EE3980 Algorithms

Homework 8. Printing Paragraphs

Due: May 6, 2018

Processing information is one of the key applications of computer today. After proper processing, the information will be printed in a format that is more readable to human beings. In this homework, we assume the information is printed using a fixed-width font. Thus each character will take a fixed horizontal spacing when printed. It is further assumed each paragraph is stored in the computer continuously without any line break character ('\n'). When printed each line of text will have a maximum width of N characters. If a paragraph has more than N characters, it must be broken at a space character and the line printed with the left edge aligned. The extra spaces at the end of the line should be minimized. As the example shown below ($N = 50$), the first line has 9 spaces ($M_1 = 9$). The second line has 2 extra spaces ($M_2 = 2$). And, lines 3, 4 and 5 have 5, 6, and 3 extra spaces. Line 6 needs no extra space. Since line 7 cannot fill the N spaces, no extra space is needed, either. Thus, the total number of extra spaces for this paragraph is 25. The objective of this homework assignment is to minimize the number of extra spaces needed when printing each paragraph.

Two approaches to minimize the extra spaces at the end of each printed line are possible: greedy method and dynamic programming method. Your need to write two functions, `greedy` and `DP`. When called each function will print a paragraph of text to multiple lines such that each line has no more than N characters. The integer N is defined as a global variable in your program. Your functions should work properly for $40 \le N \le 120$.

In your report, you should formulate your approach mathematically and then derive your algorithms. Of course, your implementation should match with your algorithm. A text file, `Address.txt`, is also provide for you to test your program. Your program should be able to read the file and print it out with each printed text no more than n characters and the total extra spaces for each paragraph is minimized.

Notes.

1. One executable and error-free `C` source file should be turned in. This source file should be named as `hw08.c`.

2. A `pdf` file is also needed. This report file should be named as `hw08a.pdf`.

3. Submit your `hw08.c` and `hw08a.pdf` on EE workstations using the following command:

   $ ~ee3980/bin/submit hw08 hw08.c hw08a.pdf

   where `hw08` indicates homework 8.

4. Your report should be clearly written such that I can understand it. The writing, including English grammar, is part of the grading criteria.