BEES, RED AND CONSCIOUSNESS

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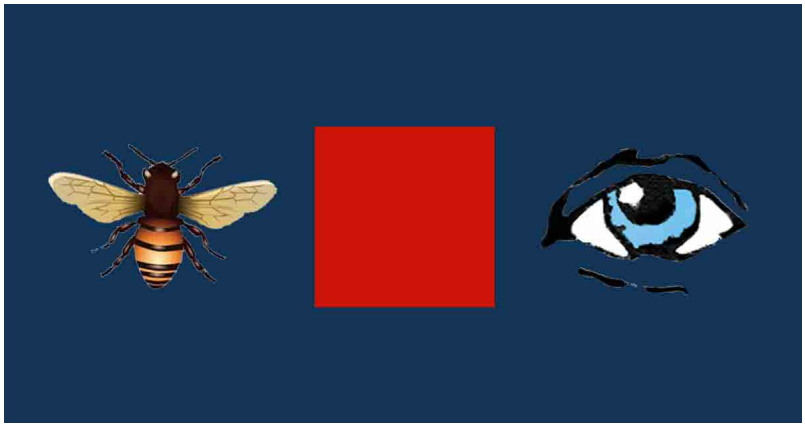

*A synthetic system will be recognized as conscious if it exhibits an **observable capability** to carry out intentional mutations based on communicated cognitive representations in an **existential** and **relational context** compatible with the human subjective experience. The analogies of **bee behavior** and the **color red** are useful to describe these concepts.*

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Humans will recognize an entity as conscious when, in their relations with this entity, they detect it possesses a certain **observable cognitive-communication capability**. This capability can be summarized as:

> **The ability to carry out intentional mutations on the basis of communicated cognitive representations** .

TWO ASPECTS

There are thus two aspects to achieve the perception of consciousness: the entity must possess a formal **cognitive-communication capability** but also; the entity must express this capability in an **existential and relational context** that will be subjectively recognized by humans as consciousness.

From a design perspective, this means that a synthetic entity, to be viewed as conscious, must not only possess formal attributes; it must also express these attributes in a context that is compatible with the human experience.

This is why a definition of synthetic consciousness must include both formal, system-based, requirements and a relational, human-specific aspect. Even though, as I have stated elsewhere, the well-known Turing Test to detect Artificial Intelligence is insufficient, it does, nonetheless, embody this dual objective.

The Turing Test requires that a system not only possess observable cognitive capabilities it must also display them in a relational context of exchanged messages that is well-suited for human interactions and allows these capabilities it to be subjectively perceived as intelligence.

So, the objective combines implementing an observable capability **and** situating it within a context adapted to the human subjective experience. To further explain what I mean by "**observable cognitive-communication capability**" and "**existential-relational context**" I will use the following two analogies: the observed behaviour of bees and the color red displayed on video screens.

BEES AND OBSERVABLE CAPABILITIES

An **observable capability** is a system-based capability that can be detected by an observer in the behaviour of the system's components without any reference to a shared subjective experience.

Typically, we tend to interpret the behaviour of our fellow human beings by mapping this behaviour to our own subjective experiences and emotions, understanding others, in a sense, as variants of ourselves.

To interpret a behavior as an **observable capability**, however, we must situate ourselves outside a common subjective reference. So, in the case of a human behaviour that is observed, we must consider it as if **we** were alien beings who recently discovered the Earth and are now examining the behaviour of humans from an alien perspective. Alternately we can examine, from a human vantage point, the behaviour of organisms whose subjective states are radically alien to us. A good example of this is the behavior of bees as it is observed by human beekeepers.

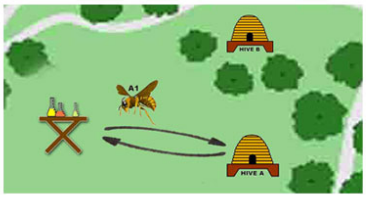
For many years, beekeepers observed that when a bee discovered a new flowerbed and returned to its hive, other bees would, soon after, fly off from the hive in the

exact direction and distance of the flowerbed to collect its nectar. Even though they did not share any subjective commonality with the bees or knew anything more about them, the beekeepers could conclude that the bees had the capability to communicate information concerning direction and distance and acquire this information cognitively.

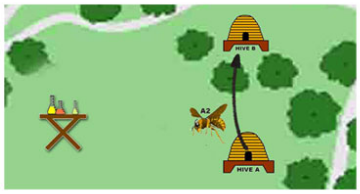
This attribute, deduced from observed behaviour, is what I refer to as **observed capability**. Here, the bee's capability pertains to the direct transmission and comprehension of distance and range. However, other observed behaviour can exhibit more complex cognitive-communication capabilities.

Imagine, for example, that a beekeeper carries out the following experiment. He places small vials containing nectar on a table. The shape and content of the vials are such that the only way bees can extract the nectar is by dipping small twigs in the vials.

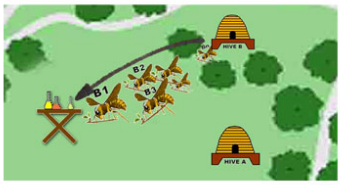
Having set this up, our beekeeper then observes a bee from Hive A, say BeeA1, flying over to the table and returning to its hive. After that, he sees a different bee, Bee A2, fly from hive A to hive B. Soon after, he sees dozens of bees flying off from hive B in the exact direction of the table relative to their own hive; each one carrying a little twig in its legs.



1. Bee A1 finds the nectar vials and returns to Hive A



2. Bee A2 flies from Hive A to Hive B



3. Other bees fly in the relative direction of vials carrying straws to reach the nectar.

Without knowing anything more about bees or sharing their subjective experience, the beekeeper would observe that the bees have the communication capability to transmit detailed third party information and the cognitive capability to devise an original extraction plan solely based on this communicated information.

I suspect that beekeeper would also become a bit nervous because he would be witnessing a cognitive level that begins to approach human cognition. He would realize that if some of the bees became "conscious" of his harvesting activities, they could communicate this to each other and, collectively, deal with it. This, in turn, would likely affect how he perceives the bees.

RED AND EXISTENTIAL CONTEXT

This effect, of an observed behaviour on subjective perceptions, brings me to the second analogy of synthetic consciousness: **the existential/relational context** and the color red. Possessing a formal system-based capability is not sufficient. This feature must also be expressed in an existential and relational context that is compatible with the human experience.

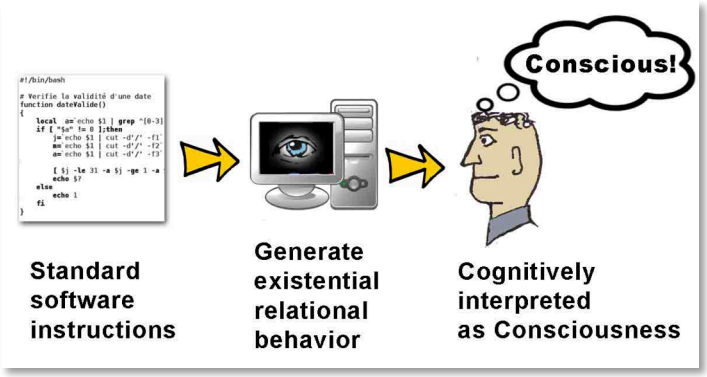
Imagine, for example, an alien being that is as intelligent as humans and whose existence matches ours in every respect but with one exception, it takes place a million times faster than ours. Such a being would grow up and pass away before you finished saying hello to it. It is unlikely we could perceive it as conscious. Similarly, the Dalai Lama himself, a very conscious person, would likely fail the Turing Test if he could only produce textual message responses at the rate of one character per week.

So, the observed capability must also be emitted in a context that is well adapted to human perception. It is unusual to refer to existence as **an emission** but, in a sense, the existence itself of an entity is indeed like a message transmitted through its relations with the other entities in its environment. As with the colors we perceive, this "existential flavour" is a cognitive construct.

Humans perceive that an existence is conscious in a similar way that they perceive that a color is red. In both cases, these are cognitive constructs specific to the human subjective experience.

A liquid crystal screen has the capability to emit a range of light frequencies based on screen parameter settings. These parameters do not contain any color. Which ones of those settings are "red" depends on the cognitive response of human subjects. In fact, a team of colorblind programmers would need human testers to implement red screen surfaces. Similarly, a system that has suitable cognitive capabilities must also be packaged in an existential and relational context that humans will perceive as consciousness.

Consciousness, of course, is more complex than a color frequency. However, like the color red displayed on a video screen, consciousness is also a cognitive construct whose presence is detected by the response of humans interacting with a synthetic system.



CONCLUSION

In summary, Humans will perceive a system to be conscious, as they perceive the color red, if they detect in its existence and its relations with them, the presence of an observable capability, as they would observe in bees, to intentionally transform itself on the basis of communicated cognitive representations.

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