Depth-First Bottom-Up Parsing Algorithm

Input: context-free grammar $G = (N, T, P, S)$ with non-recursive start symbol

string $p \in T^*$

Stack K

1. $PUSH([\varepsilon, 0, p], K)$
2. repeat
   - 2.1. $[u, i, v] := POP(K)$
   - 2.2. *dead-end* := false
   - 2.3. repeat

     Find the first $j > i$ with rule number j that satisfies

     a) $A \rightarrow w$ with $u = qw$ and $A \neq S$ or

     b) $S \rightarrow w$ with $u = w$ and $v = \varepsilon$

     2.3.1. if there is such a j then

     2.3.1.1. $PUSH([u, j, v], K)$

     2.3.1.2. $u := qA$

     2.3.1.3. $i := 0$

     End if

     2.3.2. if there is no such j and $v \neq \varepsilon$ then

     2.3.2.1. $shift(u, v)$

     2.3.2.2. $i := 0$

     End if

     2.3.3. if there is no just j and $v = \varepsilon$ then *dead-end* := true

   until ($u = S$) or *dead-end*

until ($u = S$) or $EMPTY(K)$

3. if $EMPTY(K)$ then reject else accept

Ref: Sudkamp, Thomas A., *Languages and Machines*. 2 ed. Addison-Wesley, 1997