Assignment Chapter 3

1. Exercise 3-5. "Hand run" the backtrack algorithm on the graph in Figure 3.29. Begin from state A. Keep track of successive values of CS, SL, NSL, DE.
2. Exercise 3-7. Determine whether goal- or data-driven search would be preferable for solving each of the following problems. Justify your answer.
   (a) Diagnosing mechanical problems in an automobile.
   (b) You have met a person who claims to be your distant cousin, with a common ancester named "John Doe". Verify the claim.
   (c) Another person claims to be your distant cousin. He does not know the ancester's name, but knows that it was more than eight generations back. You would like to find this ancester or determine she does not exist.
   (d) A theorem prover for plane geometry.
   (e) A program for examining sonar readings and interpreting them, e.g., telling a large submarine from a small submarine from a whale from a school of fish.
   (f) An expert system that will help a human classify plants by species, genus, etc.
3. Exercise 3-10. Trace the good-dog problem of Example 3.3.4 in a data-driven fashion.

Solutions

Exercise 3-5. "Hand run" the backtrack algorithm on the graph in Figure 3.29. Begin from state A. Keep track of successive values of CS, SL, NSL, DE.

Loop	CS	SL	NSL	DE
0	A	A	A	-
1	B	B A	B C D A	-
2	E	E B A	E F G B C D A	-
3	J	J E B A	J K L E F G B C D A	-
4	K	K E B A	K L E F G B C D A	J
5	L	L E B A	L E F G B C D A	K J
6	F	F B A	F G B C D A	E L K J
7	G	G B A	G B C D A	F E L K J
8	M	M G B A	M N H G B C D A	F E L K J
9	N	N G B A	N H G B C D A	M F E L K J
10	H	H G B A	H G B C D A	N M F E L K J
11	O	O H G B A	O P H G B C D A	N M F E L K J
12	P	P H G B A	M N H G B C D A	O N M F E L K J
13	C	C A	C D A	G H P O N M F E L K J
14	D	D A	D A	C G H P O N M F E L K J
15	I	I D A	I D A	C G H P O N M F E L K J
16	R	R I D A	R I D A	C G H P O N M F E L K J
17	-	-	-	A D I R C G H P O N M F E L K J

The algorithm returns FAIL.

Exercise 3-7. Determine whether goal- or data-driven search would be preferable for solving each of the following problems. Justify your answer.

a. Diagnosing mechanical problems in an automobile.
   Usually goal-driven, the goal being the problem. It could also be like EMYCIN, where data is collected and possible goals are suggested data-driven). Then each goal is checked (goal-driven).
b. You have met a person who claims to be your distant cousin, with a common ancester named "John Doe". Verify the claim.
   Use a combination of methods - "many frontier search": (1) Develop several generations of John Doe's descendents. (2) Develop several generations of your ancesters and (3) of the alleged cousin's ancesters. Look for common vertices in these graphs.
c. Another person claims to be your distant cousin. He does not know the ancester's name, but knows that it was more than eight generations back. You would like to find this ancester or determine she does not exist.
   Goal-driven, twice: develop ancester trees for both you and the "cousin", look for people common to these.
d. A theorem prover for plane geometry.
   Theorem provers are almost always goal-driven. Data-driven amounts to asking "What are all the theorems I can prove in this system?" Aside from the obvious TMI, there would be a lot of trivially almost-redundant theorems.
e. A program for examining sonar readings and interpreting them, e.g., telling a large submarine from a small submarine from a whale from a school of fish.
   Almost always data-driven. The possible patterns are usually not all enumerated exactly, so some kind of approximation is used. Data-driven yields results like "best match" among known goals.
f. An expert system that will help a human classify plants by species, genus, etc.
   Usually data-driven.

Exercise 3-10. Trace the good-dog problem of Example 3.3.4 in a data-driven fashion.

Fact 1 binds fred in rule 6
Fact 2 binds fred and sam in rule 7
Facts 3 and 4 add new fact location(sam,museum) in rule 9
Facts 5 and 1 add new fact gooddog(fred) in rule 6
Rule 7 fires