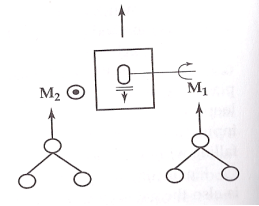


## Disentangling Embodiment

## A Question

- Do the mental states of the self-sensing XOR robot supervene on a linearly-separable space of neural activations? (StM:208)



## Logical Relations

- AND (A and B)
- OR (A, B, or both A and B)
- XOR (exclusive or; A or B, but NOT both)

## Truth Table Representation

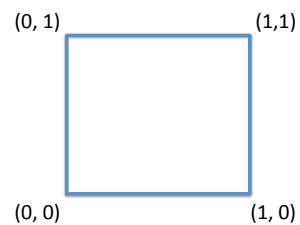
A	B	A OR B	A AND B	A XOR B
F	F	F	F	F
F	T	T	F	T
T	F	T	F	T
T	T	T	T	F

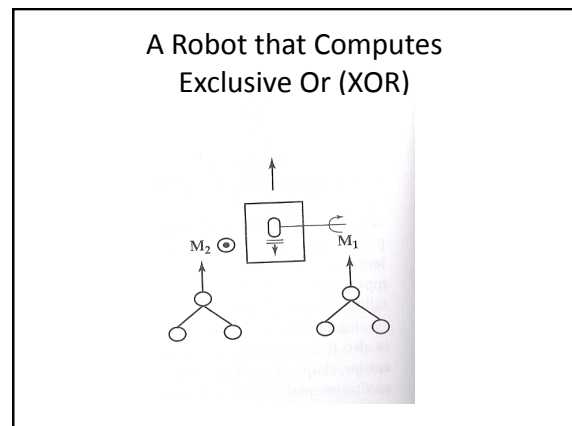
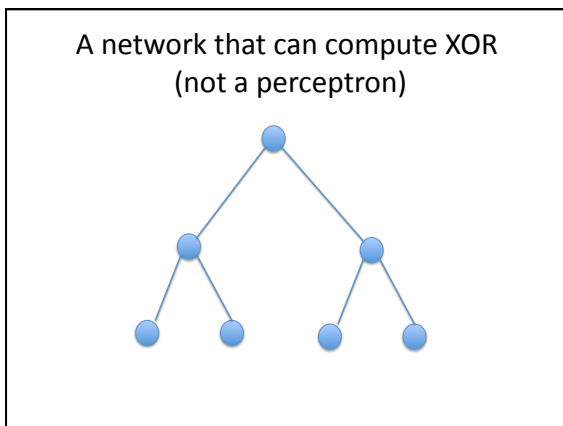
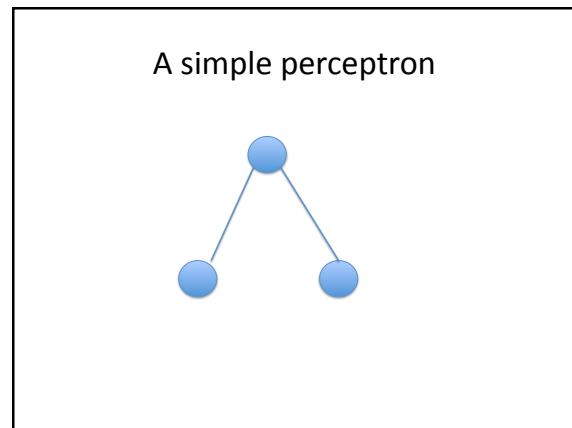
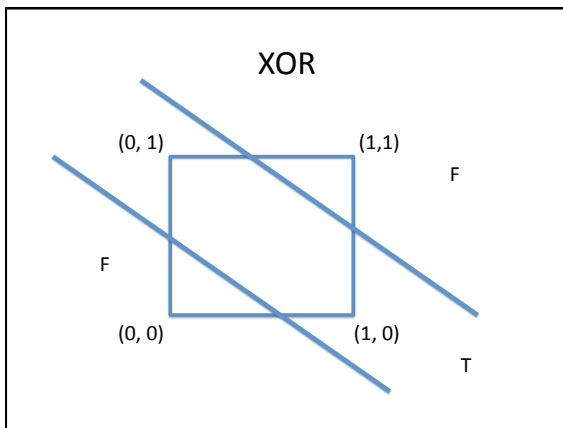
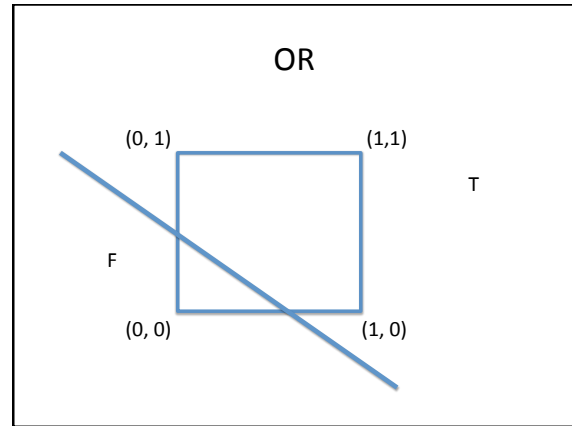
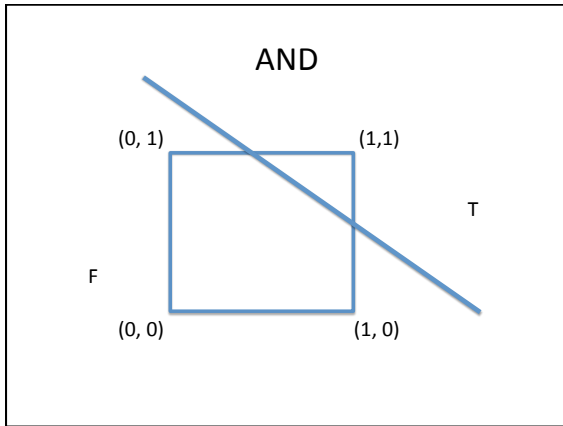
## Change representation

- A = X
- B = Y
- T = 1
- F = 0

We can now express the truth table as points in space.

## Cartesian Space





## Supervenience

- if psychological properties supervene on physical properties, then any two persons who are physically indistinguishable must also be psychologically indistinguishable; or equivalently, any two persons who are psychologically different (e.g., having different thoughts), must be physically different as well. (wikipedia)

## Answer to the question

- Do the mental states of the self-sensing XOR robot supervene on a linearly-separable space of neural activations?
- NO, because
  - XOR is not a linearly separable function
  - and because the mental states supervene on the brain-body system, not the neural activations alone.

## Why embodiment matters (pg 196)

- Spread the load
- Self-structuring information
- Supporting extended cognition
- Hypothesis of cognitive impartiality
- Hypothesis of motor deference

## The science yet to do

- To unravel the workings of these embodied, embedded, and sometimes extended minds requires an unusual mix of neuroscience, computational, dynamic and information-theoretic understandings, “brute” physiology, ecological sensitivity, and attention to the stacked designer cocoons in which we grow, work, think, and act. (StM: 219)

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## Making American Boys



## Making American Girls



## Everyday Brain Computer Interface

