CS112-B-Spring 2023

Assignment 4

Submission deadline: 7th May 2023 11:59 p.m.

Problem Statement:

Consider a group of sparse polynomials to be added as follows:

P1 = 0 + x + 0x2 + x3 + 0x4 + x5 + 0x6 + x7 + x8
P2 = 1 + x + x2 + 0x3 + x4 + 0x5 + x6 + 0x7 + x8
P3 = 0 + 0x + x2 + 0x3 + 0x4 + x5 + x6 + 0x7 + x8
P4 = 1 + 0x + x2 + x3 + 0x4 + 0x5 + 0x6 + x7 + 0x8
P5 = 0 + x + 0x2 + 0x3 + 0x4 + 0x5 + x6 + 0x7 + x8

The above set of polynomials will be given in the form of a text file (matrix) named example.txt with contents as follows:

```
10
5
0   0   0   1   0
1   0   0   1   0
0   0   0   0   0
1   0   0   0   0
0   0   0   0   0
0   0   0   0   0
0   0   0   0   0
0   0   0   0   0
0   0   0   0   1
0   1   0   0   0
```

In the text file, the first line gives the number of polynomials, while the second line is the number of variables. The remaining numbers are the coefficient values for the polynomials. For the sake of simplicity the coefficients are shown as binary, but they can be integer and reals too.

Code sparse polynomial addition technique that performs addition of a group of polynomials by reading corresponding data from a text file with the above given format.

The data structures used to represent the polynomial will be a **matrix** (1D array).The polynomial P1 will be represented as follows:

0	0	0	1	0

Array data structure starting at 0 index

REQUIREMENT

You are required to code an application that performs group addition as follows:

1. Reads the data about the group of polynomials to be added from the text file.

2. Provide an option to the user to display the contents of the file (with horizontal and vertical scrolling, required for large files if needed).

3. Performs the addition, by first adding two polynomials and storing their result (in the data structure used), then adding the third polynomial to the result, and repeating this process till all polynomials have been added and then displaying the result on the screen and also writing in a text file named result_addition.txt. For the given text file, the first line will have the name of the input file i.e. example.txt and the second line will contain the coefficients of the result in their relative

i.e. 2 3 3 2 1 2 3 2 4

4. After all the polynomials have been added, display on the screen in the form of a message the (i) file name (ii) number of polynomials and variables (iii) number of non-zero values (iv) data structure used (v) and the total time taken for addition.

5. The application is to be tested on the group of files provided.

6. Please avoid the use of any built-in functions.

Sample input files are separately attached with this problem statement.

Enjoy!