is contributed by the cerebral cortex, especially the frontal lobes which are associated with executive functions such as self-control, planning, reasoning and abstract thought. The portion of the cerebral cortex devoted to vision is also greatly enlarged in human beings. Several cortical areas play specific roles such as use of language as a communication medium, a skill that is unique to humans. The frontal lobes, located

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behind the forehead, are the largest lobes of the brain. These two lobes are involved in planning, organizing, problem solving, impulse control, memory, decision making, selective attention, controlling our behaviour and emotions. The left frontal lobe plays a larger role in speech and language.

Located behind the frontal lobes are the parietal lobes. They integrate sensory information from various parts of the body. The parietal lobes contain the primary sensory cortex, which controls sensation (touch, hot or cold, pain), tell us which way is up and help to keep us from bumping into things when we walk. The temporal lobes are located on the sides of the brain under the parietal lobes and behind the frontal lobes at about the level of the ears. They are responsible for recognizing and processing sound, understanding and producing speech and various other aspects of memory. Located at the lower back of the head are the occipital lobes. These lobes receive, process visual information, and enclose areas that help in perceiving shapes and colors

Psychological economics (PE) is based on the cognitive functioning of the human brain and on the basis of cognitive function people are take predictable errors in their judgements and decision making. PE researchers have identified many other reasons why our minds systematically err in making judgments and in decision making. These errors derive from, among other things, theanchoring effect, judgment by representativeness, overconfidence, theory-induced blindness, loss aversion, salience, use of mental accounts, framing, inconsistent preferences, defective affective forecasting, difficulties dealing with probabilities and time, the narrative fallacy, hindsight bias, information bias, and overestimating rare events[2-5].

Morphological Cephalic disorders are congenital conditions that stem from damage to, or abnormal development of the budding nervous system. Cephalic is a term that means "head" or "head end of the body." Congenital means the disorder is present usually before birth. Such cephalic disorders are not necessarily caused by a single factor but may be influenced by hereditary or genetic conditions or by environmental exposures during pregnancy such as medication taken by the mother, maternal infection, or exposure to radiation. Some cephalic disorders occur when the cranial sutures (the fibrous joints that connect the bones of the skull) join prematurely. Most cephalic disorders are caused by a disturbance that occurs very early in the development of the fetal nervous system.

Structural and functional asymmetry in the human brain and nervous system is the difference in size or shape, or both. Asymmetry analysis of brain has great importance because it is not only indicator for brain cancer but also predict future potential risk for the same. In neuroscience perspective, the concepts of symmetry and asymmetry are closely tied to the two hemispheres of the human brain. Two objects may show mirror symmetry with regard to shape and structure, although the functions of the two are clearly asymmetrical. A similar distinction applies to the two cerebral hemispheres, which at least on the surface seems to be symmetrical mirror images, making up the left and right halves of the brain. The different lobes of brain aregiven below.

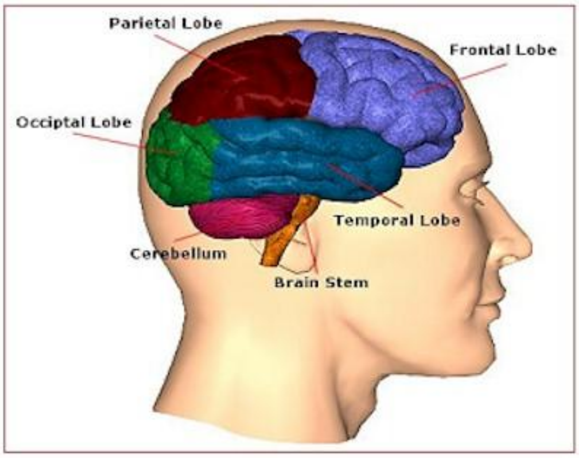

Figure 2: Picture of Human Brain[2-3]

Algorithm 1: To Calculate relative threshold value.

This algorithm is used to calculate the threshold value which will be used to convert the gray image into binary image.

Step 1: Select an initial estimate for T (T=threshold value). The initial value for T is the average gray level of the image

Step 2: Segment the images using T. This will produce two groups of pixels: consisting of all the pixels with gray level values > T called as G1 and consisting of pixels with values <= T called as G2.

Step 3: Compute the average gray level values µ1 and µ2 for the pixels in regions G1 and G2.

Step 4: Compute a new threshold value:

$T = 0.5 * (\mu1+ \mu2)$.

Step 5: Repeat steps 2 through 4 until the difference in T in successive iterations is smaller than a predefined parameter T0

Step 6: Stop

Algorithm 2: To find out separate contours of corresponding lobe

This algorithm is used to segment the valid contours of the binary image shown in fig 5.

Step1: Apply label matrix technique in the binary image, and store the output matrix in LB variable. LB will have the same dimension as the binary image. The value '1' in each contour in the binary image will be replaced by an integer number in the LB.

Step 2: count = maximum integer value stored in LB; So "count" will contain the number of contours in the input image.

Step 3: index = 1

Step 4: val = maximum gray level value of the pixels in the modified brain image.

Step 5 : Find the coordinates of the pixels of the LB where value of the pixel == index;

Step 6: local_Value = maximum gray level value of the pixels in the modified brain image whose coordinates are selected in step 5.

Step 7: if local_Value> 0.85* val

the contour is valid and segment the contour for processing.

Else

Not a valid contour

Step 8: index = index + 1;

Step 9: Repeat step 5 to step 8 until index > count

Step 10: Stop

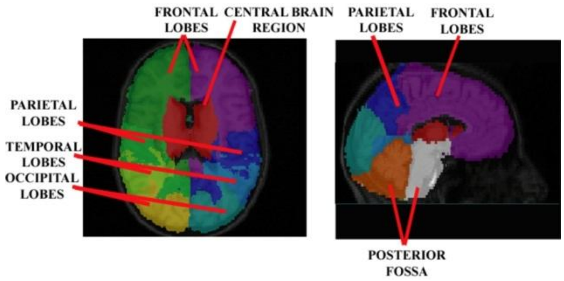

Figure1. Different Lobes of Brain (output Result)

IV. Conclusions

It is assumed here that there are two sequential circuits operating in brain-Synchronous and Asynchronous. For incoming signals pulse came from different visionary organs i.e. using Asynchronous circuits. For outgoing signals from brain it works like Synchronous circuit.

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