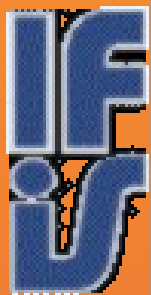


Extended Computational Systems and Extended Minds

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Extended Mind

Clark & Chalmers:

- (...) the human organism is linked with an external entity in a two-way interaction, creating a coupled system that can be seen as a cognitive system in its own right.
- All the components in the system play an active causal role, and they jointly govern behavior in the same sort of way that cognition usually does.
- If we remove the external component the system's behavioral competence will drop, just as it would if we removed part of its brain

Extended Mind

How far should we go?

- Is Wikipedia part of my mind?
- Is Wikipedia and my mind part of your mind?
- Are there any *invidual minds*?

Extended Mind

Clark & Chalmers criteria for inclusion of parts of coupled cognitive systems:

- (1) constancy – constant access to the coupled part
- (2) direct availability of the coupled part
- (3) retrieving information leads to endorsing it
- (4)* retrieving means conscious endorsing

Extended Mind

Clark & Chalmers criteria for inclusion of parts of coupled cognitive systems:

(1) constancy – constant access to the coupled part

- I have quite constant access to Wikipedia.

(2) direct availability of the coupled part

- My PC is almost always on. And the palmtop...

(3) retrieving information leads to endorsing it

- Well, sometimes not but I revise my beliefs as well

(4)* retrieving means conscious endorsing

Extended Mind = Universal Mind?

All those who have quite constant access to Wikipedia, and have their PCs and Macs on, and believe or usually believe that what they read is true...

Extended Mind = Universal Mind?

All those who have quite constant access to Wikipedia, and have their PCs and Macs on, and believe or usually believe that what they read is true...

Have the same mind.

Extended Mind = Universal Mind?

All those who have quite constant access to Wikipedia, and have their PCs and Macs on, and believe or usually believe that what they read is true...

Have the same mind.

It's not yet universal but what about a common culture?

- It's shared *constantly*
- It's *easily* available
- We usually endorse it
- And we do that consciously

Extended Computational Systems

- **Extended Mind-like theories are computational.**
- Are there any lessons we could learn from computational systems then?

Individuating computational systems

- The task of individuating a computational system is not easy, viz. Searle's notorious wall
- Coupled computational systems can be distributed spatially

Individuating computational systems

- Coupled systems are **systems**
- Extended minds can be treated as a subset of (natural) computational systems.



Criteria for individuation

- Searle: description is all we need
- Chalmers & Clark: causal interaction in the information processing
- We need more robust criteria

Individuation Criteria

- Simplicity, predictive and explanatory value of the computational description
- Description consistency and causal determination of the description
- Relative system **isolation** and **cohesion**
- Output states connected causally with input states (if any)
- Code specification

Relative isolation and cohesion

- Minds cannot be simply integrated into the environment.
- Isolation is not portability
- Only relatively isolated systems are systems
- Only cohesive systems are systems
- Me, Chalmers, and Wikipedia are not a cohesive system

Cohesion & isolation

An item A is a part of a system iff

- it interacts with the rest of the system relatively more frequently than with the rest of the environment and
- decoupling the item A makes a difference to the system's performance

Sufficiently frequent causal interactions of the process define the complex system and its subsystem boundaries (Herbert Simon's idea).

- Your glasses are more likely to be the part of the cognitive system that you are than Wikipedia

Isolation

A system is isolated from the environment iff:

- Its boundaries are describable on lower levels than the computational (or cognitive) level.
- A blurry but nevertheless distinct boundary between the system and the rest of the world is defined by part-whole relations (based on relative frequency criteria.)
- Autonomous systems are a border case: the only interaction with environment is through input-output states of the system.

Extended computational systems

- Computational systems can easily extend into the environment.
- A printer can become a part of a computational system, e.g, in a print server (when two-directional communication is taking place), but when it's used only occasionally it is only a **tool** or **peripheral part** of the system.

Extended computational minds

- According to the criteria proposed the Universal Mind is only a theorist artifact:
- Simplicity, predictive and explanatory value
 - We could grant it
- Description consistency and causal determination of the description
 - Not really: too many interactions need to be omitted
- Relative system isolation and cohesion
 - Never true
- Output states connected causally with input states
 - Not necessarily
- Code specification

Extended computational minds

- My proposal is a simple improvement on extended mind model:
 - First you have to individuate the system on the computational level
 - And only then you can try to apply four criteria that Clark & Chalmers specify (they also could be improved upon)
- The view is more intuitive (sorry!)
- The view is however quite trivial (oh, well...)