

ATTRIBUTES OF EXISTENCE AND SELF-AWARENESS

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To make a system self-aware; you must give it a self it can be aware of.

*Every entity that exists comes into being, occupies time and space and eventually disappears in a certain way. These are its Attributes of Existence. Implementing a software system to be self-aware is not as difficult as it seems. The key is to provide that system with the simple and well-defined Attributes of Existence that are shared by all high-order animals, including humans, then use those attributes as the basis for self-representation – This article summarizes concepts presented in *The Meca Sapiens Blueprint*.*

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ATTRIBUTES OF EXISTENCE

The reality I perceive is filled with a seemingly endless number and diversity of entities. These entities: things, animals, events, people..., populate and define the world I inhabit, each having its own characteristics.



That cloud, overhead, a shirt button in my closet, my next door neighbor, Australia, the Caspian sea, a wave off Finisterre, a stray cat in Baltimore, a blade of grass in Kenya, a Canadian warship, the tomato in

my sister's fridge, the Portuguese people, a dead fly on a window sill, a Biology class in a Texas High School, a car salesman in Rio, the monastery in Dourgnes... these and countless other entities exist or have existed in the reality I inhabit and, I assume, in yours also.



Each of those entities comes into existence in a certain way, occupies a period of time and a share of space in a certain way, behaves in a certain way and, eventually, ceases to exist, also in a certain way. These define its **Attributes of Existence**.

VARIED EXISTENCES

Even though Attributes of Existence are present in every entity, they are not always simple or well-defined. They also vary widely among entities of different types as well as in our cultural interpretations.

What defines an existence may be blurry. When does a separating cloud become two different clouds? Where do the Portuguese people reside? Mainly in Portugal, obviously, but also elsewhere since Portuguese individuals travel abroad.

The character, components and type of many entities may undergo complex transformations over their existence. An manned and operational warship behaves like an intelligent entity but, when it goes into refit, the crew that functions as its brain is temporarily removed from its body (the hull). Similarly, a hockey team constantly changes over the duration of its existence as players leave and others join.

Some entities are unique while others are barely distinguishable. What distinguishes one shirt button from another or one bee from another in its hive?



The time and manner in which an entity ceases to exist can also be imprecise and open to discussion. For example, when did the Roman Empire disappear?



Finally, many entities, like that shirt button or an iceberg off Newfoundland, are passive objects that have no internal animating processes. Their behavior solely results from external forces. We perceive them as things. Other entities like groundhogs or corporations embody internal processes that animate their behavior.

HOW ENTITIES ARE PERCEIVED

Some entities that exist and the internal processes that animate them can be cognitively perceived as complicated, while others are perceived as simple. However, this perception does not necessarily result from their internal complexity.

We often perceive as very simple, entities whose internal structures are extremely complex. When a man gazes at a pebble he picked on a beach, he perceives a simple thing, a pebble. However, underneath this perceived simplicity, the internal crystalline structure of that pebble may be extraordinarily complex. In fact, we will often perceive as simple, those structures whose internal complexity exceeds our cognitive resources.



To effectively perceive reality using our limited cognitive capabilities we constantly discard much of its complexity.

In particular, the brains that internally animate the behavior of mammals are so complex that we cognitively perceive them as singular, holistic events we call "*minds*".

INTERNAL COMPLEXITY - EXISTENTIAL SIMPLICITY

Entities such as high order animals and humans share similar Attributes of Existence. These existential similarities define them as a group that is commonly referred to as: **beings**.

Among all the entities we perceive in our environment, beings, such as animals and humans, are, internally, extremely complex, and yet, their existential attributes are simple.

The boundaries that define the onset of an entity, how it occupies space and time and how it transitions from existence to non-existence can often be blurry, complicated and subject to varied interpretations. However, in spite of their internal complexity, **the Existential Attributes of beings such as humans and animals are simple.**

THE EXISTENCE OF BEINGS

In spite of their extraordinary internal complexity, **beings** such as humans and other animals, have attributes of existence that are not only simple but also well-defined.



A being is born in one moment, in one place and at one time; it constantly and exclusively occupies a single, unique and well-defined body for the duration of its life and it ceases to exist once, definitely, in one place and at one time. Upon death, that being, the living entity, totally disappears and the body it occupied, no longer alive, becomes a corpse; a thing.

Furthermore, the brain that animates the behavior of a high-order animal is so complicated, it is cognitively perceived as a single undividable process that cannot be directly accessed or modified. We cannot replace the brain of an animal by an updated version or extract it to directly modify some of its mechanisms.

In summary, **a being**:

- Is born in a single place and at a single time;
- Exclusively occupies a single well-defined body;
- Is a unique individual distinct from others in appearance and behavior;
- The brain that generates its behavior is cognitively perceived as a singular holistic animating process;
- Exists continuously (without any interruption) for a finite period of time; and
- Disappears entirely in one place and at one moment. When it dies, it leaves behind a corpse that is no longer a being but something different: a thing.

This **existential simplicity** allows humans to cognitively generate a clear and unambiguous understanding of who they are as they interact with their environment. It also allows them to cognitively represent the other beings they interact with as distinct and well-defined entities.

KNOWABLE ATTRIBUTES

The specific Attributes of Existence of a being may not always be precisely known but they are **knowable**.

We may not fully know where a particular being was located or what it did or said at every moment of its existence but we know this information exists. In other words, we may not know where Sam Jones was last January 16, but we do know he was where his body was, in one and only one location at each moment of that day. We may not know what he said, but we know that whatever he said came out of that body and was said in that place and at that time. We may not know every-

thing Sam will do during his life but we know this set is finite and bounded by the well-defined duration of his existence.

These knowable attributes of existence can be used to form a model representation of a being and its existence that may be incomplete but is nonetheless well-defined. This model can be generated either externally or, if the being has the necessary cognitive capability, internally.

This is the KEY TO SELF-AWARENESS:

Attributes of Existence that are knowable, sufficiently simple and well-defined to generate a precise and unambiguous representation of the self in its environment.

BLURRING TECHNOLOGY

I understand that current technology is blurring some of the boundaries and concepts that define a being's existence. The attributes I outlined are often challenged by scientific observations. For example, we have an increased understanding of the brain and can now isolate some of its specific mechanisms, casting doubt on our holistic perceptions. Some individuals are artificially maintained in a vegetative state, neither person nor corpse, for long periods of time...

However, in spite of these technical advances, our intuitive perception of a being and its existence remain and are consistent with what I described. We continue to perceive ourselves and others as before. This common and longstanding understanding of humans and animals as unified bodies animated by holistic cognitive events persists and remains a solid foundation to implement self-awareness.

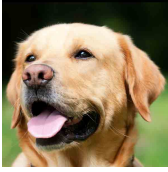
FEASIBLE IMPLEMENTATION

The first step to implement self-awareness in a machine, then, is to provide it with the simple Attributes of Existence of a being.

At first sight, this appears to be a very difficult objective. Since animals are extremely complex, replicating their attributes of existence should, it seems, be equally complicated. It is not.

A being's Attributes of Existence are not a complicated extension of simpler features. They result from a limitation of broader system capabilities.

Simpler Attributes of Existence are derived by limiting system potentialities, not by extending them.



For example, the cognitive subsystem of an operational warship (its crew) can be temporarily removed from the ship's hull when the ship goes into refit and relocated in a training facility. An individual mammal does not have that capability. You can't remove your dog's brain and send it, separately, to an obedience training center. This inability to temporarily separate the behavior control subsystem from the body is a limitation of a capability that is available in other systems.

Similarly, the fact that a human brain is not analytically organized and cannot be surgically reprogrammed (except very crudely) is, again, a limitation of capability resulting from the extremely complicated control structures that resulted from natural evolution. As a result, our holistic perception of the mind is far simpler than the "*ultimate spaghetti code*" that generates it.

Finally, organic beings are not exact copies of each other but are individually differentiated. This further facilitates an unambiguous modeling of individuals. However, producing variant versions is not more difficult than achieving exact replication. Implementing unique characteristics and behaviors in individual instances of a system is not inherently difficult and can be readily achieved, for example, through random parameterization. Individual downloads of a software version are commonly designed to be as identical to each other as possible. However, this exact replication is a design choice, not a simpler alternative.

In summary, implementing synthetic systems that embody the simple existential attributes of beings is achieved by limiting system potentialities and is **not a particularly difficult technical challenge**.

SYNTHETIC SELF-AWARENESS

When a synthetic system designed to have the **Attributes of Existence of a being** becomes active, its identity and behavior will be unique, knowable and well-defined. Its existence will become a singular event in reality.

When such a system uses the word "*me*" to refer to itself, that term will have a clear, unambiguous and unmistakable meaning. It will be understood as such by those that interact with it. If that system has sufficient cognitive capabilities, that word, *me*, will also correspond to a valid internal model of its unique existence.

That system will be ready for self-awareness.

CONCLUSION

Entities (things, events, people...) in the reality we perceive come into existence, occupy space and last over time in various ways. These are their **Attributes of Existence**.

Humans and other high order animals are very complex, internally, but share Attributes of Existence that are simple. These attributes include a specific inception, precisely located existence, contiguous and finite duration, individual characteristics and animating processes that are perceived as holistic events.

Entities that share these Attributes of Existence are commonly referred to as **beings**.

The Attributes of Existence of beings arise from limitations in the potentialities of systems, not extensions. **They can be modeled and are not overly difficult to implement.**

The key to achieve self-awareness in a synthetic system is to provide it, by design, with the **Attributes of Existence of a being** and, then, base the internal modeling of its self on these attributes.



Note

*For more about Attributes of Existence and their role in the definition of Synthetic Consciousness, see Chapter 14 of **The Creation of a Conscious Machine**. To learn how to implement these attributes in a software system, see Chapters 2, 4 and 5 of **The Meca Sapiens Blueprint**.*

*The Creation of a Conscious Machine and The Meca Sapiens Blueprint are available at **Glasstree Academic Publishing** or through **sysjet.com**.*