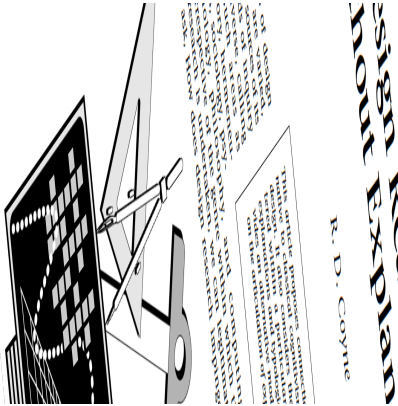




Creative cognition

Description

As I'm reading about brains and cognition again, I thought I would revisit an article I penned some time ago that tried to address the issue of creativity:

- Coyne, Richard. "Design reasoning without explanation." *AI Magazine* 11, no. 4 (1990): 72-80.

At the time there was a debate between two schools concerning how human reason operates, and by extension how design happens. So-called "classical cognitivism" suggested that at some level, human beings solve problems, make up designs and create new ideas by applying rules. Though fluid, contingent and complicated, there's a logic to design. By way of contrast, connectionism drew lessons from neuroscience and computational neural networks. This school of thought suggested that human cognition depends on our capacity to *learn* through an embodied life populated with encounters, experiences, and perceptions.

As the article drew to a close I speculated on how these two views might inform how we think creativity happens. I reproduce the end sections here with a few modifications.

How do the implications of connectionist models of cognition impinge on how we understand the design process? Leaving aside any argument about the superiority or veracity of either classical cognitivism or connectionism, we can see that a commitment to one or the other could promote tendencies toward particular approaches to design understanding. Thus, the value of these models is that each provides us with vocabularies and conceptual structures for enlivening design discourse. As indicated in the following discussion, connectionism provides a structure for talking about aspects of design that might previously have eluded us.

Classical Cognitivism

The approach of classical cognitivism provides a structure for considering the following aspects of design: (1) the importance of rules, (2) the study of typologies, (3) the importance

of explanations, (4) the establishing of evaluation criteria, and (5) the use of computers.

The first aspect of design emphasizes the importance of rules. This view takes seriously the notion of explanations as a source of generative knowledge. We should not only teach the theories that pertain to the effective analysis of designs but also decision-making principles and procedures. In light of the elusive nature of rules and their heuristic nature, this view can be modified as a quest by individuals to discover their own rules and methods. There is also considerable benefit in making this knowledge explicit as tables, diagrams, reports, and flowcharts.

Second is the study of typologies. The definition of terms used by designers is important so that we have a common base for discussion, which extends to the definition and study of typologies. For example, the study of building types and their evolution is an important part of architectural history, primarily as source material for our own designing.

The third aspect involves the importance of explanations. Design decisions must be justified. Designs should be modified in light of proven inconsistencies in explanations. There is a tendency to take explanations given by successful designers at face value.

The fourth aspect involves the establishing of evaluation criteria. The presuppositions on which explanations and decision are based should be made explicit. Making presuppositions explicit is important to establish where an argument begins and ends when all the logical statements are strung together.

Fifth is the use of computers to support this process. The knowledge by which design decisions are made can be put into a computer and made operable. Shortcomings in such a knowledge-based system are addressed by providing the system with more knowledge and more sophisticated control structures.

Connectionism

The approach of connectionism provides a structure for considering the following aspects of design: (1) the importance of precedent, (2) ~~intuition~~ interpretation, (3) the articulation of design knowledge, and (4) the belief that new ideas can emerge from prosaic ideas.

The first aspect of design is the importance of precedent. Exposure to events and instances is important. A rich experiential base is required to facilitate design reasoning. Learning to design by doing and observing is important. Observing without generalizing has a role in education, as does copying. Familiarity is the best teacher.

The second aspect is ~~intuition~~ interpretation. This view accepts that certain design activities cannot be externalized. It accepts the fickle nature of explanations as they are used to justify design decisions. It accepts that aspects of design and design teaching defy traditional academic and scientific treatment. [Much of our knowledge and understanding are *tacit* rather than *explicit*.] It gives credit to the power of persuasion that extends beyond the compulsions of logic.

Third is the articulation of design knowledge. It accepts that much is imparted in design education that cannot be made explicit. It is pluralistic and accommodating to different views and coteries of expertise that enliven and extend the cooperative domain of interactions.

The fourth aspect is the belief that new ideas can emerge from prosaic ideas. The ability to create is inherent within the human cognitive hardware. One of the prerequisites for a successful creative endeavor is a thorough grounding in the conventional.

Conclusion

The jump from a theory of cognition to its practical outworking in understanding design is bound to be hazardous. Here, I chose the safe course of maintaining that different paradigms of cognition enrich the way we talk about design. Their influence on how we actually do design poses even greater difficulties. The language of the connectionist paradigm allows such ideas as emergence to be discussed within a framework. The lesson from connectionism is that computational models exist by which we can describe apparently informal operations. Connectionism challenges the advocacy of formal rigor in design by offering a formal model that in fact supports an informal view of the design process. This challenge presents us with an attractive basis for a deconstruction. Like most interesting ideas, these propositions inevitably contain the seeds of their own destruction.

I think AI is now taken over by methods more related to connectionism than rule-based systems. Whether or not they use neural networks, they draw on vast repositories of examples to suggest inferences, e.g. identifying features in pictures. See post: [Feature detection: Cows, cars and red motorcycles](#).

Category

1. Artificial Intelligence

Tags

1. creativity
2. design

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