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Lab Assignment - 3

Title: Implementation of Solution of Constraint Satisfaction problem like SEND + MORE = MONEY

Aim: Solve Constrain Satisfaction problem like
SEND + MORE = MONEY

Objective: To Study Constraint Satisfaction method and solve constraint problem such as SEND + MORE = MONEY

Theory:

→ Constraint Satisfaction Method
In general, a CSP is a problem confused of a finite set of variable each of which has finite domain of values & set of constrained each constraint is defined over some subset of original set of variables & restricts the values for each variables such that assignment satisfy all constraints

→ Back Tracking Search
A depth first search that choose value for one variable at a time & backtracks when a variable has no legal values left to assign backtracking repeatedly chooses an unsigned variable & then tries all values in domain of that variable in turn trying to find a solution. If inconsistancy is detected then backtrack network failure causing the previous call to my another value

→ Constrain Propogation
It is a general term for propogating the implication of a constraint of one variable onto other variable

Input : Initial values for some letter in the given problem

Output : Unique value for letters S,E,N,D,M,O,R,E

Algorithm : Constraint Satisfaction Method

Platform : Windows

FAQs

1 What are other constraint satisfaction problems?

The following are problems based on CSP
→ Crypto Arithmetic
→ N-Queen
→ Map Colouring
→ Crossword
→ Sudoku
→ Latin Square Problem

2 What do you mean by constraint propagation?

It is one of these type of techniques constant propagation is central to process of solving a constrain problem. It is method of interference that assigns values to variables, characterizing a problem in such a way that some

Conditions are satisfied

3 Why backtracking search can be used to solve constraint satisfaction problem

→ CSP's can be solved by specified version of DFS
→ We can build up to a solution by searching through space of partial assignments.
→ Order in which we assign variable does not matter
→ If during process of building up solution, we falsify a constraint we can immediately reject all possible ways of extending current partial assignment
→ These idea lead to backtracking search algo
→ The algo searches a tree of partial assignment
→ Heuristics are used to determine which variable to assign next, 'pick unassigned variable'
→ The choice can vary from branch to branch
→ This dynamically choosen variable ordering has a tremendeous impact of performance.

```python
#   PE29 Vasu Kalariya
#   AI lab Assi 3

def solutions():
    letters = ('s', 'e', 'n', 'd', 'm', 'o', 'r', 'y')
    all_solutions = list()
    for s in range(9, -1, -1):
        for e in range(9, -1, -1):
            for n in range(9, -1, -1):
                for d in range(9, -1, -1):
                    for m in range(9, 0, -1):
                        for o in range(9, -1, -1):
                            for r in range(9, -1, -1):
                                for y in range(9, -1, -1):
                                    if len(set([s, e, n, d, m, o, r, y])) == 8:
                                        send = 1000 * s + 100 * e + 10 * n + d
                                        more = 1000 * m + 100 * o + 10 * r + e
                                        money = 10000 * m + 1000 * o + 100 * n + 10 * e + y

                                        if send + more == money:
                                            print(list([s, e, n, d, m, o, r, y]))
                                            all_solutions.append((send, more, money))
    return all_solutions

print(solutions())



"""
Output

PS C:\Users\kalar> & python "f:/T9/AI/Lab 3/PE29_VasuKalariya_AI_LAB Assi 3.py"
[9, 5, 6, 7, 1, 0, 8, 2]
[(9567, 1085, 10652)]
PS C:\Users\kalar>

"""
```