1

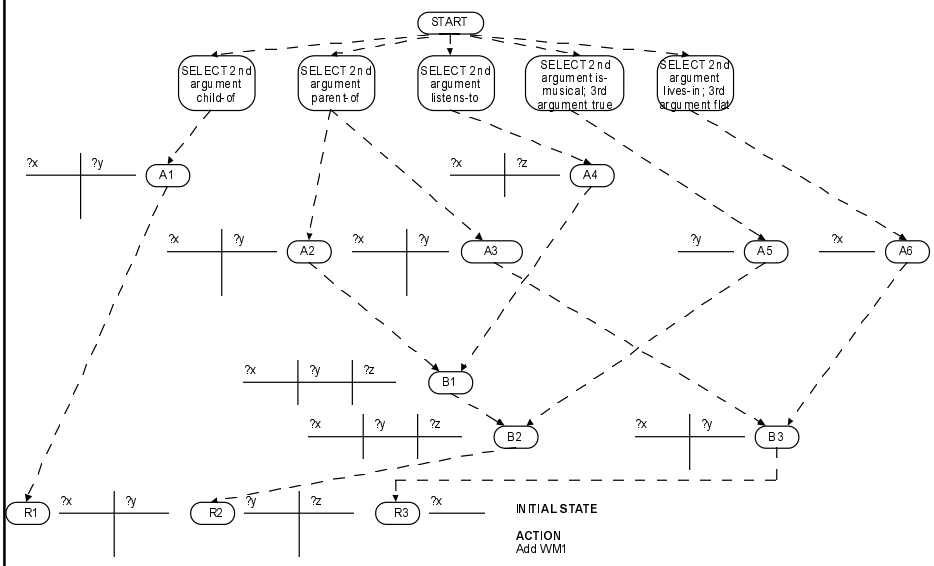
Knowledge Based Systems

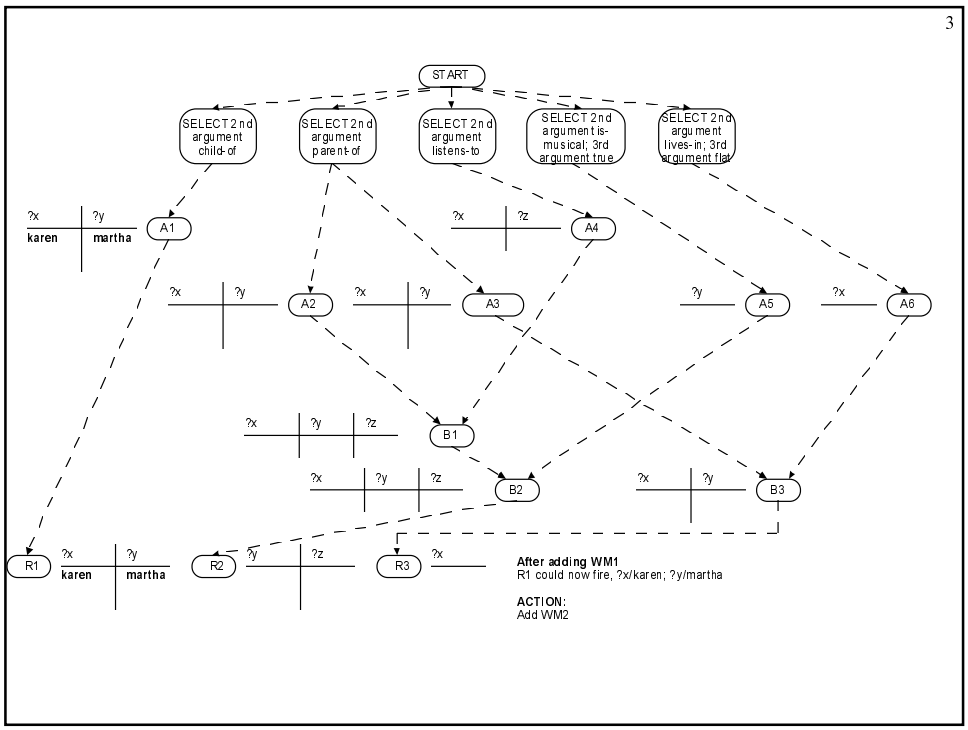
(CM0377)

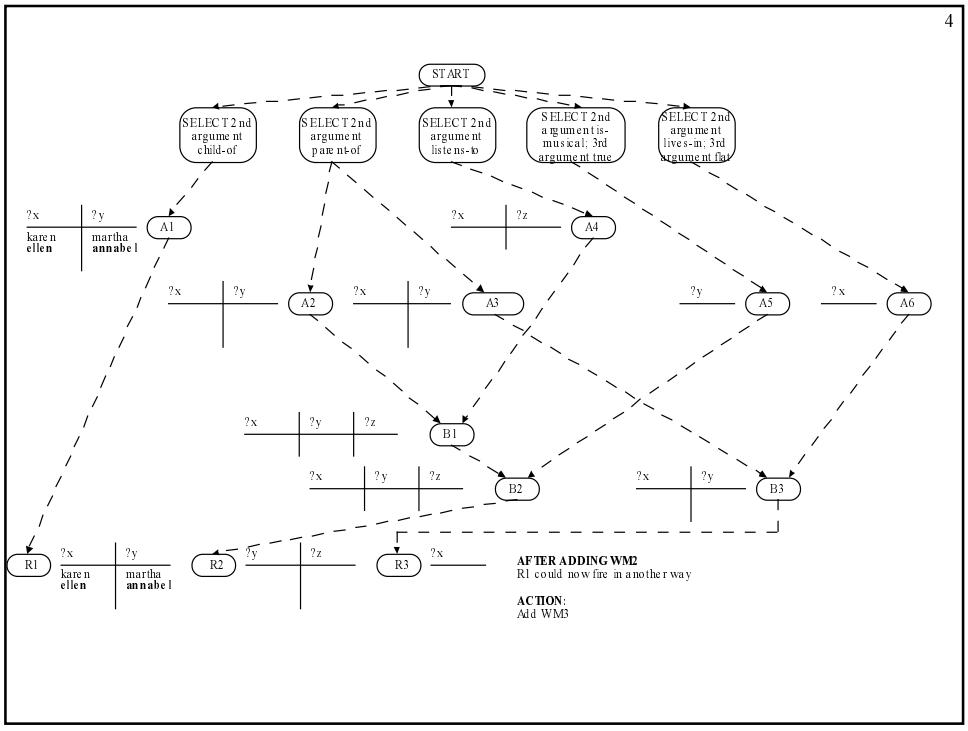
Lecture 11a: RETE simulation

(Last modified 26th March 2001)

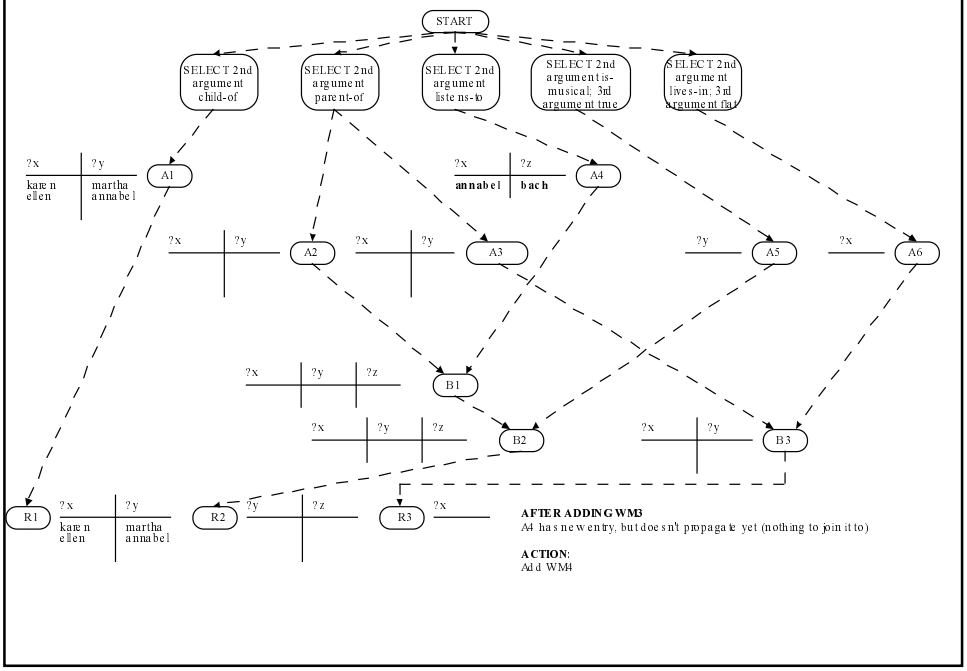
2



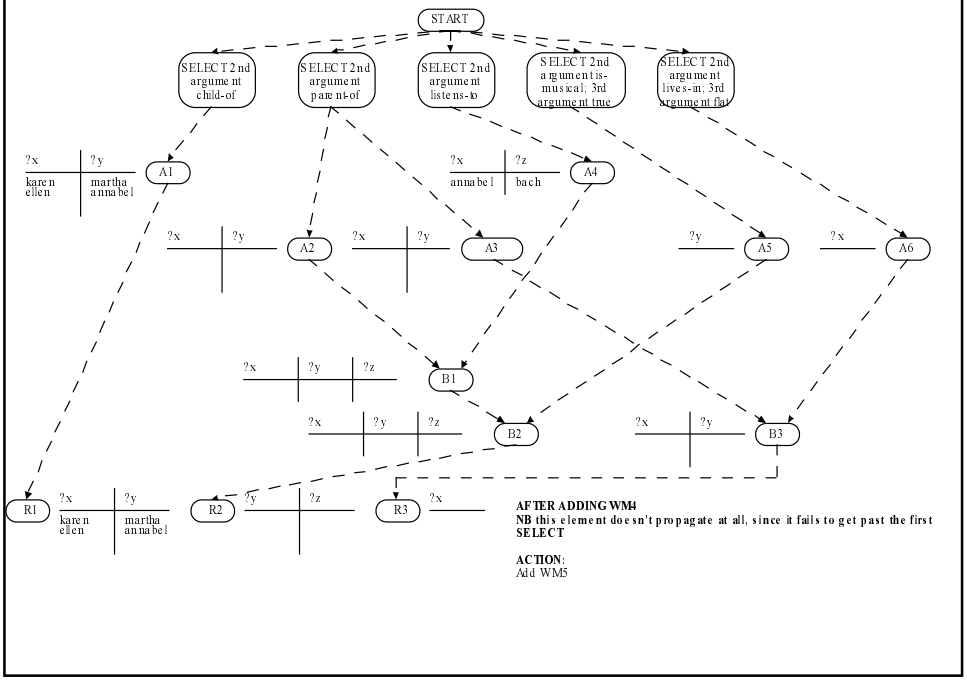

3
START
SELECT 2nd argument child-of
SELECT 2nd argument parent-of
SELECT 2nd argument listens-to
SELECT 2nd argument is-musical; 3rd argument true
SELECT 2nd argument lives-in; 3rd argument flat
?x ?y
karen martha
A1
?x ?z
A4
?x ?y
A2
?x ?y
A3
?y
A5
?x
A6
?x ?y ?z
B1
?x ?y ?z
B2
?x ?y
B3
R1
?x ?y
karen martha
R2
?y ?z
R3
?x
After adding WM1
R1 could now fire, ?x/karen; ?y/martha
ACTION:
Add WM2


4
START
SELECT 2nd argument child-of
SELECT 2nd argument parent-of
SELECT 2nd argument listens-to
SELECT 2nd argument is-musical; 3rd argument true
SELECT 2nd argument lives-in; 3rd argument flat
?x ?y
karen martha
ellen annabel
A1
?x ?z
A4
?x ?y
A2
?x ?y
A3
?y
A5
?x
A6
?x ?y ?z
B1
?x ?y ?z
B2
?x ?y
B3
R1
?x ?y
karen martha
ellen annabel
R2
?y ?z
R3
?x
AFTER ADDING WM2
R1 could now fire in another way
ACTION:
Add WM3

5


START
SELECT 2nd argument child-of
SELECT 2nd argument parent-of
SELECT 2nd argument listens-to
SELECT 2nd argument is-musical; 3rd argument true
SELECT 2nd argument lives-in; 3rd argument flat
?x ?y
karen martha
ellen annabel
A1
?x ?z
annabel bach
A4
?x ?y
A2
?x ?y
A3
?y
A5
?x
A6
?x ?y ?z
B1
?x ?y ?z
B2
?x ?y
B3
R1
?x ?y
karen martha
ellen annabel
R2
?y ?z
R3
?x
AFTER ADDING WM3
A4 has new entry, but doesn't propagate yet (nothing to join it to)
ACTION:
Add WM4

6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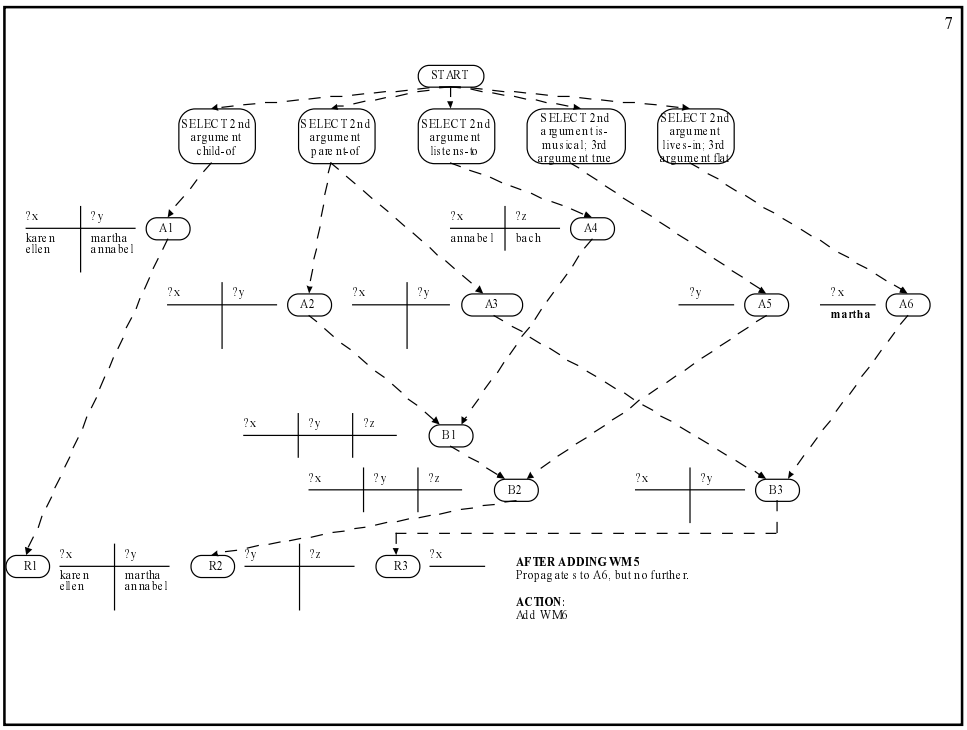
SELECT 2nd argument is-musical; 3rd argument true
SELECT 2nd argument lives-in; 3rd argument flat
?x ?y
karen martha
ellen annabel
A1
?x ?z
annabel bach
A4
?x ?y
A2
?x ?y
A3
?y
A5
?x
A6
?x ?y ?z
B1
?x ?y ?z
B2
?x ?y
B3
R1
?x ?y
karen martha
ellen annabel
R2
?y ?z
R3
?x
AFTER ADDING WM4
NB this element doesn't propagate at all, since it fails to get past the first SELECT
ACTION:
Add WM5

7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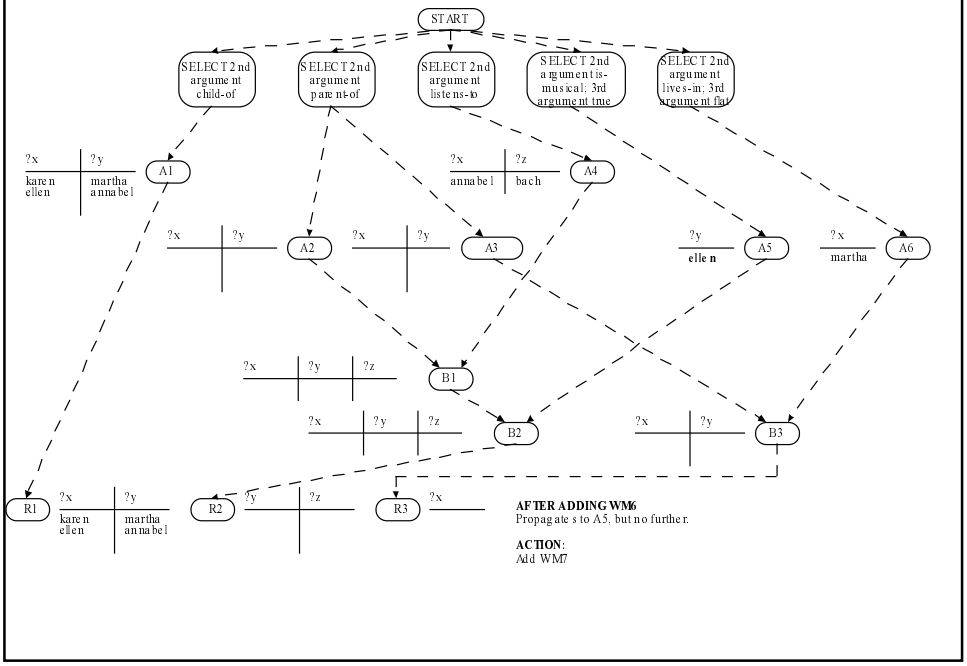
SELECT 2nd argument is-musical; 3rd argument true
SELECT 2nd argument lives-in; 3rd argument flat
?x ?y
karen martha
ellen annabel
A1
?x ?z
annabel bach
A4
?x ?y
A2
?x ?y
A3
?y
A5
?x
martha
A6
?x ?y ?z
B1
?x ?y ?z
B2
?x ?y
B3
R1
?x ?y
karen martha
ellen annabel
R2
?y ?z
R3
?x
AFTER ADDING WM5
Propagates to A6, but no further.
ACTION:
Add WM6

8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SELECT 2nd argument is-musical; 3rd argument true
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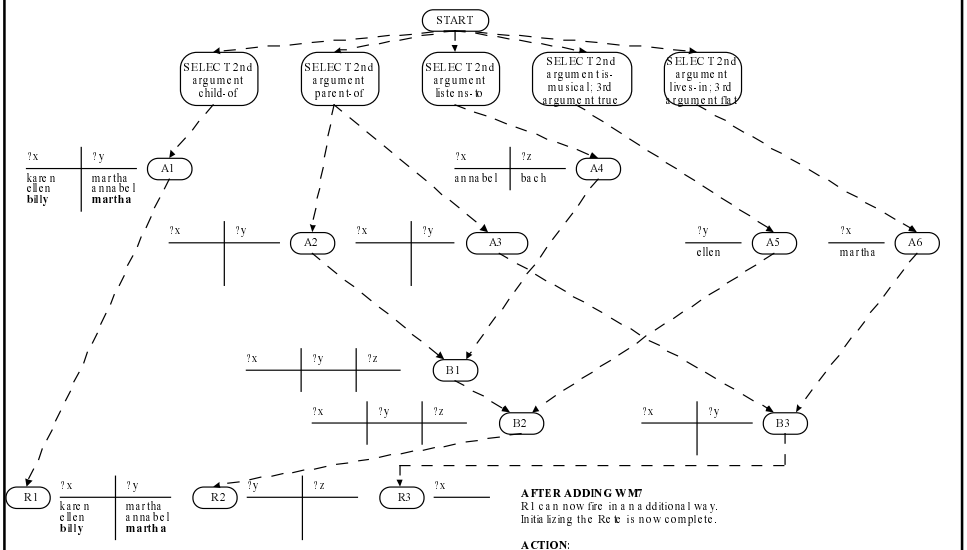
?x ?y
karen martha
ellen annabel
A1
?x ?z
annabel bach
A4
?x ?y
A2
?x ?y
A3
?y
ellen
A5
?x
martha
A6
?x ?y ?z
B1
?x ?y ?z
B2
?x ?y
B3
R1
?x ?y
karen martha
ellen annabel
R2
?y ?z
R3
?x
AFTER ADDING WM6
Propagates to A5, but no further.
ACTION:
Add WM7

9



AFTER ADDING WM7
R1 can now fire in an additional way.
Initializing the Rete is now complete.

ACTION:
Let's choose to Fire R1 on ?x/karen; ?y/martha. [NB we haven't chosen a conflict resolution strategy. I just chose the firing order to make the example look 'nice'!]
This adds the following WM element:

WM8: martha parent-of karen

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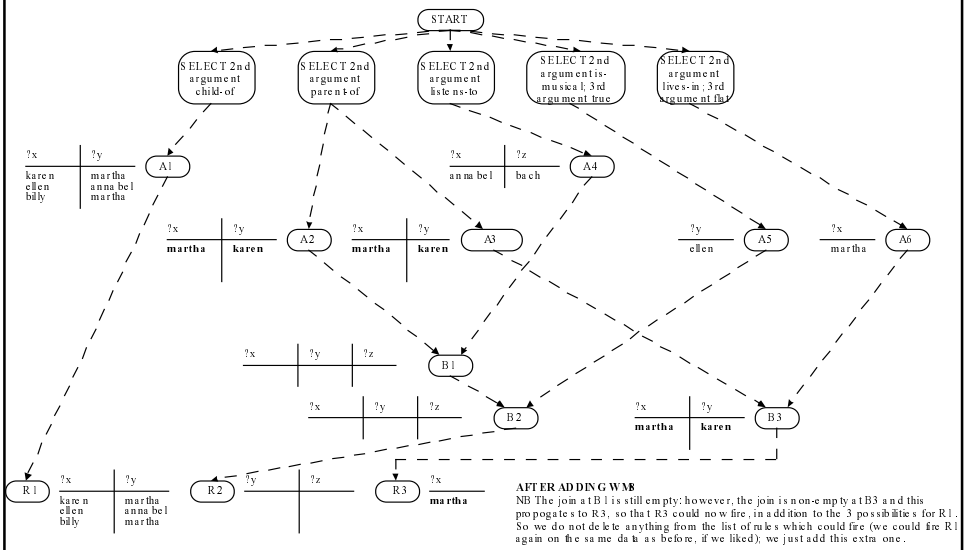
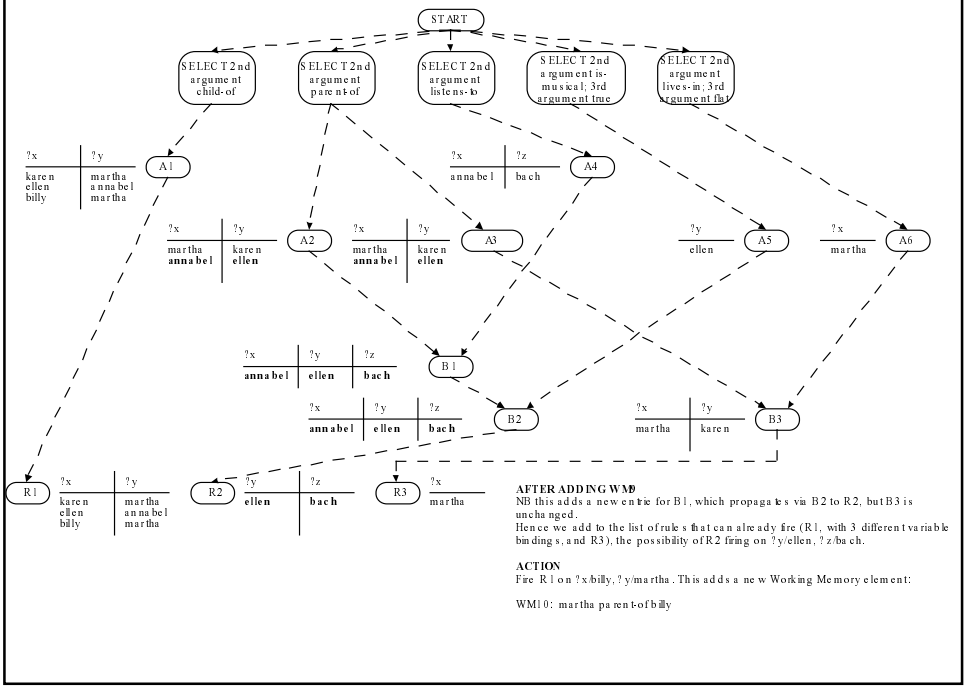


AFTER ADDING WM8
NB The join at B1 is still empty: however, the join is non-empty at B3 and this propogates to R3, so that R3 could now fire, in addition to the 3 possibilities for R1. So we do not delete anything from the list of rules which could fire (we could fire R1 again on the same data as before, if we liked); we just add this extra one.

ACTION:
Fire R1 with ?x/ellen, ?y/annabel. This will result in adding:

WM9: annabel parent-of ellen

11



AFTER ADDING WM9
NB this adds a new entrie for B1, which propagates via B2 to R2, but B3 is unchanged.
Hence we add to the list of rules that can already fire (R1, with 3 different variable bindings, and R3), the possibility of R2 firing on ?y/ellen, ?z/bach.

ACTION
Fire R1 on ?x/billy, ?y/martha. This adds a new Working Memory element:

WM10: martha parent-of billy

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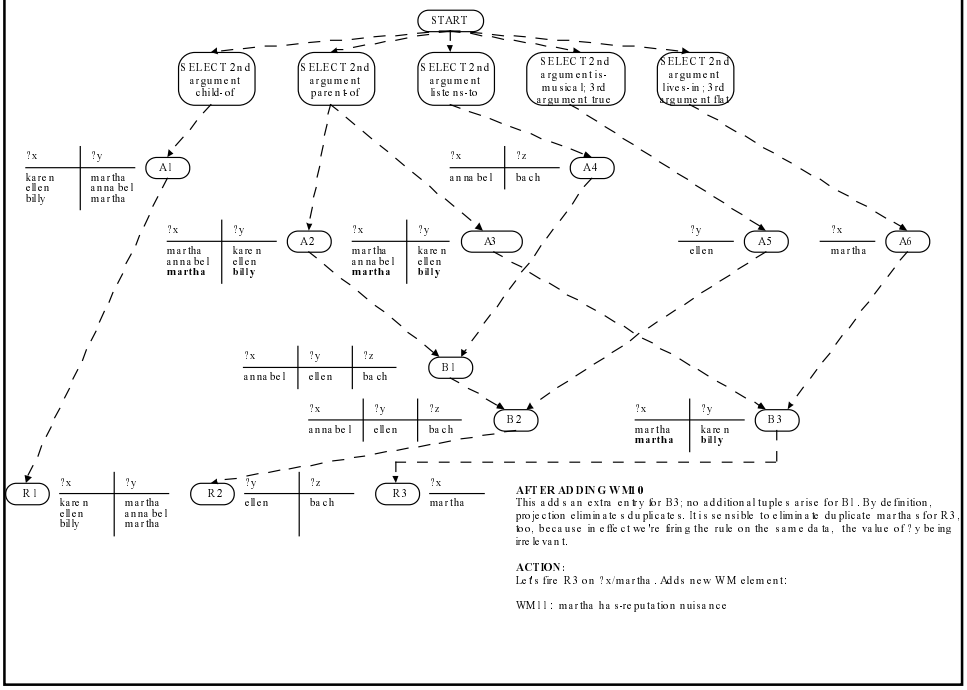
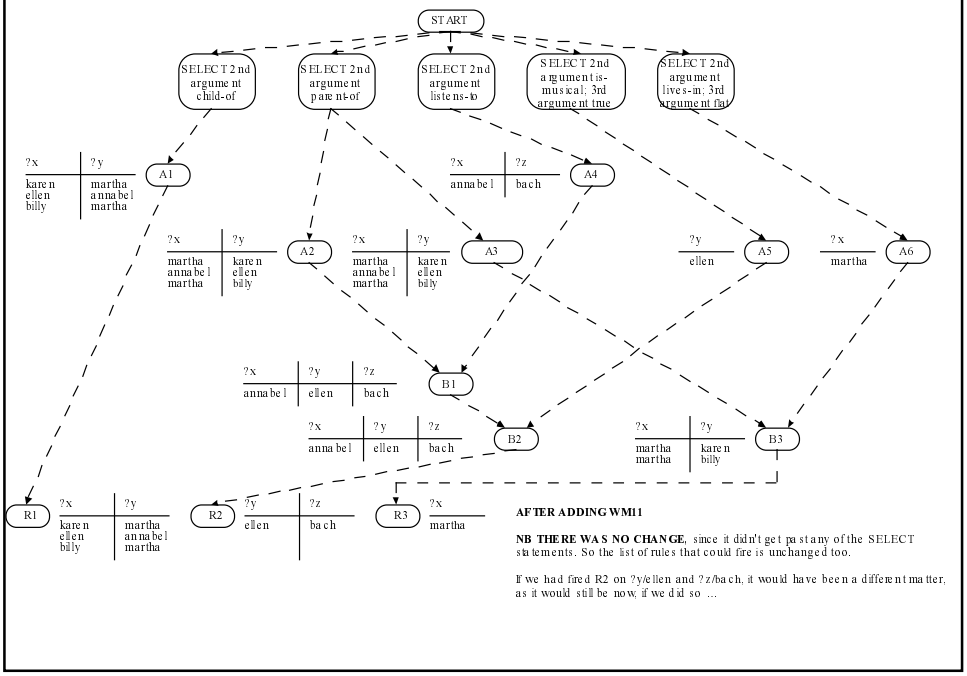


AFTER ADDING WM10
This adds an extra entry for B3; no additional tuples arise for B1. By definition, projection eliminates duplicates. It is sensible to eliminate duplicate martha s for R3, too, because in effect we're firing the rule on the same data, the value of ?y being irrelevant.

ACTION:
Let's fire R3 on ?x/martha. Adds new WM element:

WM11: martha has-reputation nuisance



AFTER ADDING WM11

NB THERE WAS NO CHANGE, since it didn't get past any of the SELECT statements. So the list of rules that could fire is unchanged too.

If we had fired R2 on ?y/ellen and ?z/bach, it would have been a different matter, as it would still be now, if we did so ...