

Is it Possible to develop a
mathematical
model of a
Self-Conscious Unit?

Motivation

1. Firm faith in reliability of Mathematical Models
2. Success in the study of physical sciences
3. Utility for welfare living beings
4. Possibility of averting disasters

Expectations and Limitations

- Success in the study of models in nature may or may not ensure success in the case of living beings.
- Possibility exists for isolating those features which are relatively invariant and therefore amenable for mathematical notation.

Expectations and Limitations

- Similar 'guiding principles' exist applicable to physical sciences and living beings.

Identifying the differences between inert material and a conscious being.

Hopefully,

- These can help us to model a self-conscious unit.

Preliminary knowledge

- Existence of difference and similarity between (a) Static system and (b) Stationary system.
- Mathematical concepts needed are: Numbers, Integers, Algebra and Geometry and Transcendental functions.

Examples

- Familiar examples of Transcendental Functions are:
 - 1. Exponential Function
 - 2. Trigonometric Functions and so on

Methodology

- We know a how a mathematical function $f(x)$ is defined : 'f(x)' is known when is 'x' is known, for example:
- $f(x) = x^2$. This is an elementary operation involving only one step, namely, to calculate the square of 'x'.

Exponential Function

- The exponential function e^x is defined by
- $\exp(x) = 1 + x^1/1! + x^2/2! + x^3/3! + \dots,$

needs summation of an Infinite number of terms. Hence it is called Transcendental

Foundations

- The Foundation of mathematics is the notion of a 'unit' which is represented mathematically by the number 1. From this, one proceeds with well stated rules to build a mathematical structures.

Methodology for Applications

The additional requirement is: **one must be prepared to read a ‘meaning into mathematics’**. This is an integral part of theoretical physics, sometimes called **Mathematical Physics**.

Methodology (continued)

Mathematics had been our chief tool for our understanding of the nature. There is no boundary which limits the potentiality of mathematics. Hence we try to model a Self Conscious Unit.

- An important clue is taken from Physical sciences. It is known as Ergodic Hypothesis, introduced by physicists in an attempt ‘to provide a dynamical basis for statistical mechanics’.

Maxwell 1860, 1867

Boltzman 1868, 1872

Ergodic Hypothesis

- The hypothesis states; ‘The time average of an observable - which is determined by dynamics- is equivalent to an ensemble average , that is, an average taken at one time over a large number of systems all of which have identical thermodynamic properties but are not identical at molecular level’.

Reference

- Source (Internet): Adrian Patrascioiu, **Los Alamos Special Issue, [1987]**.

Ergodic Hypothesis

- After discussing the implications of this hypothesis for both classical and quantum statistics, the author concludes

His Conclusion

- ‘ I think neither physicists nor mathematicians should close the book on the venerable problem of the ergodic hypothesis , and I guess some big surprises may be in store once the problem is better understood’.

My Attempt

- I do not claim that I have a big surprise but I want to suggest that a beginning can be made to examine possibilities of understanding a Self Conscious Unit
- (S.C.F)

Relevance of Ergodic Hypothesis

- This hypothesis can be interpreted as implying that a model of an individual exists for a large population.
- However, there is a fundamental question. What is it?
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Relevance of Ergodic Hypothesis

- A difference exists, however, between a self-conscious-unit and a particle of matter. It lies in the existence of a conscious interior and a conscious exterior for a self-conscious unit.
- Hence a question is raised whether one can develop of a mathematical model of a self-conscious-unit?

Detour to Vedanta

- “The central principle of all knowledge is consciousness. The valid knowledge (*pramaa*) is viewed in Advaita Vedanta in two main aspects: as Pure Consciousness (*suddha chaitanya*) and as modal consciousness (*vrutti chaitanya*)”

Reference

- *Methods Of Knowledge*. Swami Satprakashananda. Advaita Ashrama. 1974. p. 62

Detour to Vedanta

“Pure Consciousness is beyond the subject-object relation.....Modal consciousness finds expression through the subject-object relation. It is relational, finite and varied in kind and marked by degrees of manifestation.”

→ It is the modal consciousness that we call as Self-Conscious Unit.

Two Necessary qualities of S.C.U

- Further:
- S.C.U must be a like a transponder which is Stable, Sensitive and Selective to an unlimited range of inputs and outputs.
- Definition: 'A transponder is a device in communication engineering that responds to specific signal from an interrogator.'

Necessary qualities of S.C.U

- Second
- It must be 'aware' of Its interior and Its exterior.
- This distinguishes Self Consciousness from Pure Consciousness.

Mathematical Representation

- With these preliminaries, a Self-Conscious Unit is represented by the number '1'.
- The number 1^n represents sensitivity to 'n' inputs $n \geq 1$. The choice $n=0$ is trivial.
- The 'n' represents the multitudes of qualities

Awareness

- The ‘awareness’ of Its interior is represented by $(1 - 1/n)$ where ‘n’ is a number ≥ 1
- The awareness of Its exterior is represented $(1 + 1/n)$.

Conscious Awareness

- The 'conscious awareness' of 'n' external inputs is represented by $(1 + 1/n)^n$
- The 'conscious awareness' of 'n' internal inputs is represented by $(1 - 1/n)^n$

Signal & its identification

- For a Transponder,
- An 'Exterior' is needed for signal reception.
- An 'Interior' is needed for signal identification.
- Such distinction is not new. How?

A clue from Vedanta

There is a central issue in Vedanta. It is known as Drug-Drushya Viveka.

It means: “The discrimination between the Seer and the Seen”.

- *Methods Of Knowledge.*
- Swami Satprakasananda. Advaita Ashrama. 1974. p. 60 and p. 90

Orthogonality

- The Seer and the Seen are analogous to a line and an area which is perpendicular to that line, somewhat like an umbrella.
- The line joins the Interior to the Exterior

Multidimensional unit

- Since S.C.U has to be sensitive to several inputs, it is represented as a multidimensional unit, such as $1^n = 1 \times 1 \times 1 \times 1 \times \dots$ up to n- times.
- It is an 'n-dimensional' unit cube!

Multidimensionality of interior and exterior

- The interior and exterior of S.C.U are represented by
- Interior $(1 - 1/n)^n$
- Exterior $(1 + 1/n)^n$
- Thus far about Mathematical introduction.
- Next?

Now to Mathematics

- As $n \rightarrow \infty$,
- $(1 + 1/n)^n \rightarrow 2.7182818148 \dots$
- Which is same as, e^x which is
- $\exp(1) = 1 + 1^1/1! + 1^2/2! + 1^3/3! + \dots$,

Mathematics contd.

- As $n \rightarrow \infty$,
- $(1 - 1/n)^n \rightarrow 0.36787944099$
- Which is same as e^{-x} which is
- $\exp(-1) = 1 - 1^1/1! + 1^2/2! - 1^3/3! + 1^4/4! - \dots$

Relation between exterior and Interior

- It can be seen that
- 0.36787944099 multiplied by (Interior)
- 2.7182818148 equals (Exterior)
- 0.99999999945
- Which is nearly unity!
- This is not surprising. Why?

Mathematical Truth

- Because
- $\exp(+x)$ multiplied by $\exp(-x)$
- $= \exp(0) = 1$
- Reference:
- A course of Modern Analysis
- E.T. Whittaker and G.N. Watson
- Cambridge. Publ 1962
- Page 581.

Reading a meaning into mathematics

- (Habits of theoretical scientists)
- $(1 - 1/n)^n$ is called ‘inner’ volume of an infinite dimensional unit cube; and
- $(1 + 1/n)^n$ is called ‘outer’ volume of an infinite dimensional unit cube;

Theorems?

- The ‘inner’ and ‘outer’ volumes of an infinite dimensional unit cube, are inverses of each other.
- For ‘a Self Conscious Unit’ the ‘interior’ is an ‘image’ of its ‘exterior’.
- Together, they constitute UNITY

Again Mathematics

- Since, the ‘interior’ of S.C.U is the inverse of the ‘exterior’, its experience of Time is also reversed accordingly. Exterior time ‘moves’ from ‘the present to future’. However, Interior Time moves from past to present.

Our Concept if Time

- We have a notion of To-day, and anticipation of To-morrow, and as well as a memory of Yesterday.
- Thus, our model is consistent with our experience, because we are Self Conscious Units.

Extension of the Model

3. Utility for welfare living beings.

4. Possibility of averting disasters.

One question remained unanswered:

The mathematical model for
selectivity of a Transponder.

- This subject goes beyond mere Transcendental functions. But it can be incorporated by introducing special mathematical notation.

Hope

- One hopes to extend this study to the question of finite life of a S.C.U.
- 1. This includes the study of self protection and interaction between separate Self Conscious Units.
- 2. It can be extended to the concept of Self Education.

Future study

3. A study of malfunctioning of S.C.U. is necessary.

And steps are needed to ensure correct functioning . Because One malfunctioning Self Conscious Unit can pose serious threat to safety of the whole population of such Units.

Utilitarian considerations

- The survival instinct of S.C.U appears to be operative on this Earth.
- The discriminative faculty is also seen in the S.C.U. It is known as Viveka in Sanskrit. Though we could not have mathematical model though it is already operative in Nature.

Our Role

- To nurture Viveka so that the natural
- S.C.U does not err in functioning.
- The alternative is not pleasant.
- It would be simply called disaster.
- Thank You.