

## Assignment 6

*due Wednesday, March 7, 2018*

### 1 Description

We want to devise a dynamic programming solution to the following problem: there is a string of characters which might have been a sequence of words with all the spaces removed, and we want to find a way, if any, in which to insert spaces that separate valid English words. For example, *theyouthevent* could be from “the you the vent”, “the youth event” or “they out he vent”. If the input is *theeaglehaslande*, then there’s no such way. Your task is to implement a dynamic programming solution in two separate ways:

- iterative bottom-up version
- recursive memoized version

Assume that the original sequence of words had no other punctuation (such as periods), no capital letters, and no proper names - all the words will be available in a dictionary file that will be provided to you.

Let the input string be  $x = x_1x_2...x_n$ . We define the subproblem `split(i)` as that of determining whether it is possible to correctly add spaces to  $x_ix_{i+1}...x_n$ . Let  $dict(w)$  be the function that will look up a provided word in the dictionary, and return *true* iff the word  $w$  is in it. A recurrence relation for `split` is given below:

$$split(i) = \begin{cases} \text{true} & \text{if } i = n + 1 \\ \bigvee_{j=i}^n [dict(x_ix_{i+1}...x_j) \wedge split(j + 1)] & \text{otherwise} \end{cases}$$

Obviously, `split(i)` only finds out whether there’s a sequence of valid words or not. **Your program must also find at least one such sequence.**

The program will read a text file from standard input. For example, if you have a Java class named `dynProg`, the command `java dynProg < inSample.txt` is what you would use to run your program. The name of the dictionary file should be hardwired in the code. We will be testing your program on a file named “diction10k.txt”.

### 2 Sample Input

The first line of input is an integer  $C$ . This is followed by  $C$  lines, each containing a single string, representing a phrase to be tested.

3

theyouthevent

theeaglehaslande

lukelucklikeslakeslukeducklikeslakeslukeluckclickslakesluckduckclickslakes

### 3 Sample Output

phrase number: 1

theyouthevent

iterative attempt:

YES, can be split

the you the vent

memoized attempt:

YES, can be split

the you the vent

phrase number: 2

theeaglehaslande

iterative attempt:

NO, cannot be split

memoized attempt:

NO, cannot be split

phrase number: 3

lukelucklikeslakeslukeducklikeslakeslukeluckclickslakesluckduckclickslakes

iterative attempt:

YES, can be split

luke luck likes lakes luke duck likes lakes luke luck licks lakes luck duck licks lakes

memoized attempt:

YES, can be split

luke luck likes lakes luke duck likes lakes luke luck licks lakes luck duck licks lakes

## 4 Submission

Post a copy of your java, python, c, or c++ program to Canvas by midnight of the due date of Wednesday, March 7.