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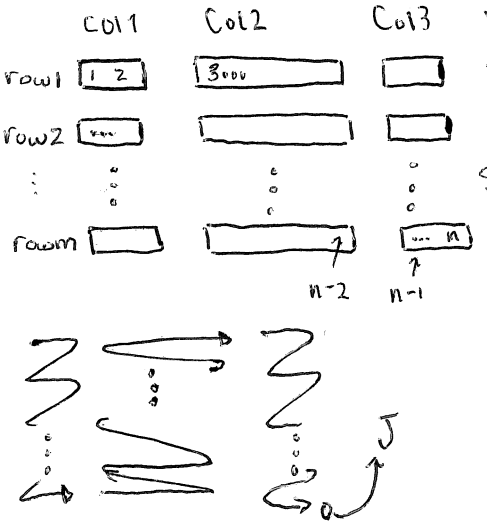
CS 427 Homework 5

1) Production System: rules: i) if paper is at seat n, pass to Jamie
ii) if paper is at seat 1, pass right
iii) if ColIndex is odd & at leftmost in Col seat, pass right
iv) if ColIndex is odd & at rightmost in Col seat, pass back & leftmost
v) if ColIndex is even & at leftmost in Col seat, pass right
vi) if ColIndex is even & at rightmost in Col Seat, pass up & leftmost
vii) if ColIndex is 1 & rowIndex is m (& at rightmost seat), pass right to ColIndex 2
viii) if ColIndex is 2 & rowIndex is 1 (& at rightmost seat), pass right to ColIndex 3.



Sample Run ↓ Conflict res. = take leftmost rule.

Iteration #	Working Mem.	Conflict Set (valid)	Rule fired
0	Seat #1	ii, iii	i
1		iv	iv
2	(Col 1, row 2, left ~~left right~~) 2	vii	iii
3	(Col 1, row 2, right)	iv	iv
4	(Col 1, row 3, left)	iii	iii
...	...	... not valid	...
m*2	(Col 1, row m, right) seat	iii, vii	vii
m*2 +1	(Col 2, row m, left seat)	v	v
...	...	...	...
n	(Col 2, row m, right)	vi	vi
...	...	... not valid	...
i	(Col 2, row 1, right)	vi, viii	viii
i+1	(Col 3, row 1, left)	iii	iii
i+2	(Col 3, row 1, right)	iv	iv
...	... (n-1)	...	...
j	(Col 3, row m, left)	iii conflict res.	iii
J+1	Seat #n	i, iv	i

This system will work by passing through Columns first. On odd columns, it will flow towards the back of the classroom in a left-to right fashion. On even columns, it will flow towards the front of the classroom in a left-to right fashion for each row. Once the paper reaches the rightmost of row m, Col 3 it should halt by passing to Jamie. After running, I noticed I might need an extra rule for Col 2 saying "if ColIndex is even & not at leftmost or rightmost seat (ie, middle), pass right. This system has the inconvenience of needing to pass to the opposite end of the next row when transitioning rows.

CS427 Homework 5

2) Fair 6 sided die $\Rightarrow P(1) = P(2) = \cdots = P(6) = 1/6$

Cost = \$4, earn = \$n (where n is result of roll)

Expected value = $\frac{1}{6}(1+2+3+4+5+6) - 4 = -0.5$

∴ We can expect to lose \$0.5 each roll, this is a scam!

3) $P(\text{detected} \mid \text{has disease}) = 0.9$

$P(\text{detected} \mid \text{not has disease}) = 0.03$

$P(\text{has disease}) = 0.1$, $P(\text{not has disease}) = 0.9$

Bayes: $P(H|E) = P(E|H) \times P(H) / (P(E|H)P(H) + P(E|\neg H)P(\neg H))$

$P(\text{has disease} \mid \text{detected}) = [0.9 \times 0.1] / [(0.9 \times 0.1) + (0.03 \times 0.9)] = 0.77$

There is a 77% chance a person who tests positive will actually have the disease.

4) good, bad, average

↓ 25% ↓ 25% ↓ 50%

$P(\text{accident} \mid \text{good}) = 0.05$ $P(\text{good}) = 0.25$

$P(\text{accident} \mid \text{avg}) = 0.15$ $P(\text{avg}) = 0.5$

$P(\text{accident} \mid \text{bad}) = 0.25$ $P(\text{bad}) = 0.25$

$$P(\text{good} \mid \text{accident}) = \frac{P(\text{acc.} \mid \text{good})P(\text{good})}{[P(\text{acc.} \mid \text{good})P(\text{good}) + P(\text{acc} \mid \text{avg})P(\text{avg}) + P(\text{acc} \mid \text{bad})P(\text{bad})]} = \frac{(0.05 \times 0.25)}{[(0.05 \times 0.25) + (0.15 \times 0.5) + (0.25 \times 0.25)]}$$

$= 0.08\overline{3} \approx 8.4\%$

There is an 8.4% chance you're a good driver if you've had an accident in the past year.