

Structured Program or Bag of tricks?

Is connectionism a viable alternative to PSSH?

- Representing the microstructure of cognition
- More accurate than PSSH
- Lots of nice features come “for free”: generalization, learning, feature extraction...

Unknown

- Will it scale up?
- How can nets interact with a real-world?
- How does higher-level organization arise?
- How are symbols processed?
- Where do symbols come from?

And remember our reservations about PSSH. Are they resolved?

- The time course of real-world action
- There are many levels of software. Are there also levels of mindware?
- Are games and toy problems good representatives of cognitive tasks?
- Is the Turing test a good representative?

OK, But...(continued)

- Engineering A/I vs Research A/I
- Consciousness (the C word) and qualia
- Language and Searle's Chinese Room

Where to now?

- CogSci has grave doubts about the physical symbol system hypothesis in particular, and the computational metaphor for mind in general.
- But, if computation is not what the brain is doing, then...
 - What is the brain doing?
 - And how do we account for reason respecting flow, high-level cognition, language, symbol processing, planning... and all the rest?

Evolution and Design

- Evolution can only make small moves from what already exists.
- But it can exploit interactions that no designer would ever think of

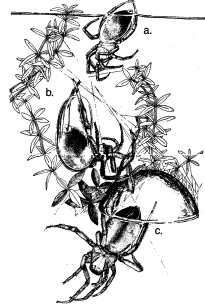


Figure 8.1 *Argyroneta aquatica* in its web. (From Presson-Mathews 1964)

Can Marr's levels work for biological systems?

- If evolution can exploit tiny details of implementation in creating high-level effects, is it possible to distinguish computational level from representational level from implementational level?
- Consider monkey finger motions. (brain and body interaction)
- Inverting lenses (perception and action are not separate systems)
- Consider Herbert the cleanup robot. (no internal model of the environment)

Perception IS Action

- Perception is not something that happens to us, it is something we do.
- Focus on touch rather than vision.
- Handling objects effects our visual perception of their shapes. (Smith, 2006)
- Tactile vision substitution system TVSS
 - Experiencing the feel of the array
 - Experiencing the objects "out there" in the world.
- Blindness can result from severing connections between visual and motor systems!

Representation is an activity

- Representation is not a state.
- Our spatial knowledge is not a map of the environment, it is a set of plans for moving in the environment.
- The function of vision is to keep the perceiver in touch with the environment and to guide action, not to produce inner experiences and representations.

What is the brain doing?

- Action oriented representations
- (MW pg 95)

Artificial Life

- Complete, low level systems
- Recognizing the complex interactions of body, action, and context
- Focus on emergence and collective effects.

Michael Hayward: Swarmoil

- Simulating evolutionary processes with genetic algorithms
- Searching complex design spaces for good solutions

Lessons of Swarmoil

- Emergence of interesting collective effects
- Complexity and adaptability of solutions exceeds our designer expectations
- Complex interactions at all levels: e.g. taking advantage of roughness of oil gradient

Bag of Tricks

- If the brain provides a bunch of context sensitive (context bound) multimodal functional skills,
- Then how are the parts coordinated to produce large-scale coherent behavior?
- And now that we can model cockroach cognition, can this scale up to produce high-level cognition?