

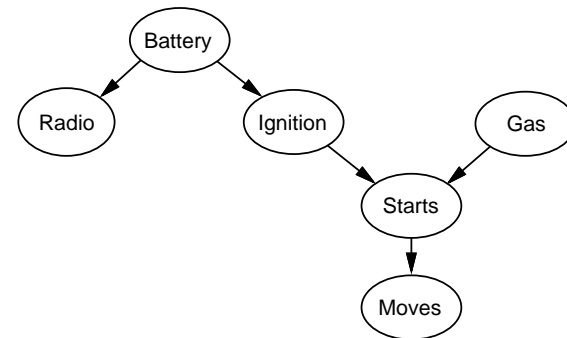
# Artificial Intelligence

## Value of Information

this is not in the Nilsson  
Russell and Norvig - Chapter 16

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example



You are trying to find out why the car does not start.  
You have checked the battery already. It is not empty.  
Does it make sense to check the radio?

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## “Decision Trees”

so far:

Bayes Nets  
probabilistic reasoning

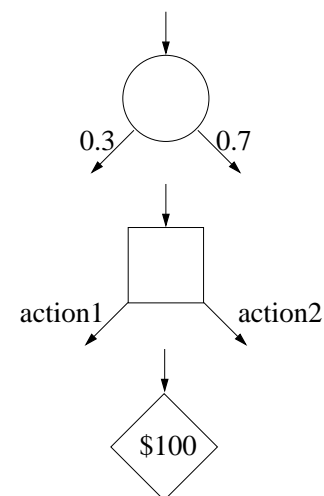
now:

“Decision Trees”  
probabilistic reasoning  
including costs and actions

- similar to Influence Diagrams (Decision Networks)
- similar to Game Trees
- not similar to Decision Trees used in machine learning

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## “Decision Trees”



Chance Node  
= average

Decision Node  
= take max (or min)

Utility Node

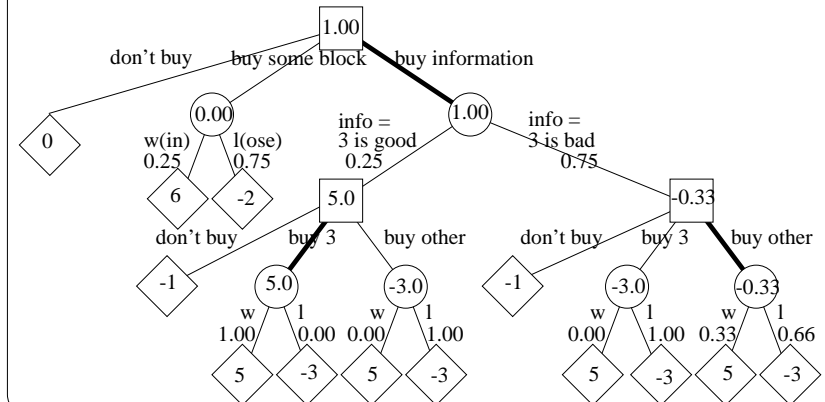
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## Value of Information

- should a doctor perform a certain lab test
- should we by the “Wall Street Journal” to make better business decisions
- should a robot spend time localizing itself to improve its navigation performance

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An oil company is hoping to buy one of 4 indistinguishable blocks of ocean drilling rights, exactly one of which contains oil worth 8 dollars. The price of each block is 2 dollar. A seismologist offers the company the results of a survey of block number 3, which indicates definitely whether the block contains oil, for 1 dollar. Should the company buy the information? How much would it pay at most for the information?



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## Value of Information

= how much you should pay at most for the information  
= performance improvement achievable with the information

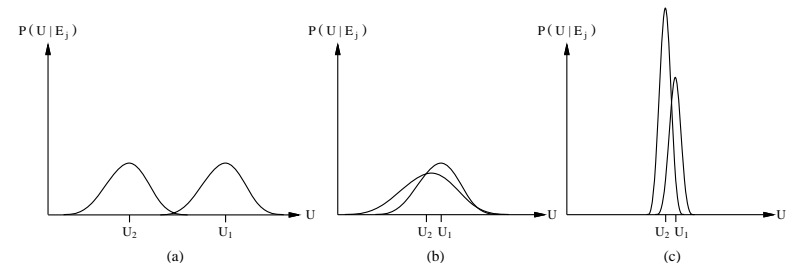
get the information  
(for example, perform the test)

iff

value of information  $\geq$  cost of information

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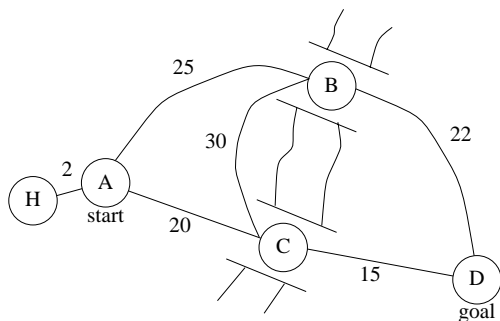
## Value of Information



notice:  
information has value only  
to the extent that it is likely to cause a change of plan  
and to the extent that the new plan will be significantly better than the old one

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### Example



In similar situations in the past, the robot experienced that 4 out of 5 times bridge C was out and only 1 out of 5 times bridge B was out. The robot has a short-range sensor that tells it with 100 percent reliability whether a bridge is out. This sensor can only be used when the robot is directly in front of the bridge. The long-range sensor of the robot is unreliable. It errs with a probability of 10 percent, that is, suggests that the broken bridge is operable and the other bridge is broken.