

Modeling the Physical Mechanism of Human Mind

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ABSTRACT

This paper explains a number of aspects of human thinking including conscious mind and proposes an abstraction to model these aspects. It also explains how the accuracy of the model can be evaluated and explicates the benefits of building such a model. However, the model is not intended to capture the complete human thinking mechanism in low level. Also please note that this paper is a concept paper. It is not intended to explain in detail how to implement consciousness, but to demonstrate using a model that there is a possible way of implementing consciousness in computers.

1. INTRODUCTION

To understand the “conscious mind” it is required to break the problem into two sub-components [1].

First one is how we generate so called a “movie-in-the-brain”; a metaphor for the integrated composite of diverse sensory images such as visual, auditory, tactile, and olfactory – that constitutes the multimedia show we call mind?

Second one is how we automatically generate a sense of ownership for this movie in the brain, the “self”?

The movie in the brain has already being studied successfully and a correspondence between the structure of an object, as seen by the eye, and the resulting pattern of neuron activity generated within the brain’s visual cortex has been established. Also on the basic of the facts gathered from these studies the neural basis for the movie-in-the-brain can be inferred. However the emergence of a sense of “self” is an intricate problem yet to be explored.

2. THE THINKING PROCESS

When we think we can hear a voice generated within our body. We know this voice is coming from inside our body because from our other sensors we know that no one is speaking to us from the outside world. This suggests that we need a language to think. This leads to the question how a person thinks if he doesn’t know any language. Can we say that born deaf people can’t think because they don’t know any spoken language? One of the solutions to this question is to assume that these deaf people think by using a sequence of mind images. The existence of mind images is an accepted concept by many researches [3]. Thus thinking visually and by using a language are two different ways of thinking. This does not explain how a born deaf and blind person thinks, as they don’t have any idea about images and sound. Since our body receives information from the surrounding environment from our five sensors, namely visibility, audibility, smell, taste and touch, it can be suggested that there are five methods of thinking entitled to these five sensors. This phenomenon is termed by Professor Antonio as “movie in the brain” [1]. However we claim that movie is not an appropriate term as movies are composed of only visuals and sound; a more appropriate term to explain this phenomenon would be a “virtual world” in the brain.

We frequently use the sound and visual thinking methods. Other three thinking methods are weak in normal people but they tend to get stronger if the first two methods are not possible to use, such as in the case of born deaf and blind people.

Let’s try to devise a common simple physical mechanism to model thinking methods.

What happens when we hear something? Sound waves hit the eardrum and generate electro-

chemical signals inside our brain. These signals are identified by the part of the brain that identifies sound. What happens if we generate a similar electro-chemical signal in the same format as the previous signal between the ear and sound identification part of the brain? We should here another sound or voice, which we know, is not coming from the outside world (from our other sensors we know this). This is similar to what happens when we think using sense of sound.

In all five thinking methods it looks like there is a common process. That is, there is a signal generator, which generates signals in between the identification part and the sensor as shown in the following figure and sends those generated signals to the sensor identification part of the brain. This signal generator generates signals in the same type as the signals generated by the sensor, but has different information in it.

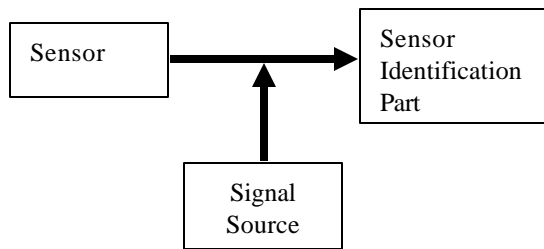


Figure 1. *Common Abstract Model of Thinking*

3. SIGNAL SOURCE

Signal source generates the virtual world that we feel when we are thinking. In this signal source there are two aspects that we have to consider. Firstly we have to identify how these signals are created. Secondly we have to find out how the information in those signals is generated.

Basic principle behind the signal generator can be explained. All signals generated by this signal source (i.e. the one responsible for thinking) try to satisfy organism's needs and secure its existence. Obviously this signal source should be quite complex. A suitable candidate for this signal source is the complex neural network within our brain. This network has a lot of inputs and outputs. These inputs come from every part of the body informing the current state and needs of the body.

It also gets inputs from various parts of the brain. The structure of this neural network created by genes and altered later by the process of learning.

The basic structure of this neural network is written in our genes. This neural network has evolved during millions of years to give stable outputs, which makes the organism hosting the network, live longer. These outputs may not be 100% effective. Neural networks that were unable to give these kinds of successful outputs have become extinct during the evolution. That is, natural selection has taken place in this case too. The structures of these successful neural networks are written to genes during the evolution and those genes create similar structures in the next generation. Identifying the structure of this neural network and how it creates signals is another problem, which is not very important to explain conscious mind.

4. CONSCIOUS MIND

“Explaining how we make mental images or attend to those images will not suffice to elucidate the mystery of consciousness. A satisfactory hypothesis for the making of consciousness must attempt to explain how the sense of self comes to mind. The sense of self does not depend on memory or on reasoning and even less on language. The sense of self depends on the brain's ability to portray the living organism in the act of relating to an object. That ability, in turn, is a consequence of the brain's involvement in the process of regulating life. The sense of self began as yet another device aimed at ensuring survival” [1].

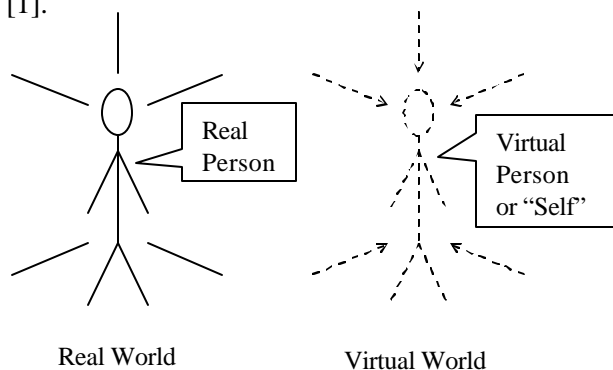


Figure 2. *Generation of "Self" within Human Body.*

Conscious mind generates because of our awareness of us. That is sense of self generates conscious mind. The virtual human created by the five thinking methods creates the sense of self in humans. Also from the information coming from the virtual sensors of this virtual human creates a virtual world. This virtual world shows our needs and how to satisfy those needs, in different ways, which we call thinking. We think in order to satisfy our needs. That is the fundamental principle behind thinking.

5. EXPERIMENTAL EVIDENCE

There are experimental ways to identify, in a larger scale which areas of the brain are involved in recognizing and processing more general concepts. Researches use positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) to identify regions of the brain in which blood flow changes during different tasks or situations. An increase in blood flow is interpreted to mean more neuronal activity in the area and suggests the region is specifically involved in the task at hand. If we take a PET scan while some one is thinking, particular parts of the brain where sensor identification is done should be active.

If we ask some one to think about some place visually and scan his brain in the same time, we should see parts of the visual cortex are active.

We can study the behavior of born deaf people and find out how they interact with the environment. Here we should be able to find evidence of visual thinking.

If given a problem to a born deaf and blind person, which needs lot of thinking to solve and scan his brain while he solves it, we should see that sensor identification parts other than visual and auditory are active.

6. CONCLUSION

There are basically five methods of thinking for humans and they are closely related to five sensors. Normal humans mainly think using oral and visual thinking methods. The heart of thinking

is the signal source, which produce signals in the same format as sensory signals and these signals are generated by signal source according to the needs of the human. Combination of these five thinking methods creates a virtual human, which every human feel as 'Me' or 'self'.

One's thinking was considered to be private. But according to this model if we can trap the signal when the signal is on its way to the sensor identification part, we should be able to get some idea about what that person thinks. Also we should be able to implement primitive mind on a computer and study its behavior.

REFERENCES

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