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(i)

Depth Limited Search (DLS)

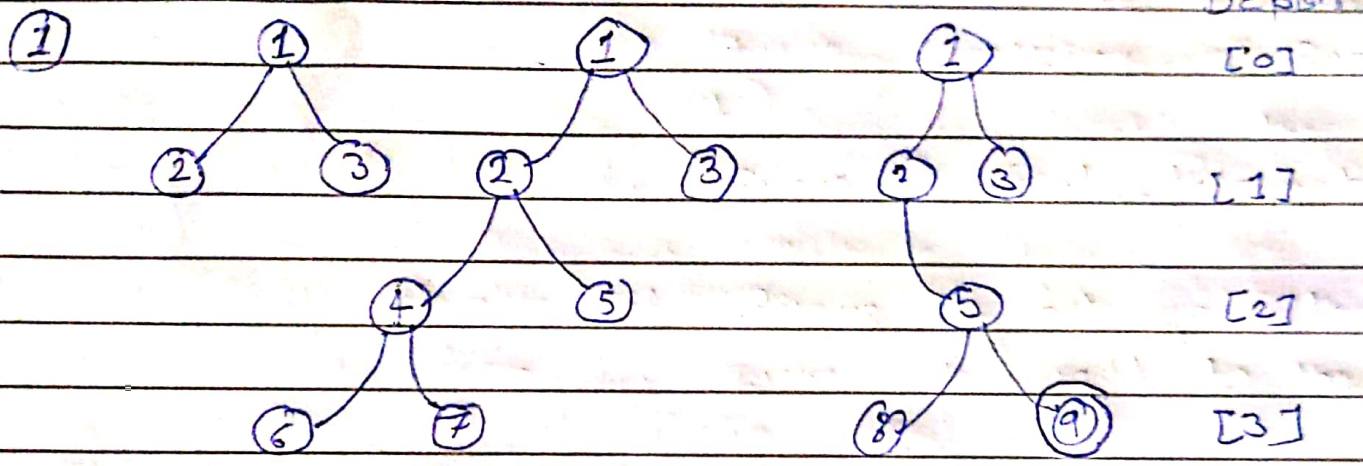
- Depth Limited Search is used to avoid Dead-End problem of DFS.
- It puts limit on maximum depth to which search is allowed.
- Beyond that limit, search is not performed.
- It then explores other branch.
- Depth of each state is recorded as it is generated.
- When picking the next state to expand, only those with with depth less or equal then the current depth expanded.
- Once all the nodes of a given depth are explored, the current depth is incremented.

Algorithm:

(1) Create a single member Queue comprising of Root Node.
(2) If first member of Queue is Goal, then go to step 5.
(3) If first member of Queue is not goal then remove it from the queue and add to the visited or closed queue.
Consider its successor if any and add them to the Queue from Front End [LIFO].
(4) If the Queue is not empty, then go to step 2.
If the Queue is empty, then go to step 6.
(5) Print "success" and stop
(6) Print "Failure" and stop

Performance of DLS:

(1) Completeness
(2) Optimality
(3) Space Complexity
(4) Time Complexity.



Consider the example as shown above.
Here "1" is the Initial Node and 9 is the Goal.
Since the Depth limit is 3., it explores the node till 3rd depth

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(ii)

Forward Chaining Reasoning.

- Forward chaining is also known as Forward Reasoning.
- It is one of the two main methods of reasoning.
- It can be described logically as repeated application of modus ponens.
- Forward chaining is a data - driven approach
- Forward chaining starts with the available data and uses inference rules to extract more data until a goal is reached
- Forward chaining is a popular implementation strategy for expert systems, business and production rule systems.

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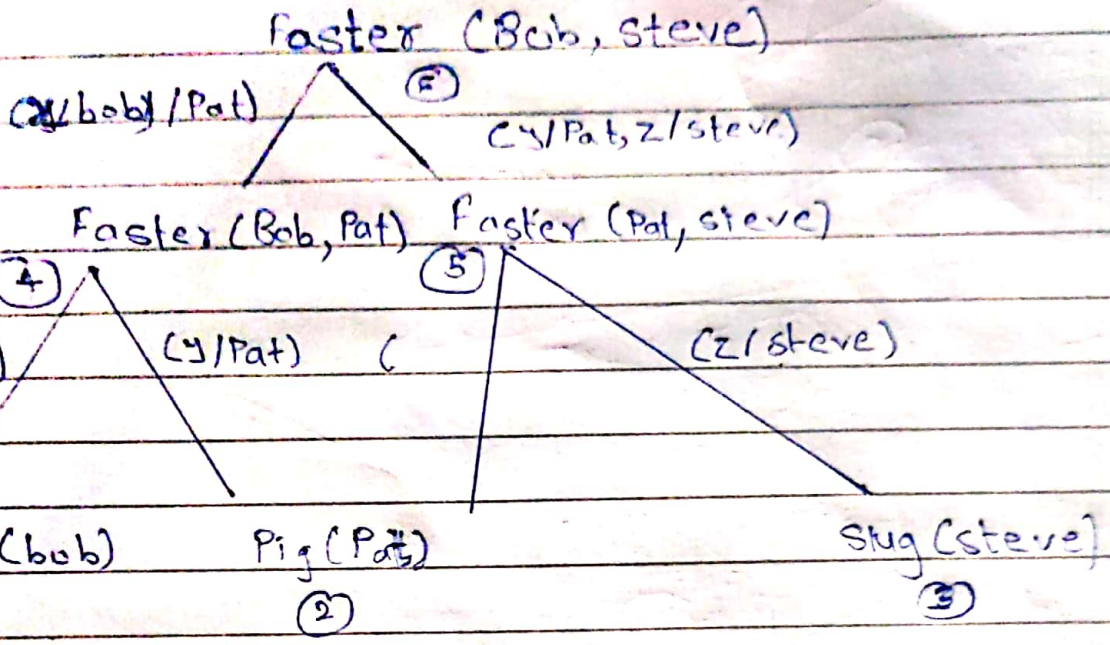
Example:



Example of forward chaining in propositional logic.

Rules:

1. Buffalo (x) ∧ Pig (y) ⇒ Faster (x, y)
2. Pig (y) ∧ Slug (z) ⇒ Faster (y, z)
3. Faster (x, y) ∧ Faster (x, z) ⇒ Faster (x, z)

Facts:

1. Buffalo (Bob)
2. Pig (Pat)
3. Slug (steve)

New Facts:

1. Faster (Bob, Pat)
2. Faster (Pat, steve)
3. Faster (Bob, steve)

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(i)

FOL.

(1) Every Gardener likes the Sun

$\forall x$ gardener $(x) \rightarrow$ likes $(x,$ Sun$)$

(2) You can fool some of the people all the time.

$\exists x \ \forall t$ person $(x) \wedge$ time $(t) \rightarrow$ Can-fool (x, t).

(3) All purple mushrooms are poisonous

$\forall x$ (mushroom $(x) \wedge$ purple $(x)) \rightarrow$ poisonous (x)

(4) Only some of the Animals are mammals.

$\exists (x)$ (Animals $(x) \rightarrow$ Mammals (x))

(5) Not all students like both Mathematics and Science.

$\neg (x)$ [student $(x) \rightarrow$ like $(x,$ mathematics$) \wedge$

$\wedge$ like $(x,$ Science.