CYK Algorithm Implementation using Python

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Listing 1: https://github.com/Mohammad-Rahmdel/cyk_algorithm

```python
def read_input():
    file = open("input.txt","r")
    x = []
    x = file.readlines()
    x = x[0]
    x = x[:-1] # ommiting '\n'
    file.close()
    return x

def read_grammer():
    file = open("Grammer.txt","r")
    x = []
    x = file.readlines()
    for i in range(len(x)): # ommiting '\n'
        y = x[i]
        x[i] = y[:-1]
    file.close()
    return x

def parse_grammer(grammer):

    uppers = []     # storing rules containing terminals (e.g. A -> BC)
    lowers = []     # storing rules containing variables (e.g. B -> c)

    for rules in grammer :
        left, rights = rules.split('->', 1)   # find product rules
        left = left.strip()                   # removing extra spaces
        rights = rights.strip()
        right_split = rights.split('|')       # splitting rules
        for right in right_split:
            right = right.strip()
            if right.isupper():               # separating variables and ↩
                terminals
                uppers.append([left, right])
            else:
                lowers.append([left, right])
    return uppers, lowers
```

```
38
39
40  def CYK_Algorithm(bigs, littles, n):
41
42      # creating a table for dynamic programming part
43      matrix = [[set() for x in range(n)] for y in range(n)]
44
45      for i in range(n):
46          char = inp[i]
47          for x in littles:                # first row of the table
48              if char == x[1]:
49                  matrix[0][i].add(x[0])
50
51      for j in range(1, n):                # implementing CYK algorithm
52          for k in range(n-j):
53              for l in range(j):
54                  B = matrix[l][k]
55                  C = matrix[j-l-1][k+l+1]
56                  X = set()
57                  for x in B:
58                      for y in C:
59                          X.add(x + y)
60
61                  for element in X:
62                      for x in bigs:
63                          if element == x[1]:
64                              matrix[j][k].add(x[0])
65      return matrix
66
67  inp = read_input()
68  grammer = read_grammer()
69  uppers, lowers = parse_grammer(grammer)
70  matrix = CYK_Algorithm(uppers, lowers, len(inp))
71
72  # check whether last element in table contains starting symbol or not
73  if(matrix[len(inp)-1][0].__contains__('S') == True):
74      print("The input can be produced by the given grammer.")
75  else:
76      print("The input cannot be produced by the given grammer!")
```