Modeling of Consciousness:
Classification of Models

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Abstract

Mind is a complex information processing mechanism which causes consciousness - the processed information content of mind. Information coming from both the outer world (physical world) and the inner world (mind) are equally being processed in the mind. We use various methods to represent information. Anything which represents an information is a model and the procedure is called modeling. There are models generated in various hierarchical levels. In this paper, we will classify the models and discuss its importance. We will also give a reasonable explanation for subjectivity of human experience, in terms of models and suggest a way to study it objectively.

Keywords: Mind, Consciousness, Mathematical models, Information, α-models, β-models, γ-models

1 Introduction

Understanding and explaining consciousness is one of the greatest challenges ever faced in the history of the development of human consciousness. It is a very old problem that any human consciousness had asked, but failed to give a successful answer, even by world renowned mathematical modelers; like Sir Isac Newton and greatest philosophers; like Aristotle. Perlovsky in his review paper [5] points out that, recently there is a renaissance in the field, due to the emergence of new data, new intuitions and new mathematical tools. A few basic principles of the mind operations have been identified, formulated mathematically and being used to explain a wealth of known data and make predictions that can be tested in the lab.

In Taylor’s [8] own words, “Confusion abounds in present consciousness research, in spite of the high level of present activity. These confusions may arise due to the many deep problems facing us when we try scientifically to understand consciousness. These include:
• Reconciling subjective experience, at the heart of consciousness, with objective knowledge, at the root of scientific methodology.

• Achieving interaction between the self, supposedly possessing a non-relational character, with the content of experience, as contained in so-called ‘qualia’ which do possess a relational structure as the phenomenological content of our experience.

• Explaining the many different states in which consciousness can be said to be present: in the normal awake state, in dreams and possibly in slow-wave sleep, under drugs, in trance state, in meditation, in mental ill-health, such as schizophrenia, Alzheimer’s disease, and so on.

• Choosing from the large range of models of consciousness that have been proposed, with no present consensus amongst them.

• Determining which theoretical framework should be used inside which a theoretical model of consciousness could be built.”

How could we overcome all these difficulties described, simultaneously? A model developed to fit the reality, by keeping in mind all these difficulties, would be a better solution. Models are in no way equal to the reality and it is possible to find a new model which matches more perfectly with the reality, than any existing model. Aim of this study is to develop a theory, which would match with the reality and overcome the difficulties mentioned above. We use a simplifying assumption that; human consciousness is built with models and these models are involved in the development of consciousness, at the very basic level. As such consciousness is subject to all advantages and limitations of models. For a detailed discussion of related concepts refer [6]. I would not claim that this model is final. On the other hand, whether this model is the best among the known models is yet to be verified through comparison with the reality and other models. Now a relevant question arises. How could such an extremely complex phenomena develop from a null, simple state? I hope that this could also be successfully answered, as we proceed.

Perlovsky [5] adds that: “How the mind works has been the subject of discussion for millennia, from the Ancient Greek philosophers to mathematicians and cognitive scientists of today. Words like, mind thought, imagination, emotion, concept present a challenge: people use these words in many ways colloquially, but in cognitive science and in mathematics of intelligence they have not been uniquely defined and their meaning is a subject of active research and ongoing debates. Standardized definitions come at the end of the development of a theory.”

How do we define new concepts? Unless we do not know the characters of an object or a phenomena, we cannot define it. This requires pre-existing
concepts in our consciousness. If we have to use a new concept in the definition of another concept, we have to define the new concept first. This will lead to an unavoidable sequence of new definitions and consequently ends up with impossibility. The possible way, consciousness overcomes this difficulty will be discussed in the coming section. Consciousness can define new concepts by extending, generalizing or replicating the relationships of pre-existing concepts.

Consider the following definitions of mind and consciousness, which matches with the assumptions made in this theory [7]. Mind is an information accepting, information processing and information generating mechanism. New information enters our mind through the sense organs. Consciousness is the end result of all information processing activities taking place in the mind. Even though there are similarities in the processing of information, the end result may vary from person to person due to the variations in the accepted information and the variations in the processing of the information internally. I argue that if information is completely blocked from entering the mind for a sufficiently large period of time, immediately after the birth of a child, its consciousness would be null. This is verifiable and there are some related evidences already available [2, 3].

1.1 Axiomatic approach

In this section, an axiomatic approach to the study of consciousness is proposed. It is justifiable because the best way to develop any mathematical theory is through axioms. Axioms are those verifiable statements in a theory, which are accepted as true. Its function is to provide a simple and clear beginning to a theory. Let us accept the following axioms.

1. Basic unit of the information being processed in the mind is model (piece of information).

2. Mind compares, classifies, characterizes and differentiates various models.

3. New models are created from the existing models.

4. Mind associates some value or preference with each model.

The first axiom helps us to express the complex problem of consciousness into its fundamental units and provides a clear starting point. Second and third axioms help to analyze the internal processes of the mind which constitute consciousness. The fourth axiom initiates a study of the subjectivity and objectivity of our mind. Next we proceed to analyze various kinds of models and classify them based on the inherent difference.
2 Classifying models

We know that, a baby listens to sound, responds to light, taste and touch. These primary forms of information are accepted through its sense organs. We assume that these basic pieces of information are processed in the mind as models. We shall call it $\alpha$ - models. In the initial stage of development, mind handles only $\alpha$ - models, but its use does not stop in the subsequent stages. Now the mind faces some fundamental problems such as identifying an already familiar model, comparing two models, differentiating and classifying etc. These activities have different difficulty levels. Another notable fact about $\alpha$ - model is that it is created unconsciously in the mind. It has no external manifestations, except some responses. These models create firsthand experience in the mind. In essence, $\alpha$ - models have its source in the external world and generated and preserved in our mind. It can independently exist without any conscious interference of man. So these models can be called pre-linguistic models. Preference is associated unconsciously to $\alpha$ - models.

How could we express our experiences and states of mind to the external world? As a solution to this problem, external representations of ideas, objects and phenomena of the physical world arose. This is the beginning point of language. Some models represents ideas, objects and phenomena through one to one correspondence. A word representing an object is an example. Let us call them $\beta$ - models. Seeing an elephant, when we make the sound ‘ELEPHANT’, then a $\beta$ - model is created. Thus every language is a collection of $\beta$ - models, which are arranged according to some rule. Rules in language are originated by unchanged, repeated use of group of words by majority of population.

Finally there are $\gamma$ - models which are highly complex and developed to explain the experiences of mind. Stories and poems in literature or a theory in mathematics or physics is an example. Speaking in this sense, all mathematical models are $\gamma$ - models.

Among the three kinds of models, $\alpha$ - models are relatively simple and $\gamma$ - models are most complex. As a child begins to use language, $\beta$ - models comes into picture and $\gamma$ - models appear subsequently. Preference is associated with all the three models, which causes subjectivity. In the following section we shall discuss this unique feature of consciousness in detail.

3 Subjectivity of Consciousness

Finding the reason for subjective experience is one of the intriguing problems in the study of consciousness. Human consciousness is dominated by subjective experiences and there is hardly any consciousness which is completely objective. So any study of consciousness which exclude the subjective experiences is incomplete. Subjectivity is a preference or liking we associate with a model.
Most of the time this association is unconscious. It is felt when we consider two or more models simultaneously. For example, while defining functions, we deliberately associate exactly one element in the range. This is to avoid ambiguity and subjectivity from further mathematical treatments.

Consciousness begins to expand when it differentiates models. I would like to conjecture that, ‘a consciousness for which all models are equal is a null consciousness’. When we compare two models we simply compare its characters. So identifying characters must precede comparison. We can identify anything only in terms of characters. Knowledge about all objects having a particular character leads to the classification of objects. When two objects are differentiated, we find a character which is present in one object and not in the other. These mental processes might be the reason for subjectivity.

Some models are ambiguous. Such models can be interpreted in many ways. Ambiguity can cause subjectivity. Models defined loosely and fail to provide examples are ambiguous models. There are many models in language and literature whose meaning is interpreted only from the context. These models are suitable examples of ambiguous models. Ambiguous models represent different things for different consciousness. This gives freedom for a consciousness to interpret the model his own way.

Now we shall analyze the models in mathematics and science. These models stand distinct from other models due to its unique character of objectivity. While keeping this common property, models in mathematics and science show difference in the manner in which it keep objectivity. Models in mathematics are exactly defined and developed using mathematical rules on the firm foundations of axioms or postulates. But models in science, even though defined properly and accept models from mathematics frequently, keep objectivity assuming that models do not represent the reality exactly. This helps a scientist not to be slave to any model. In other words, a model which claims that it represents a realty completely or if it does not allow comparison with the reality or if it argues that no other model can better represent the same reality, is not a scientific model, even though it is objective. A further analysis, which differentiates mathematical and scientific knowledge from other forms of knowledge is given in [6, 7]. The models in mathematics and science are in the broader class of objective models and objective models are in the class of unambiguous models. The following figure shows this relation.

4 Conclusion and future research

In this paper we have seen some new approach to the study of consciousness. Mind and consciousness are defined and axioms of consciousness are given in the first section. The idea that models are fundamental units of consciousness is put forward. Various kinds of models are also discussed which through light,
on the relative importance of those models, in the development of consciousness. Though the existence of $\beta$ and $\gamma$ - models can be verified, the validity of $\alpha$ - models are yet to established. This could be done only through experimental methods.

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**References**


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