```
(Lower case indicates input typed by the user)
* reset wm run
WM = [* PC]
1.  RSM IS TRUE
***** INPUT FOR [ATTEND S AND MAYBE M] = *[s 8] [m 4];
WM = [M 4] [S 8] [* PC]
2.  SB1 IS TRUE
***** INPUT FOR [ATTEND DIFF * 4 8] = *[diff 6 4 8] [borrow next];
WM = [BORROW NEXT] [DIFF 6 4 8] [* PC] [M 4] [S 8]
3.  SB2 IS TRUE
>>>>> WRITE DIFF = 6
WM = [DONE PC] [OLD DIFF 6 4 8] [OLD M 4] [OLD S 8] [BORROW NEXT]
4.  CDF IS TRUE
WM = [* FNC] [OLD DIFF 6 4 8] [OLD M 4] [OLD S 8] [BORROW NEXT]
5.  CBN IS TRUE
WM = [* PC] [BORROW ACTIVE] [OLD DIFF 6 4 8] [OLD M 4] [OLD S 8]
6.  FNC IS TRUE
***** INPUT FOR [ATTEND MOVELEFT FNC] = *[rep fnc pc];
WM = [* PC] [BORROW ACTIVE] [OLD DIFF 6 4 8] [OLD M 4] [OLD S 8]
7.  RSM IS TRUE
***** INPUT FOR [ATTEND S AND MAYBE M] = * [s 7];
WM = [S 7] [* PC] [BORROW ACTIVE] [OLD DIFF 6 4 8] [OLD M 4] [OLD S
         8]
8.  RM IS TRUE
***** INPUT FOR [ATTEND M] = *[m 2];
WM = [M 2] [* PC] [S 7] [BORROW ACTIVE] [OLD DIFF 6 4 8] [OLD M 4]
         [OLD S 8]
9.  BS1 IS TRUE
WM = [* ADD1 7] [* PC] [S 7] [BORROW ACTIVE] [M 2] [OLD DIFF 6 4 8]
         . . .
10. SU7 IS TRUE
WM = [8 ADD1 7] [* PC] [S 7] [BORROW ACTIVE] [M 2] [OLD DIFF 6 4 8]
         . . .
11. BS2 IS TRUE
WM = [* PC] [S 8] [OLD BORROW ACTIVE] [8 ADD1 7] [M 2] [OLD DIFF 6 4
         8] . . .
12. SB1 IS TRUE
*****INPUT FOR [ATTEND DIFF * 2 8] = * [diff 4 2 8] [borrow next];
WM = [BORROW NEXT] [DIFF 4 2 8] [* PC] [M 2] [S 8] [OLD BORROW
         ACTIVE] . . .
13. SB2 IS TRUE
>>>>> WRITE DIFF = 4
WM = [DONE PC] [OLD DIFF 4 2 8] [OLD M 2] [OLD S 8] [BORROW NEXT]
         . . .
14. CDF IS TRUE
WM = [* FNC] [OLD DIFF 4 2 8] [OLD M 2] [OLD S 8] [BORROW NEXT] . . .
15. CBN IS TRUE
WM = [* FNC] [BORROW ACTIVE] [OLD DIFF 4 2 8] [OLD M 2] [OLD S 8]
16. FNC IS TRUE
***** INPUT FOR [ATTEND MOVELEFT FNC] = * [rep fnc pc];
WM = [* PC] [BORROW ACTIVE] [OLD DIFF 4 2 8] [OLD M 2] [OLD S 8]
         . . .
17. RSM IS TRUE
***** INPUT FOR [ATTEND S AND MAYBE M] = * [s 3] [m 5];
WM = [M 5] [S 3] [* PC] [BORROW ACTIVE] [OLD DIFF 4 2 8] [OLD M 2]
         . . .
18. BS1 IS TRUE
WM = [* ADD1 3] [* PC] [S 3] [BORROW ACTIVE] [M 5] [OLD DIFF 4 2 8]
         . . .
19. SU3 IS TRUE
WM = [4 ADD1 3] [* PC] [S 3] [BORROW ACTIVE] [M 5] [OLD DIFF 4 2 8]
         . . .
20. BS 2 IS TRUE
WM = [* PC] [S 4] [OLD BORROW ACTIVE] [4 ADD1 3] [M 5] [OLD DIFF 4 2
         8] . . .
21. SB1 IS TRUE
***** INPUT FOR [ATTEND DIFF * 5 4] = * [diff 1 5 4];
WM = [DIFF 1 5 4] [* PC] [M 5] [S 4] [OLD BORROW ACTIVE] [4 ADD1 3]
         . . .
22. SB2 IS TRUE
>>>>> WRITE DIFF = 1
WM = [DONE PC] [OLD DIFF 1 5 4] [OLD M 5] [OLD S 4] [OLD BORROW
         ACTIVE] . . .
23. CDF IS TRUE
WM = [* FNC] [OLD DIFF 1 5 4] [OLD M 5] [OLD S 4] [OLD BORROW ACTIVE]
         . . .
24. FNC IS TRUE
***** INPUT FOR [ATTEND MOVELEFT FNC] = * [rep * nomore];
WM = [NOMORE FNC] [OLD DIFF 1 5 4] [OLD M 5] [OLD S 4] [OLD BORROW
         ACTIVE] . . .
PS STOPPED - NO RULE APPLICABLE
```

Implications of Human Pattern Processing for the Design of Artificial Knowledge Systems

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Artificial knowledge systems typically embody several design principles that are also widely accepted as characteristic of human knowledge processing. These properties include: canonical meaning representations for stored patterns; prototypes as representations of classes of stored patterns; pattern matching processes that must evaluate fully all stored patterns that partially match a target pattern; and pattern matching processes that are influenced by pattern complexity and limited processing capacity. This characterization of human pattern processing is critically evaluated in light of recent psychological studies. The implications of these results for the design of artificial knowledge systems are discussed.

Pattern-Directed Processing of Knowledge from Texts

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A framework for viewing human text comprehension, memory, and recall is presented that assumes patterns of abstract conceptual relations are used to guide processing. These patterns consist of clusters of knowledge that encode prototypical co-occurrences of situations and events in narrative texts. The patterns are assumed to be a part of a person's world knowledge and can be activated during comprehension to build associations among multiple linguistic propositions in memory according to their higher-order conceptual relations. During text reproduction from memory, these patterns provide retrieval plans for recall and a mechanism for sophisticated "guessing" when retrieval fails. Some data from human text learning tasks are presented as evidence for these higher-order conceptual patterns. Several structural and processing properties of the model are evaluated in light of these data. It is argued that the proposed pattern-directed processing model could be successfully implemented in artificial intelligence systems to provide adaptive error-handling mechanisms such as those observed in human behavior.

Natural Language Understanding

Conversational Action Patterns in Dialogs

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Systems that interact in dialogs need to understand linguistic actions being used by one another and know which linguistic actions are appropriate for their own uses. We introduce a model based on conversational action patterns to describe and predict speech acts in natural language dialogs and to specify appropriate actions to satisfy the system's goals. A modified production system was used to implement the formalism. The salient characteristics of the production system are:

(1) Affects (emotions) can modify the interpretation of external events and alter the flow of control of the system.

(2) The system uses overlapping and parallel rules to predict and generate overlapping linguistic events in dialog situations.

The same mechanism is used as a basis of cognitive functioning to model internal planning and inference functions.

Rule-Based Computations on English

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