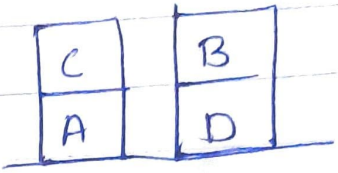
ASSIGNMENT.

Title : Goal Stack Planning.

Problem Statement :

Implement goal stack planning for the following configuration from the blocks world.

Start



Goal

Objectives:

- To learn and understand concept of goal stack planning.
- To study need and real time use of goal stack planning.
- To implement goal stack planning algorithm using a suitable programming languages

Outcomes:

We will be able to :

- learn the concept of goal stack planning
- study need and use of goal stack planning
- implement goal stack planning.

Software and Hardware requirements:

- OS: Ubuntu / Fedora 20 (64-bit)
- RAM : 4 GB
- HDD : 500 GB
- Python libraries, jupyter notebook.

Theory:

- Goal Stack Planning:
  - One of the earliest techniques in planning using goal stack.
  - Problem solver uses single stack that contains
    - sub goals and operates both
    - sub goals are solved linearly and then finally the conjoined sub goal is solved.

  - Plans generated by this method will contain complete sequence of operations for solving one goal followed by complete sequence of operations for next etc.
  - Problem solver relies on
    - A database that describes the current situation.
    - Set of operators with pre-condition, add and delete lists

- let us assume that goal to be satisfied is
  GOAL = G1 ∧ G2 ∧ G3 ... ∧ Gn

- Sub-goals G1, G2, G3 are stacked with compound goal G1 ∧ G2 ∧ G3 ... ∧ Gn at the bottom

Top G1
G2
:
GN

Bottom
G1 ∧ G2 ∧ ... ∧ GN

Algorithm:

1. Find an operator that satisfies sub goal G1 (makes it true) and replace G1 by the operator.
    1. If more than one operator satisfies sub goals then apply some heuristic to choose one.
2. In order to execute the top most operation, its pre-conditions are added onto the stack.
    1. once the preconditions of an operator are satisfied then we gurantee that operator can be applied to produce a new state.
    2. New state is obtained by using ADD and DELETE lists of an operator to the existing database.
3. Problem solver keep track of operations applied
    1. This process is continued till the goal stack is empty and problem solver returns plan of the problem

Consider given example:

Initial state:

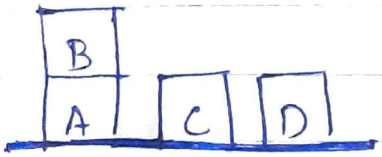
ON(B,A) ^ ONT(C) ^ ONT(A) ^ ONT(D) ^ CL(B) ^ CL(C) ^ CL(D) ^ AE

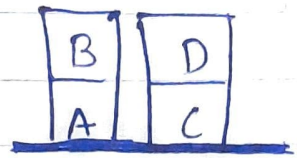
Goal state:

ON(C,A) ^ ON(B,D) ^ ONT(A) ^ ONT(D) ^ CL(C) ^ CL(B) ^ AE

Test case:

Input,





Conclusion:

We successfully implemented goal stack planning in python to implement above case.