

Cogsci 300
Week 9: Action and Robots

Please turn off and put away all electronics.



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Why Did Consciousness Evolve?

Side effect of increasing brain size and representational capacity?

Useful for social interactions?

- Social brain hypothesis (Dunbar)
- Cooperation (Tomasello)
- Alloparenting (Hrdy)
- Social foraging (Sterelny)
- Social learning and *teaching*

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Levels of Consciousness

1. Basic feelings
2. Feelings **about** situations
3. Self awareness (macaques too?)
4. Awareness of self in social context

Conjecture: 1-2 are side effects, but 3-4 are advantageous for social functioning.

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Make Computers Conscious?

No current computers/robots display behaviors that indicate consciousness.

Reasons to want conscious computers: better social interactions, ethical behavior?

How to build a conscious computer:

1. Multimodal representations
2. Recursive binding
3. Attention bottleneck and competition

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Conscious Action

1. Most action is unconscious, automatic, and fast, e.g. walking to class.
2. But some actions seem to be conscious, deliberate, and slow, e.g. choosing a job.
3. Question: does conscious thought contribute to action?

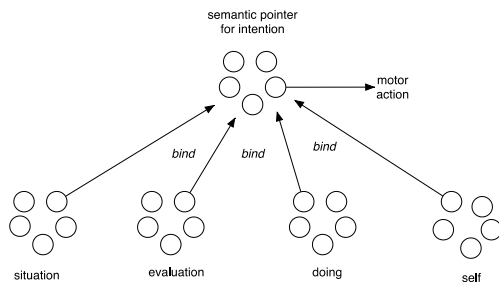
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Discussion Questions

1. Does consciousness contribute to actions as reasons, causes, or neither?
2. Would you want a robot to have conscious control of action?

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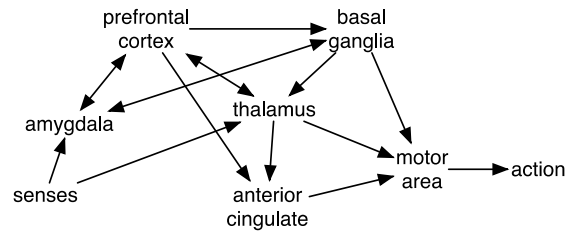
Intentions as Semantic Pointers



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Brain Mechanism

Expanded from Schröder, Stewart, and Thagard, "Intention, Emotion, and Action", *Cognitive Science*.



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Will Alternatives



Will: Direction of action by deliberate conscious control.

Libertarian: People have complete free will.

Determinism: All events have causes.

Hard determinism: All events have causes, so there is no free will.

Soft determinism (compatibilism): All events have causes but people have free will.

Hard indeterminism: Not all events have causes, but mental acts do, so there is no free will.

Free-ish will: people are responsible for actions that are not coerced or diseased.

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How BigDog Works

Representations: 50 sensors: body attitude and acceleration, joint motion and force, temperature, speed, etc.

Procedures: Integrate sensory information, estimate movement, control joints, regulate ground interaction to maintain propulsion, communicate with human operator, control locomotion such as walk, squat, trot.

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BigDog Strengths

1. Walks over rough terrain
2. Integrates many senses
3. Various kinds of action

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BigDog Limitations

1. Requires human controller (not later versions?)
2. Limited inference and planning
3. Limited sensors: later versions add LIDAR (laser sensing)
4. No conscious will

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Discussion Question

Can robots be built that act the way that humans do?

Should such robots be built?

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Robots Versus Humans

1. Advantages of robots: no fatigue, pain, emotional distractions.
2. Advantages of humans: motivations, intentions, complex inferences, flexibility.

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