**NYUx - Theories of Media and Technology**
**Philip Hughson - philipfhughson@gmail.com**
**November 2020**

**Curation 1 - Reflexive Cybernetic Objects**

I read the Chicago School of Media Theory's article on Cybernetics, and was particularly interested by a paragraph which describes the introduction of the concept of reflexivity into the theory of cybernetics in the 1960s. It is worth quoting in full:

> *Starting in 1960, however, this theory was modified to the more powerful, pervasive, and subversive concept of reflexivity, which was defined as "the movement whereby that which has been used to generate a system is made, through a changed perspective, to become part of the system it generates."6 Systems re-entangle with themselves, and become referential to themselves. More than just feedback, wherein systems reprocess their own output, reflexivity implies a stronger sense of self-referentiality and self-awareness. For mathematicians this meant that statements of number theory could also become statements about number theory; a reflexive system can model itself. The danger and power of reflexivity lies in the fact that it blurs the traditionally accepted borders imposed on the world between subject and object, object and environment.*

This concept struck me as interesting, because self-referentiality or reflexivity is something that humans are very good at. In particular, we excel at imitative learning, where we observe, and possibly are taught by, someones else on how to do something. This means that our cultures can evolve far faster than more converntional normal modes of Darwinian evolution.

My attention was also taken by the notion of blurring boundaries between subject and object, and object and environment. I find life easier to understand when I view minds as containers for ideas, and ideas as things which float around in the world, infecting minds and spreading to others (by conversations in cafés and otherwise).

The following paragraph of the article relates the notion of "virtuality", which sees a world of information flows, and as much as I find this congruent with the notion of ideas floating around in the world, I struggle with the notion of disembodiment which goes with it. Perhaps this is a natural prejudice: since I inhabit a body, I have a natural interest in not being disembodied. I therefore prefer to focus on systems which are centered on human beings and the development of their capacities (rather than say developing systems which remove the need for human judgement altogether: so the tension between developing a sense of direction and using a satnav, for example, or artifitial intelligence as a means of enhancing human perception rather than replacing it).

Cybernetics invites as to considers objects (including people) as existing as part of systems which communicate and regulate each other via feedback. Based on this, we might identify objects, systems and art which assist with reflexive cybernetic processes, and try to pick out the abstract qualities which they express, with a view perhaps to creating a reflexive cybernetic artefect of my own.

Artefect 1: The Flyball Govenor

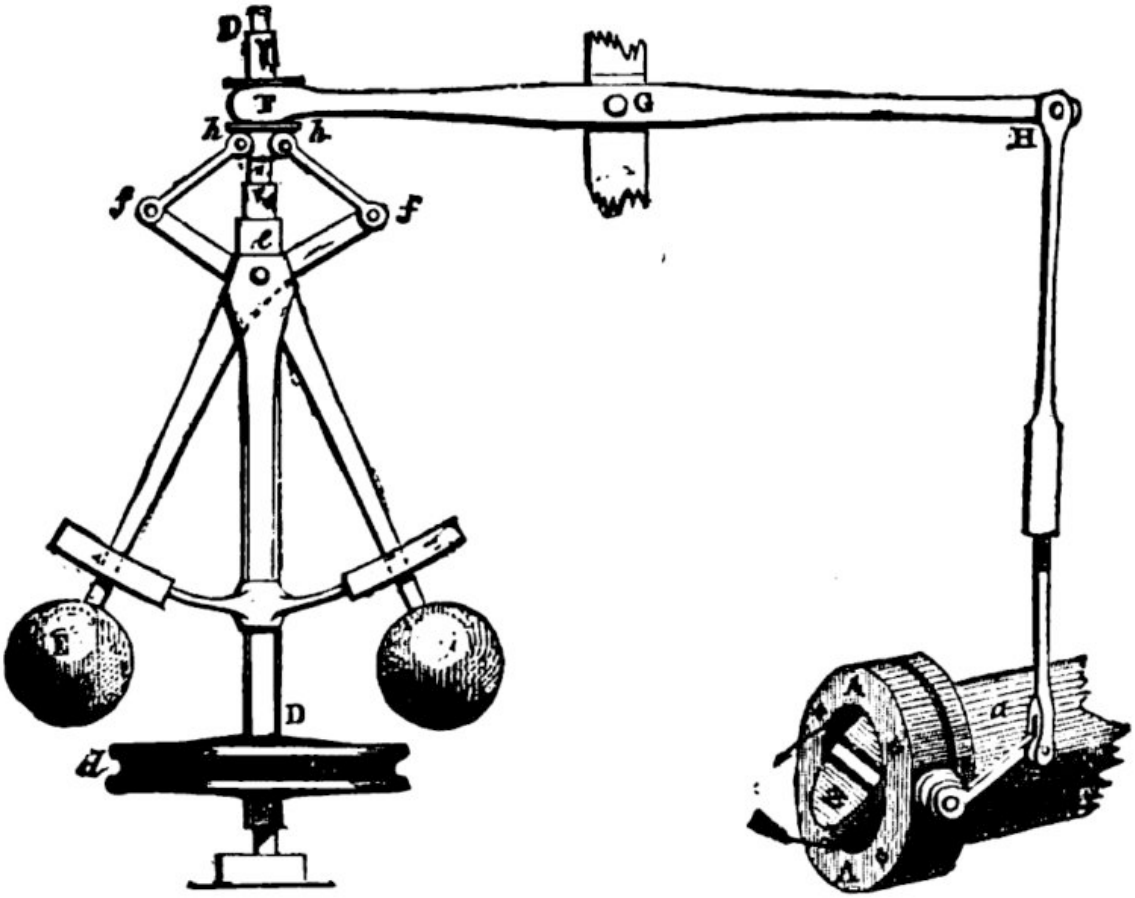



FIG. 4.—*Governor and Throttle-Valve.*

James Watt's flyball govenor is perhaps the qunitessential example of an early cybernetic system. It solves a key problem of the steam age: how to use negative feedback to previde a steam stream of power from a steam engine, where the input power to the system is inherently variable. It solves the problem by monitoring its own output, and apply negative feedback to its input based upon this. As the engine produces more power, so the heavy flyballs spin and rise up against gravity, which in turn closes the throttle value, thereby reducing to supply of power, which in turn reduces the rotation of the balls, meaning they lower under gravity, which in turns opens the value, thereby increasing the power..... this produces a negative feedback loop which sets the power to a steady level, making it easy to control .

This system is distinguished by being analogue, and by the use of natural forces such as gravity to facilitate regulation. It can self regulate, but it could scarely be accused of being self-aware.

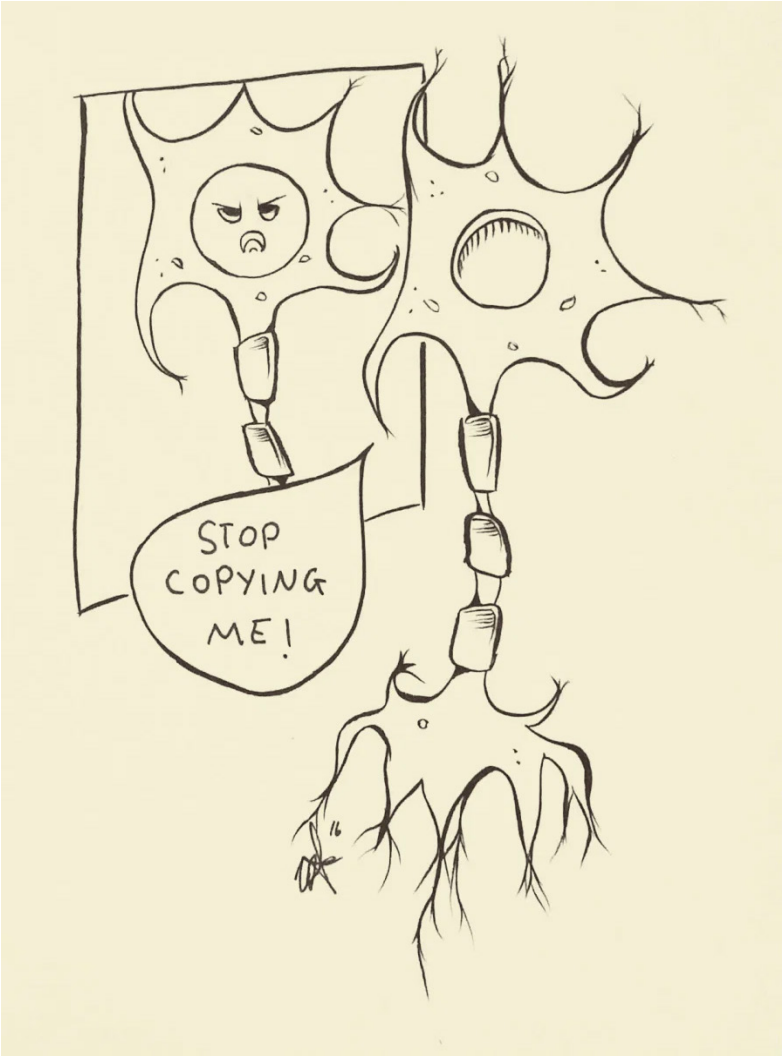
Artefect 2: the mirror

The mirror is the most basic instrument of self-awareness. and reflexivity. A reflection in a pool of still water is the most simple of natural mirrors, as made famous in the myth of Narcissus. The romans had mirrors of polished metal and latterly glass backed with metal, as illustrated in the first century fresco above.  In the modern age, mirrors are commonplace, though the ubiquity of the selfie-camera may diminish their importance in some contexts.

The mirrors is typically anologue - though digital ones are now easy to make too, perhaps with filters added -  and real time: we see the reflection as it is right now. Despite their optical improvement over the years, mirrors still present a “mirror image” of the viewer - unless we use a so-called “real mirror”, where two (or more) mirrors at 90 degrees provide a non inverted image.

It’s interesting to compare the mirror to the portrait: paintings persist. The reflection and the lady in the fresco above have long gone, but the painting is still with us. (Oscar Wilde’s Portrait of Dorian Gray is an exception, where the portait ages in place of its subject)

Artefect 3: The Mirror Neuron




From Wikipedia:

*A mirror neuron is a neuron that fires both when an animal acts and when the animal observes the same action performed by another.Thus, the neuron "mirrors" the behavior of the other, as though the observer were itself acting. Such neurons have been directly observed in human[citation needed] and primate species,[4] and birds.*

*In humans, brain activity consistent with that of mirror neurons has been found in the premotor cortex, the supplementary motor area, the primary somatosensory cortex, and the inferior parietal cortex. The function of the mirror system in humans is a subject of much speculation. Birds have been shown to have imitative resonance behaviors and neurological evidence suggests the presence of some form of mirroring system.*

If a theme of reflexivity is the breakdown of the boundary between subject and object, the mirror neuron is perhaps the most obvious physiological expression of it: a neuron which fires in the same way when the subject performs and action as when the subject observes somebody else performing it. Credited by some with being the basis of capacities such as empathy, this neurons also suggest that idea that reflexivity can be learned from outwith: we can learn to perceive ourselves by persceiving others.

Artefect 4: Pablo Veron's shoulder

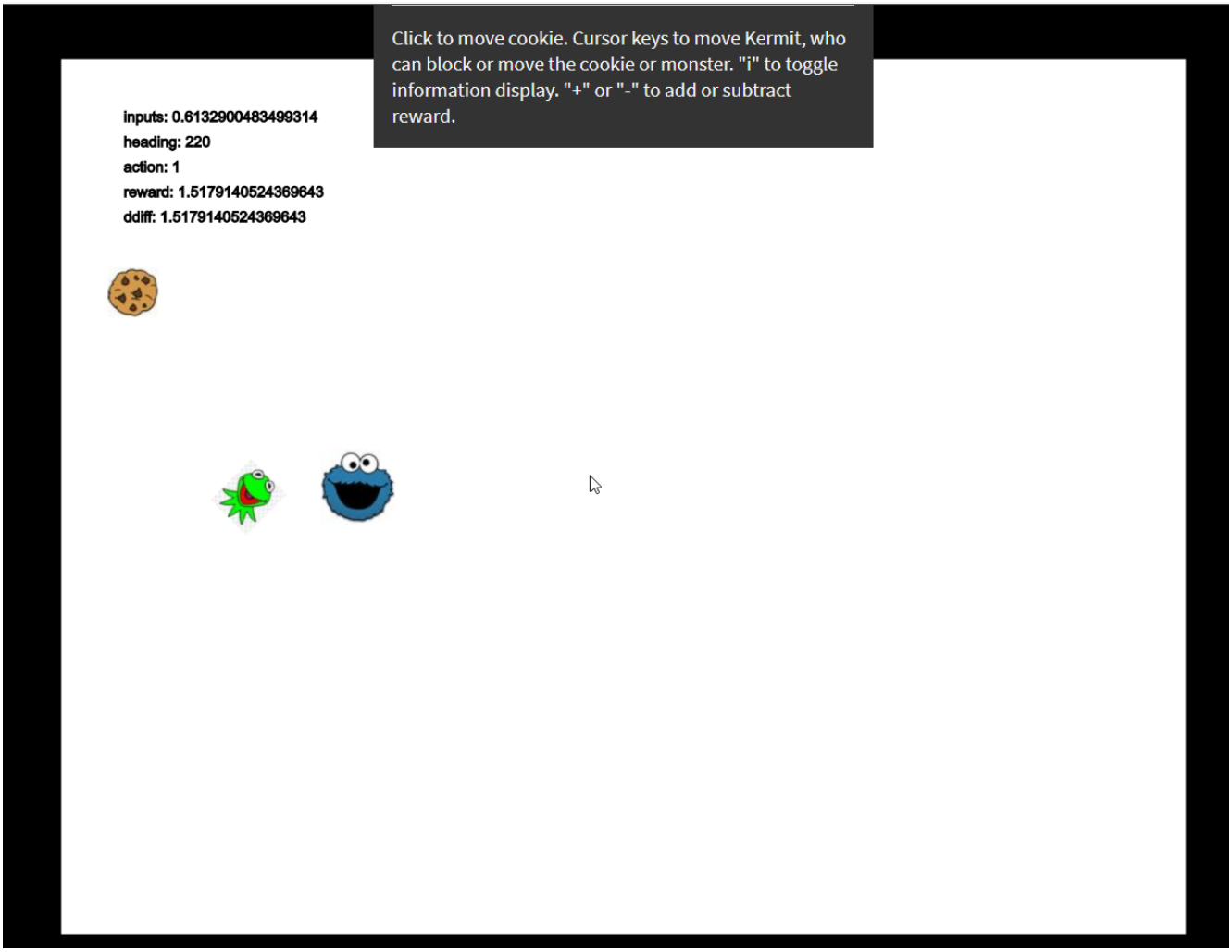
Pablo Veron is a tango dancer, and starred in Sally Potters film "the tango lesson", from which the still above is taken.

Tango is a dance of couples, and it involves a close and physical embrace, with two roles: leader (traditioanlly male) and follower (traditioanlly female). Much of the interest of the dance is in the dynamic between these two, which is far from a dictatorship of one-way communication - at least when the dance is danced well! A leader will invite the follower to a motion, say by opening his shoulder, using a language which is not an arbitrary code, but more so a distillation of a language of movement and imitation: the leader can be seen as creating in his own body the negative of the movement-shape the follower is invited to express.

The shoulder is of interest because I once observed Pablo Veron dancing, and way struck by the detail with which he adjusted his own body, as well has having a clear perception of his partner's. His eye watched his shoulder is it moved, whereupon the shoulder readjusted, whereuopn the partner adjusted, whereupon the shoulder adjusted.... Movements like this become far from discrete motions, as steps often are, but rather continuous arcs of adjustment, improvisation and possibility. The leader can follow the impulses of the follower, which are responses to the leader, which are responses to the music..... a complex cybernetic system, of which the shoulder is one part.

A key theme here is the interplay of the senses: vision, touch, hearing (music), but also proprioception (the capacity of the body to monitor its own position, perhaps in response to its own movements. Proprioception can perhaps extend to perception of the body of the other, the partner, again questioning the subject-object relation.

Artefect 5: Cookie reinforcement




Cookie reinforcement is a Processing sketch I produced during the creative coding course. It's available at https://www.openprocessing.org/sketch/946371.

I used a javascript reinforcement learning library to have the cookie monster learn to find cookies, with the learning reinforced by the consuption of cookies (positive feedback of a kind). The intent was to have Kernit the frog, a user controlled character, "Nudge" the monster in case he gets stuck. I came across a problem though: if kermit nudges the monster towards a cookie, the monster doesn't know he's moving, because he isn't making the motion himself, and lacks a sense of proprioception, which might tell him he's moving (without moving himself, so to speak).

This observiation made me reflect on the importance of proprioception in learning and self regulation, and also on the relation of external input to proprioception: perhaps we need external input to learn to perceive our own possibilities for action. Otherwise put, intelligent behaviour, for humans at least, may to some extent be necessarily embodied.

Artefect 6: the tape recorder


This is included as a contrast to the mirror, and as an example of 20th century sound recording equipment. The tape recording made recording one's own sound possible on a mass basis, cheaply, with reusable media. In cybernetic context, it allowed my early musican self to record myself and hear the result later.... An edifying and horrifying experience!

**REFERENCES**

https://lucian.uchicago.edu/blogs/mediatheory/keywords/cybernetics/
Fulton, W. (2007). "Cybernetics", The Chicago School of Media Theory.

https://makezine.com/projects/remaking-history-james-watt-and-the-flyball-governor/#:~:text=The%20fly-ball%20governor%20is%20based,the%20steam%20engine%20to%20close.
James Watt

Mirror  fresco taken from https://en.wikipedia.org/wiki/Mirror#Prehistory

https://en.wikipedia.org/wiki/Mirror_neuron