C3 Artificial Intelligence (25 points)

Uncertainty. (10 points) Suppose that four different Boolean sensors (S1, S2, S3, S4) are used to predict an imminent earthquake E, with the following probabilities:

p(E)=.02	p(S1lE)=0.01	p(S2lE)=0.1	p(S3lE)=0.002	p((S4lE)=0.0003
p(S1)=.01	p(S2)=.01	p(S3)=.01	p(S4)=.01	

(a) [5 pts] Assuming the conditional independence of S1, S2, S3, and S4 given E (often called Naive Bayes), compute the p(ElS1,S2,S3,S4).

(b) [5 pts]Suppose that you are told that the probability of all of the sensors registering positive given an imminent earthquake is 0.000004 and you are also given the following additional information:

p(S1,S4)=.01 p((S2lS1,S3,S4)=.03

What one other piece of information do you need in order to compute a better estimate of p(ElS1,S2,S3,S4) than is provided by Naive Bayes? Give the formula that you would use to compute this better estimate, using all of these additional pieces of information.

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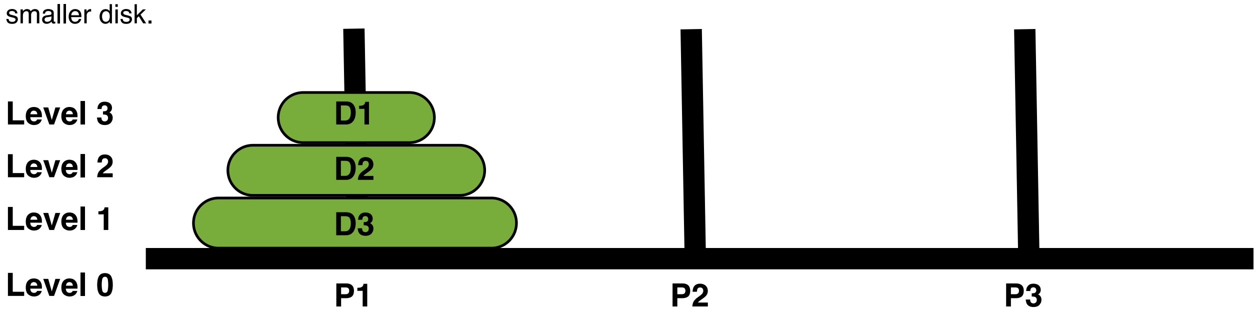
Planning. (15 points) Consider the Towers of Hanoi problem as a planning problem. Here, the idea is to move all the disks from Peg 1 to Peg 3, one at a time, where no larger disk may ever be placed upon a smaller disk.



Consider the following initial state.

`At(D3, 1, P1)`
`At(D2, 2, P1)`
`At(D1, 3, P1)`
	`Top(P1,3)`
	`Top(P2,0)`
	`Top(P3,0)`
		`Size(D3, 3)`
		`Size(D2, 2)`
		`Size(D1, 1)`

(a) [12 pts] Write an STRIPS-style operator schema or schemas to represent the operations in this problem so that it could be solved by a planner. You may use numerical comparisons (<, >, =, etc.) and functions **+** and **-** only. Do not use conditional schemas.

(b) [3 pts] Argue that you don't really need + and - at all.