

Artificial Intelligence, Blockchain, e Criptovalute nello Sviluppo Software

Lezione 6: Distributed Cognition, Extended Mind, and Systemic Thinking

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Structure of the lecture

- Extended Mind
- Distributed Cognition
- Systemic Thinking



Boundaries of the Mind

- Where is our mind?
 - Are the hands part of our mind?



Reference: Robert MacDougall, "The Significance of the Human Hand in the Evolution of Mind," *The American Journal of Psychology*, 16(2):232 – 242, Apr., 1905

Picture taken from

<https://www.yourtherapysource.com/blog/2019/02/07/3-evidence-based-benefits-of-writing-by-hand/>.



Extended Mind (1/2)

- Let us consider a simple problem: we are given shapes and we have to see if they fit holes:



Source of the content: Andy Clark and David Chalmers, “The extended mind,” *Analysis* 58 (1): 7–19 , 1998

Picture taken from <https://gurugamer.com/mobile-games/shapes-and-holes-a-new-mobile-puzzler-where-you-fit-things-into-other-things-1214>.



Extended Mind (2/2)

- Let us consider three cases:
 - this is a computer game (as in the picture) and the person has to rotate the pieces by mind and determines the fitting;
 - this is a paper game and the person has pieces that s/he rotates manually to determine the fit;
 - let us assume that the person has an implanted device, say, special smart glasses, that perform the rotation and then s/he just does the fitting
- What is the level of cognition present in these cases?
 - Clark and Chalmers claim that it is the same.
- Therefore, what is the boundary of our mind?

Source of the content: Andy Clark and David Chalmers, "The extended mind," Analysis 58 (1): 7–19 , 1998



Tools and Mind

- There are many tools even before computer that helped our cognitive tasks
 - abacus
 - paper and pen
 - sliding rule
 - ...
- Once we start using it, they become intrinsic part of our reasoning and computational process
- Think at how we do computations in column
 - papers and pen are essential components of our reasoning process
 - even when we do the computation in our mind we often simulate the presence of paper and pen
- Once more, **what are the boundaries of our mind?**

Source of the content: Andy Clark and David Chalmers, "The extended mind," *Analysis* 58 (1): 7–19 , 1998



Impact

- We care about this for at least three reasons:
 - we understand that the request of tools may be not a caprice of a spoiled kid but an actual desire to organize the (extended) mind in the most effective way
 - when developing tools we need to think at how such tools can most effectively “extend” the mind of the users, and not simply being tools
 - when creating a (development) environment for us and for our people we must determine the best configuration
- Once more, **what are the boundaries of our mind?**

Source of the content: Andy Clark and David Chalmers, “The extended mind,” *Analysis* 58 (1): 7–19 , 1998



Active Externalism

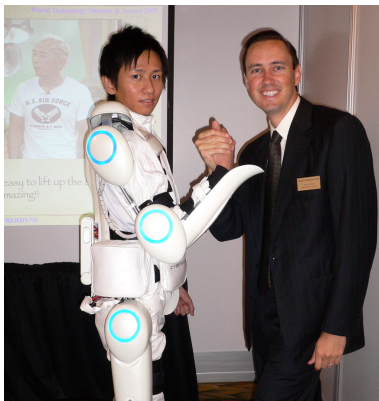
- The claim of Clark and Chalmers is that the tool and the person couple together forming a unique mix
- The external tools are not just instruments for actions that are determined in an hypothesized internal mind
- Rather, they are a key active external component of our mind, hence we talk of:
 - **Active Externalism**
- Think at exoskeleton, for instance

Source of the content: Andy Clark and David Chalmers, "The extended mind," Analysis 58 (1): 7-19 , 1998



Example: Exoskeleton

- A Hybrid Assistive Limb:



Picture taken from https://en.wikipedia.org/wiki/Powered_exoskeleton.



Questions?

End of lecture six.