

Embodied Interaction

Philosophy

- Immanuel Kant advocated a view of the mind-body duality The empirical (Body) VS the Transcendental (Mind)
- **Phenomenology:** Edmund Husserl + Martin Heidegger + Maurice Merleau-Ponty → the modern 'embodiment' thesis.

*"Species-typical activity patterns must be thought of as **emergent phenomena** in three different senses of the word. They have emerged...through natural selection,by a process of maturation and/or learning, ...and from interactions between the creature's low-level activities and its species-typical environment."* Horst Hendriks-Jansen

➡ Move towards re-localizing the mental processes out of the neural domain.

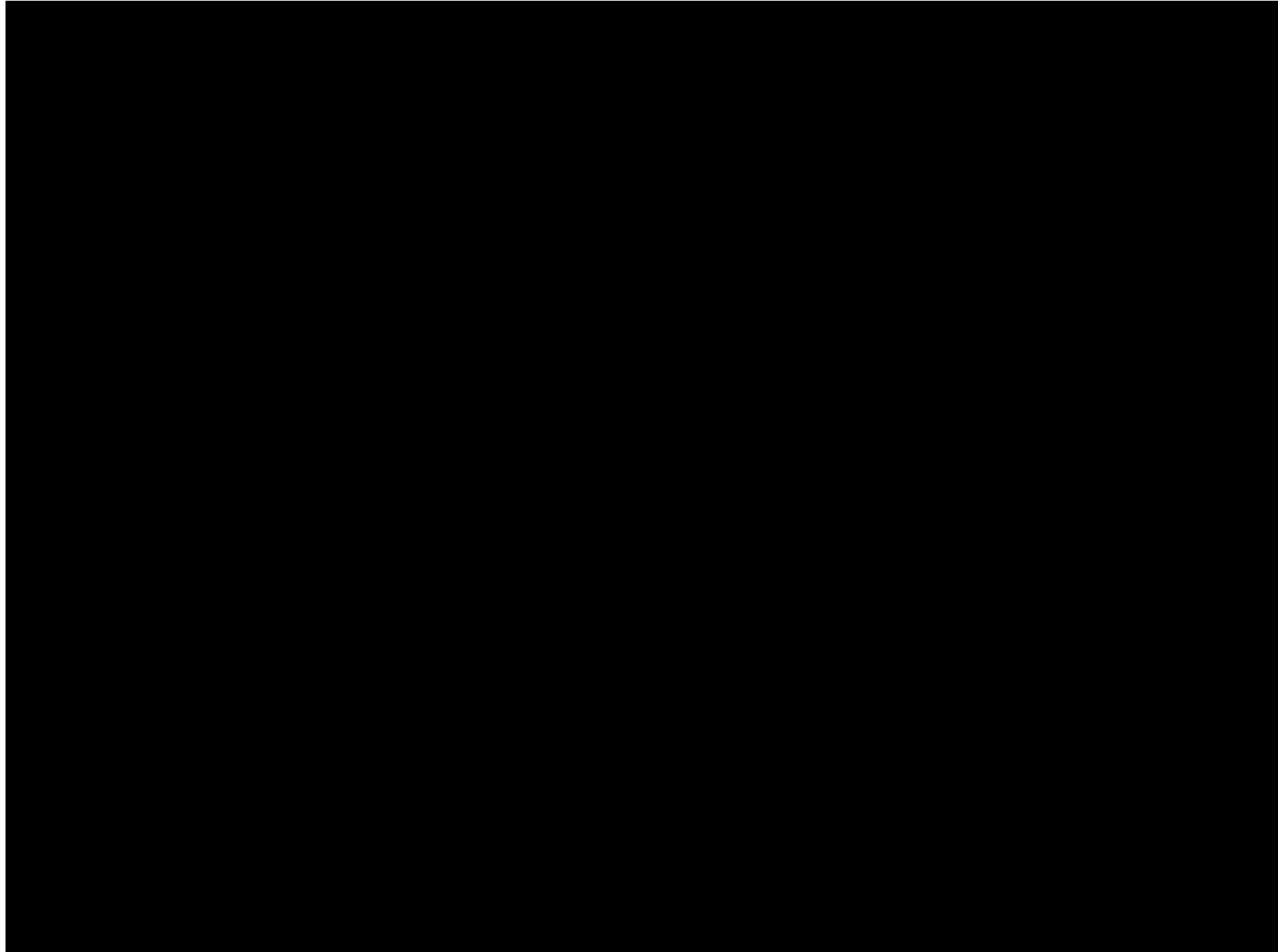
Phenomenology

Phenomenology is the study of structures of **consciousness** as **experienced** from the **first-person** point of view.

The central structure of an experience is its **intentionality**, being directed toward something, some **object**.

An **experience** is directed toward an object by virtue of its content or **meaning** (which represents the object).

Phenomenology



Husserl + Heidegger

Husserl had rejected the primacy of abstract, decontextualised entities of science and mathematics but, he had retained a mentalistic model that placed the focus of experience in the head.

Where Husserl had conceived of a progression from perception to meaning to action, Heidegger stressed how we ordinarily act in a world that is already organised in terms of meaning and purpose.

—> “**ready-to-hand**” and “**present-at-hand**”

Objects when becoming **present-at-hand** takes on an existence as an entity.

Merleau-Ponty

Intentionality underlies analysis of perception.
Perception is always directed towards something.

“To move one's body is to aim at things through it” (Merleau-Ponty)

The **instrumentality** of the moving body in **acts of perception**, particularly perception of the external world:

“Our bodily experience of movement is not a particular case of knowledge; it provides us with a way of access to the world and the object, which has to be recognized as original and perhaps as primary.” (Merleau-Ponty)

Thinking in Movement

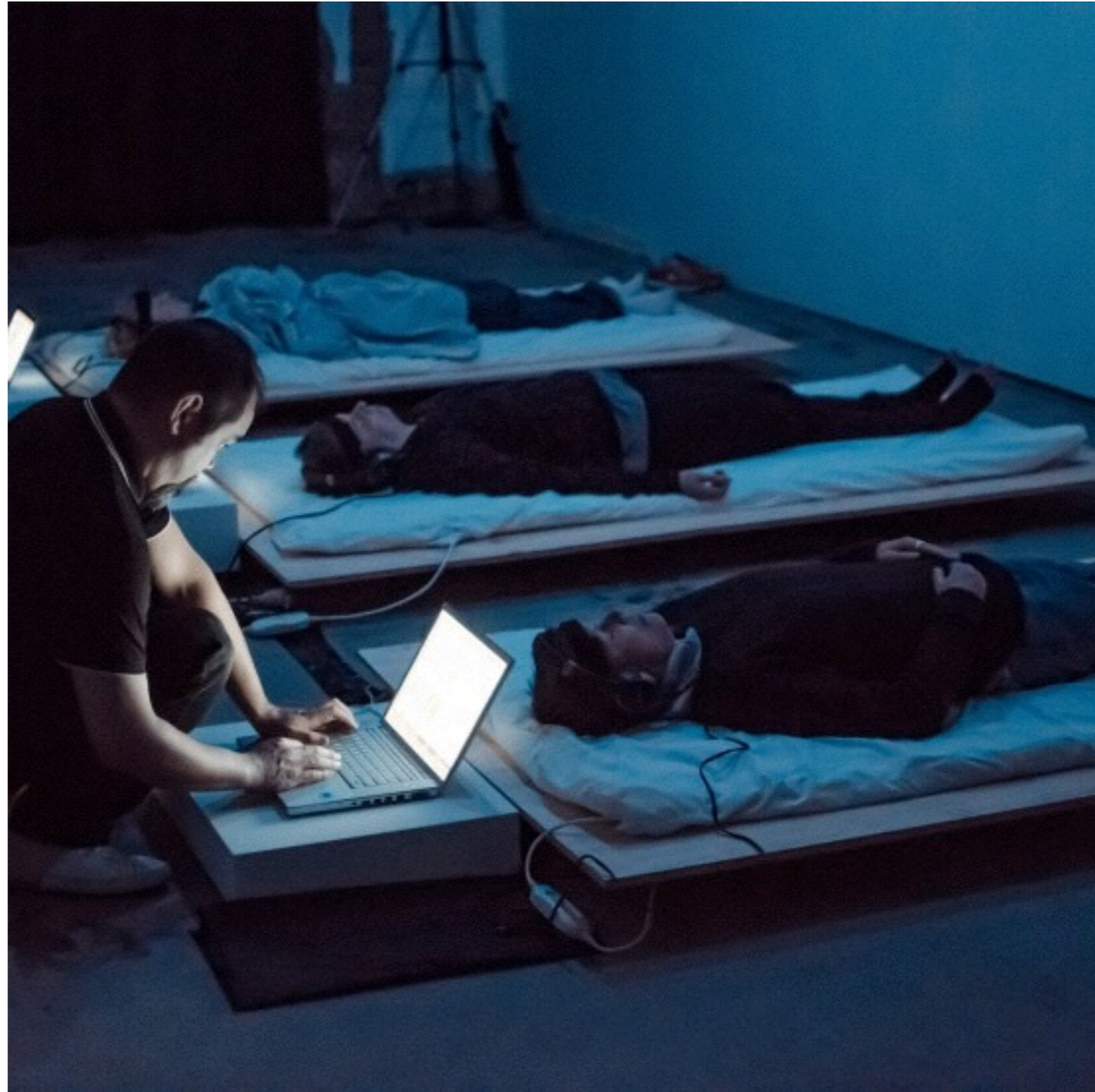
Sheets-Johnstone's phenomenological accounts of the moving body emphasise and explicate the **kinaesthetic sense** as vital to our perception of self-movement.

Where Husserl considered movement only with respect to external perception, Sheets-Johnstone extends the analysis to include the actual **perceptual experience of self-movement** in the phenomenon of kinaesthesia.

Mind = Body

To separate myself into a mind and a body would be to perform a radical surgery upon myself such that a vibrant **kinetic** reality is reduced to faint and impotent pulp, or excised altogether.
(Sheets-Johnstone)

Embodied
Situating
Distributed
Enactment



Embodied Cognition

Many features of human cognition are shaped by aspects of the body **beyond** the brain.

- Cognition: high level mental constructs and concepts, human performance on cognitive tasks (reasoning or judgment).
- Body: the motor system, the perceptual system, the body's interactions with the environment (situatedness) and the *ontological* assumptions about the world that are built into the body **AND** the brain.

Embodiment

- Embodiment challenges theories, such as cognitivism, computationalism, and Cartesian dualism. It is closely related to the extended mind thesis, situated cognition and enactivism.
- In philosophy, embodied cognition holds that **cognition is strongly influenced by aspects of the body beyond the brain itself.**

Enaction

- Varela's **Enactive approach** to cognition encompasses the biological, psychological and cultural **context**

"By using the term embodied we mean to highlight two points: first that cognition depends upon the kinds of experience that come from having a body with various sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological and cultural context."

Eleanor Rosch, Evan Thompson, Francisco J. Varela: The Embodied Mind: Cognitive Science and Human Experience pages 172–173

<https://www.youtube.com/watch?v=Xhk9MkTkSPA>

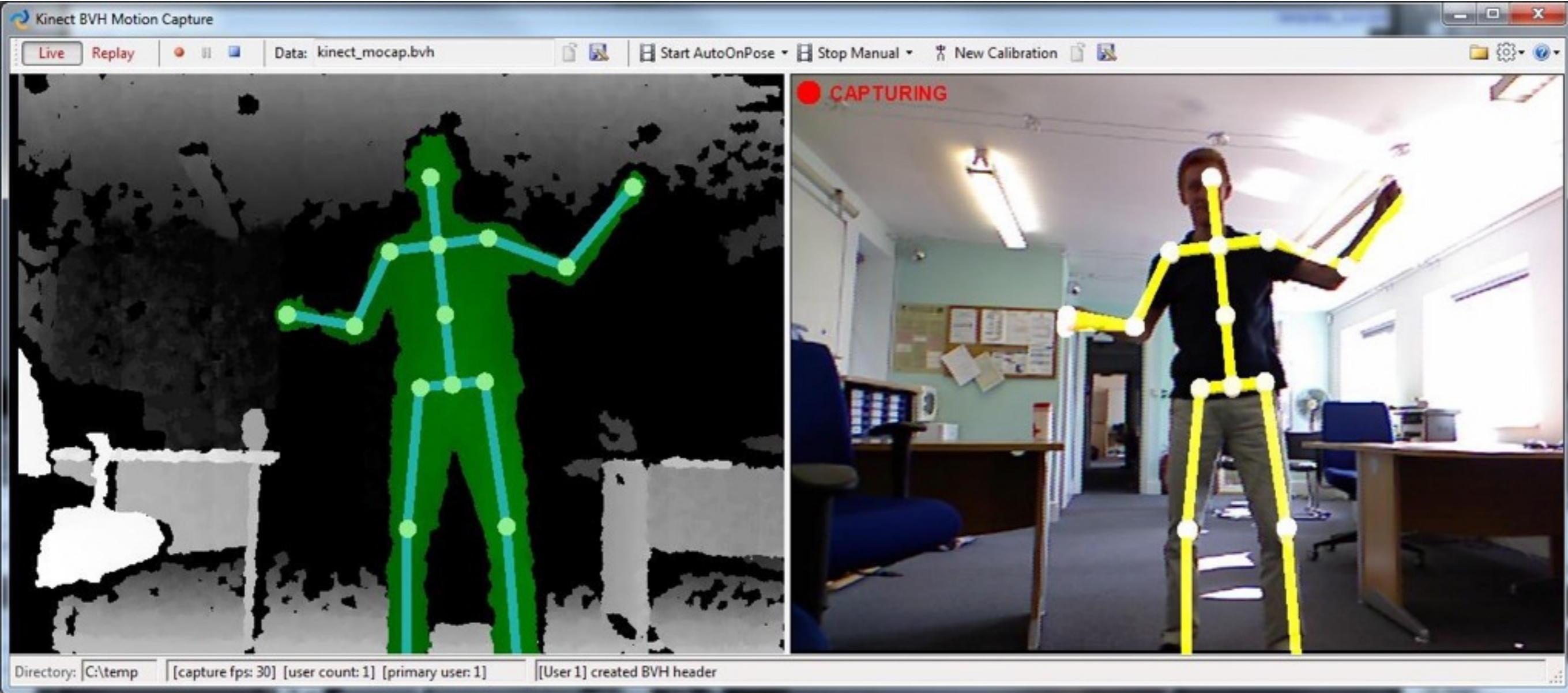
Situatedness

- The ***Extended mind thesis***, in contrast with the Embodiment thesis, limits cognitive processing neither to the brain nor even to the body, but extends it outward into the agent's world.
- ***Situated cognition*** emphasizes that this extension is not just a matter of including resources outside the head, but stresses the role of probing and modifying interaction with the agent's world.

Six Views of Embodied Cognition

by Margaret Wilson

- Cognition is situated: context of a real-world environment, and inherently involves perception and action.
- Cognition is time-pressured. Under the pressure of real-time interaction with the environment.
- We off-load cognitive work onto the environment to reduce the cognitive workload.
- The environment is part of the cognitive system.
- Cognition is for action. The mind is to guide action; contributes to situation-appropriate behavior.
- Off-line cognition is body-based. Even when decoupled from the environment, the activity of the mind is grounded in mechanisms/skills that evolved for interaction with the environment



In HCI

Situated Action

The flaws in the view of human action as one based on a planning model.

Difficulties in attempting to predetermine the intention of a person's action from their observable behaviour and to then specify this to be implemented as a computer program.

Alternative view of understanding human action as **situated**.
Situated action refers to “**actions taken in the context of particular, concrete circumstances.**” (Suchman).

Distributed Cognition

Fundamental unit of analysis “**a collection of individuals and artefacts and their relations to each other in a particular work practice**”

Emphasizes the ways that cognition is off-loaded into the environment through social and technological means.

Three key components:

- Embodiment of information that is embedded in representations of interaction
 - Coordination of enaction among embodied agents
 - Ecological contributions to a cognitive ecosystem
- (Zhang & Norman)

Visual Perception Affordance

Gibson, visual perception could not be seen purely in terms of information but had to be seen in the context of **acting in an environment**.

Perception is located in the relationship between the person and its environment.

Affordance: property of the environment that affords action to appropriately-equipped individuals.

Dourish

When I talk of “embodied interaction”, I mean that interaction is an embodied phenomenon. It happens in the world, and that world (a physical world and a social world) lends form, substance and meaning to the interaction.

Embodied Interaction

“Interaction Design for and with the Lived Body” (Dourish, 2001)

Cognition is where the (shared) action is....

Paul Dourish, “Where the action is: The foundation of Embodied Interaction”, 2001, MIT Press.

All Interactions are Embodied ?

Desktop computing with mouse and keyboard is also “embodied,”

The questions/topics for HCI: how it is embodied?
What is the relevance of its embodiment?

Embodied Interaction: the focus on the relevance of an embodied account of interaction in contrast with traditional user interface design and analysis.

Dourish's model

- Interaction is physically and socially embodied;
- Ontology arises out of activity;
- Meaning subsists in embodied action.

—> Relationship between action and meaning

Dourish's model of embodied interaction:

- **Intentionality** is the essence of how entities bear meaning.
- **Coupling** refers to the degree of coordination of two elements, and to how that coordination is maintained.

the meanings assigned to the objects in the interface depend on the coupling of actions. Coupling and intentionality are directly related.

Kirsh's principles

- Interacting with tools changes the way we think and perceive
- Tools, when manipulated, are absorbed into the body schema, and this absorption leads to fundamental changes in the way we perceive and conceive of our environments;
- We think with our bodies;
- We know more by doing than by seeing (Although mirror neurones)
- There are times when we think with things.

Embodied Cognition and the Magical Future of Interaction Design



Embodied Interaction

Is a focus on physical actions and bodily skill.

Phenomenology as a Methodology

“For the phenomenologist, **any quest for knowledge about a phenomenon begins with the direct intuition of the phenomenon**, apart from any prejudice, expectation, or reflection; hence, this direct intuition is pre-reflective.

The phenomenologist's attitude toward the phenomenon is **neither objective nor subjective**, but rather an attitude of being present to the phenomenon, fully and wholly, to intuit it as it appears, without preshaping it in any way by prior intentions or beliefs.

He is thus led to describe the lived experience of the phenomenon, the essential relationship between consciousness and its world.”
(Sheets-Johnstone, 1999a, p.12)