Assignment

- Title : Goal Stack Planning
- Problem statement :
  Implement goal stack planning for the following configuration from blocks world

- 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 suitable programming lang.
- 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

- Theory :

- Goal stack Planning :
  - One of the earliest techniques in planning using goal stack
  - Problems solver uses single stack that contains both
    - subgoals and operates both
    - subgoals are solved linearly and then finally the cojoined subgoal 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
  - Problem solver relies on
    - A database that describes the current situation
    - Set of operates with precondition add & delete lists

- Let us assume that goal to be satisfied is $GOAL = G1 \perp G2 \perp G3 \perp \ldots \perp GN$

- Subgoals G_1, G_2, G_3 are stacked with compound goal $G1 * G2 * G3 * \ldots * GH$ at the bottom

Top G_1
G_2
:
GN

Bottom
$G_1 \perp G_2 \perp \ldots \perp GN$

- Algorithm:

1.) Find an operator that satisfies sub goal G_1 (makes it true) and replace G_1 by operator
   (i) If more than one operator satisfies subgoals then apply some heuristic to choose one
2.) In order to execute the top most operation its pre-conditions are added onto stack
   (i) Once the preconditions of an operator are satisfied then we are guaranteed that operator can be applied to produce new state
   (ii) 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
   (i) This process is continued till the goal stack is empty and problem solver returns plan of the problem

Consider given example:

Initial state:

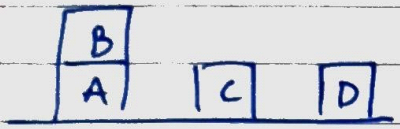
$$ON(B,A) \wedge ONT(C) \perp ON(A) \perp ONT(D) \perp CL(B) \wedge CL(C) \wedge CL(D) \wedge AE$$

Goal state:

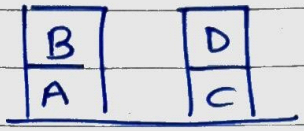
$$ON(C,A) \perp ON(B,D) \perp ONT(A) \; ONT(D) \perp CL(C) \perp CL(B) \perp AE$$

- Test case:

Input



Output



- Conclusion:

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