



# Cognitivist and Emergent Cognition; An Alternative Perspective

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# Motivation

## Cognitive Robotics

- ▶ Aims to approach human-level cognitive abilities
- ▶ “Real-world” examples of cognitive systems
- ▶ Classification by properties enables:
  - ▶ Comparison of different systems
  - ▶ Better understanding of specific systems
  - ▶ Point out research opportunities

# What's the Matter?

## Current Classification

- ▶ Cognitivist vs Emergent (Vernon et al., 2007)
- ▶ Does it well-characterise different systems?
- ▶ Distinction effectively based on implementation

## Example

Mental representations: abstract symbolic vs global state

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## Example

Mental representations: abstract symbolic vs global state

# The Embodiment Divide

A key property?

- ▶ Necessary for emergent systems
- ▶ Not so for cognitivist systems?
- ▶ Really a question of representation

# Mental Representations

## Representational Content

- ▶ Are its representations systematic?
- ▶ Systematic vs unstructured content

## Representational Semantics

- ▶ Does its representations have intrinsic meaning?
- ▶ External vs independent semantics

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# Resulting Classification

Content	Semantics	
	External	Independent
Unstructured	Dynamical	Connectionist
Systematic	Physical Symbol	?



# A Proposal for the *Missing Piece*

## A Symbolic Emergent System

- ▶ Systematic representations with independent semantics
- ▶ Together strongly implies a symbol system
- ▶ Representations composed of percepts
- ▶ Rules manipulate representations

# Where to Now?

- ▶ The challenge:
  - ▶ Build a cognitive robotics system that can think...
  - ▶ Without saying what to think about
- ▶ Ales Leonardis - University of Birmingham/Ljubljana
  - ▶ Learning hierarchical shape vocabularies for object representation.

# Thanks

## Shameless Plug

- ▶ Come see my talk at IJCAI! — Tue morning KR track

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## References

- D. Vernon, G. Metta, and G. Sandini. A Survey of Artificial Cognitive Systems: Implications for the Autonomous Development of Mental Capabilities in Computational Agents. *IEEE Trans. Evolutionary Computation*, 11(2): 151–180, 2007.