On Representational Completeness

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Abstract. A theory for the representation of *everything* is derived from a closer examination of the term *now* and concepts of cells in the human brain and atoms in the universe. Here *everything* is not limited in any way. The theory points out an approach to achieving representational completeness.
Key words: representational completeness, philosophy, Nowpoint Theory, Nowpoint Line, Nowpoint Graph, now, everything

1 Introduction

In recent years, science has made considerable progress in understanding the functions of the human mind and brain. However, exact comprehensive theories about its in-depth functionality are still a mystery. This article intends to make a contribution towards developing such theories.

We are going to concentrate on the term *now* first and produce a deeper understanding of it. This leads to the definition of the Nowpoint. The behaviour of the brain along the time axis is examined, which leads to the definition of Nowpoint Lines. How something can be represented by a Nowpoint Line is then shown. This, in turn, leads to general statements about representing something by Nowpoint Lines. Finally the relationship between representing something by Nowpoint Lines and achieving representational completeness is pointed out.

2 The Nowpoint

At the onset of investigations, this section examines the term *now* and defines the *Nowpoint*. Generally speaking, one does not usually think about or investigate the term *now* to any great extent. It very often describes a dull impression of time, meaning *the current 5 minutes* or *today* or *this year* or even *this decade*. The true meaning of *now*, however, is further investigated here. When examined more precisely, *now* turns out to be not a period of time, but an infinitely miniscual point in time, a point in a mathematical sense. I have named this point *the Nowpoint*.

The Nowpoint has some very important properties:

1. It moves along the time axis perpetually.

2. Every human being can mentally become aware of the Nowpoint. Our awareness of this is only limited by the speed of the neurons in our brain.
3. The Nowpoint can not be talked about in the Nowpoint, because when we say a word, the Nowpoint moves along with the word and forces us to keep talking about the past. If we wish to produce a deeper understanding of the Nowpoint, we have to talk about it in lengthy texts like this one. The Nowpoint cannot be grasped by single words during its perpetual progression.
4. Since the Nowpoint cannot be talked about in the Nowpoint, everybody has to cope with the reactions of their mind in the Nowpoint themselves. The Nowpoint can be described by a text, but the last step to recognize and handle one´s own Nowpoint has to be made by every individual on their own. This is called the existential loneliness at the Nowpoint.
5. The components of the human brain have complex interactions in the Nowpoint.

These properties have important consequences and raise further questions as follows:

- Which components and structures exist in the human mind and brain seen by a subjective observer?
- How do these components interact?
- What consequences arise from these interactions?
- How can the concepts based on these components and structures, together with the Nowpoint, be expressed in a mathematical theorem?
- What consequences arise from such a mathematical theorem?

3 The Nowpoint in the Human Mind

This section focuses on components of the mind and examines their relationship which will lead to the definition of Nowpoint Lines to produce a deeper understanding of the Nowpoint.

Numerous articles on how the brain may be structured have already been published. We have focused on the simplest possible structure here we can all discern. This is how we produce a link between the Nowpoint and the human brain.

The following components can be identified when considering one´s own thoughts:

- Our understanding that enables us to draw logical conclusions and to perform mathematical calculations.
- Our feelings which enable us to have desires and make subjective judgments.
- Our will which allows us to make decisions and act upon them.

These three components have a perpetually changing state in the Nowpoint. They influence each other and, in this way, they not only develop their own state in the Nowpoint by themselves, but also process the input from the other two components. Here is a description of each these components:

– First of all, the process of our understanding is similar to that of a computer. However, some people may have noticed that it is possible to solve problems designed for analysis by listening to their feelings. Especially when quick decisions have to be made, it is very helpful to solve problems by listening to our feelings and incorporating the results into an overall result. Of course, when used in the wrong way, this result may be nonsensical from an analytical point of view. In this case, the feelings are not a good solution in helping to solve problems. An example of the interaction of our analytical ability and feelings may be seen in professional chess players. They are said to do calculations about the positions of pieces with the help of their feelings. The influence of our will upon our understanding is simple. Our will just decides which problem is to be solved next.

– Our feelings produce a property of our Nowpoint. This property is called feeling. In this way, the property also describes the input of the other two components. How do we feel regarding our will? How do we feel regarding our understanding? These three properties are used to produce the next state of our feelings. In reality, this process is a floating process and cannot be separated into different states. However, a way of simulating this is to compute as many discrete states as necessary.

– Our will decides what to think next. It is obvious that our will is influenced by our understanding and our feelings. The next state of our will is computed from the current state of our will, the current state of our understanding and our current feelings.

When the balance between these three components is disturbed, psychic illness arises. See [3] for a discussion on psychic illnesses. For example, when our will decides not to recognize our feelings in a positive way too often, we become depressed. All psychic states can be expressed in terms of the three components. The results of current research on the human mind and brain give the impression that there must be more than these three components. However, the division into these three components, as described, intends to describe the minimal set of components necessary to produce intelligent behavior. The author is convinced that all other components necessary for intelligent behavior are created automatically when trying to implement the concept of the said three components.

4   Nowpoint Lines

This section links the Nowpoint and the consideration of the components of the human mind to the definition of Nowpoint Lines.

Our brain consists of billions of single cells which all have a state in the Nowpoint. If we take one dimension of a vector space for each cell, we can express the current state of the brain in the Nowpoint as a point in this vector space. As the Nowpoint moves along the time axis, all the Nowpoints in the vector space form a line along the time axis. This line describes the whole life of the respective individual's brain.

As a direct consequence of this, many things can be represented by Nowpoint Lines:

- everything a human being can perceive
- everything described in writing
- everything a human being can think of

These things are sufficient for artificial intelligence, as we are interested in human intelligence here in order to understand it.

How can this help us to develop data structures for artificial intelligence? We can represent one point on a Nowpoint Line by a node in a graph. In order to limit the number of these nodes, we can just handle them on single points in time which have a sufficiently small intervall between them. Of course, it is not sufficient to focus on just one point on the Nowpoint Line in any given point in time. The problem to be solved is to concentrate on the right sublines of the main Nowpoint Line and handle the relations between the points, that is, the nodes in the graph. I have called this graph the *Nowpoint Graph*.

It is an open problem to construct a proper Nowpoint Graph in order to construct truly artificial intelligence. Another open problem is to decide what can be represented by a Nowpoint Line. The author proposes the following statement, without being able to prove it:

Everything can be represented by a Nowpoint Line.

Everything is completely unlimited in this statement. In order to better understand it, take a fixed number of dimensions to describe the state of an atom. Then take dimensions for every existing atom. We get a Nowpoint Line that describes the universe.

Here is another example: take anything in the real world, for example a car. How can this car be represented by a Nowpoint Line? To understand this, consider all atoms of the car. Suppose

$$10^{50}$$

is the number of atoms the car consists of. Take a fixed number of dimensions to describe the state of an atom, for example

$$24$$

(the correct number may be different, this is only an example). Take one dimension for the time axis. Take a vector space with

$$10^{50} \times 24 + 1$$

dimensions. You can describe everything that happens to the car during its whole existance with one line in this vector space.

5   Representational Completeness by Nowpoint Lines

Representational completeness always is a subject in knowledge representation, for example in MultiNets as described in [2]. The challenge of artificial intelligence concerning representational completeness is: how to represent everything that is going on in the human mind properly. The answer is: represent it by a Nowpoint Line or something isomorphic to a Nowpoint Line. An open problem is how to turn a human mind's Nowpoint Line into a data structure, which can be processed by a computer. The Nowpoint Graph is one possible way. The details how to construct such a graph still need to be developed. There are many approaches similar to such a Nowpoint Graph, for example [1], but they do not seem to be the final solution to the challenge of producing artificial intelligence.

6   Conclusion

The Nowpoint Lines and Nowpoint Graphs offer an alternative to change currently used data structures in artificial intelligence to develop more sophisticated ones. We can get closer to producing artificial intelligence in this way. The concept of Nowpoint Lines offers a way to better understand what is going on in the human mind. This concept offers a possibility to formalise intelligence. The details of this formal theory and the proper data structures in a computer still need to be developed, however, this concept brings us a step nearer to overcoming this challenge.

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