CS 786G *Cognitive Modeling*
Week 4 Discussion Paper
Frames: Representation, but intelligence emergent or controlled ?

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Minsky criticizes the logistic approach to understanding intelligence or common sense thinking on the basis that it is: not the way in which humans achieve thought, especially with regards to completeness and consistency enforcement; not demonstratably sufficient to represent knowledge in small, functionally disjoint packages such as propositions; too restrictive to separate knowledge from information about the way in which this knowledge may or should be used; unable to deal with the complexities of the real world as a result of combinatorical overload and a lack of focus methodology in a part of all knowledge. This is, I believe, a very effective attack on much of the AI community's efforts at representation, both historically and currently. This criticism is unfortunately vague with respect to procedure.

Minsky's conception of *Frames* provides a partial alternative to logistics which directly highlights the inadequacy of packetized knowledge through powerful direct linkages of related knowledge in a way that also directly connects knowledge to the use of knowledge. Much of AI has focused on (often complete) search-based approaches to reasoning in which heuristics have guided search both domain dependently and domain independently, but most often with the heuristics developed and tested quite separately from the actual knowledge. Recent work such as outlined in work such as Holte, Zimmer & MacDonald (1992) and reflected in Woods (1993) demonstrates the signifiant complexity reduction that can be gained through expressing a problem in alternative representations which effectively control the search by explicitly describing the steps to be taken when attempting to specialize abstract problem solutions. These richer representations can be tied much more closely to the actual search process, and need not be complete. In addition, others such as Nadel (1990) have clearly shown the complexity gains that may be experienced through alternative, non-intuitive problem representations even in simplistic domains. Clearly, frames provide a plethora of potential search-reducing or eliminating information that can be exploited. Questions about where and how this information can be acquired and used are not answered in sufficient detail by Minsky.

Thus, while frames seem to provide a powerful method of connecting "what" as expressed by feature details or description, "why" as the inter-frame connections and possibly hierarchy reflected in the frame network, "how" in the actual specification of plans tied directly to a concept, or in the participation of a frame in a set of other frames, "effects" in the direct linkage of a frame to its consequences, and even more powerful frame-type dependencies as may appear, what is most definitely lacking is an overall specification of how this information may be used or controlled, or incited to act so as to produce intelligent behaviour. Essentially the information that would seem to be necessary in order to produce this behaviour is in place and frames seem capable of most types of human-like representation, but with only vague conceptions of control such as activation, focus is most definitely lacking, and it is focus which procides such a system with behaviour that could be credited as intelligent.

References

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