DYNAMIC PROGRAMMING

Dynamic programming is mainly an optimisation over plain recursion. It means simplifying a complicated problem which has recursion in it by breaking it down into simpler sub-problems.

EXAMPLES

Dijkstra's Algorithm: Dijkstra's algorithm for shortest path problem is a succesive approximation scheme that solves the dynamic programming functional equation for shortest path problem by "Reaching" method.

Fibonacci Sequence: Original algorithm for getting n-th Fibonacci number

```
function fib(n)
    if n<=1 return n
    return fib(n-1) + fib(n-2)
```

Using the technique "memoization" of dynamic programming, the above function's performance can be improve drastically. The algorithm of

Fibonacci sequence using "memoization" and bottom -up approach would be

```
function fib(n)
    if n = 0
        return 0
    else
        var previous_fib := 0, current_fib := 1
        repeat n-1 times
            var new_fib := previous_fib + current_fib
            previous_fib := current_fib
            current_fib := new_fib
    return current_fib
```

Time Complexity for this is O(n) and space complexity is O(1) or constant.