Bangladesh University of Engineering & Technology
Department of Computer Science & Engineering
CSE 464: Computational Geometry Sessional
Session January 2018

Assignment 2
Polygon Partitioning

April 27, 2018

1 Introduction

In this assignment you will partition a polygon into y-monotone pieces in $O(n \log n)$ time and triangulate a y-monotone polygon in $O(n)$ time according to the algorithms described in chapter 3 of [1].

2 Input

You will have to take input from a file . The first line of the input is a number n indicating the number of corners of the polygon. Each of the next n lines contains a pair of numbers indicating the x-coordinate and y-coordinate of each corner in counterclockwise direction.

3 Output

You have to show the partitioned polygon and the triangulated polygon graphically.

4 Sample I/O

For sample input, check the two input files named 'input1.txt' and 'input2.txt' uploaded in moodle. Figure 1 demonstrates sample graphical output of polygon partitioning step. Figure 2 shows graphical output of triangulation of y-monotone polygon. Finally, Figure 3 presents sample output triangulation of a polygon.

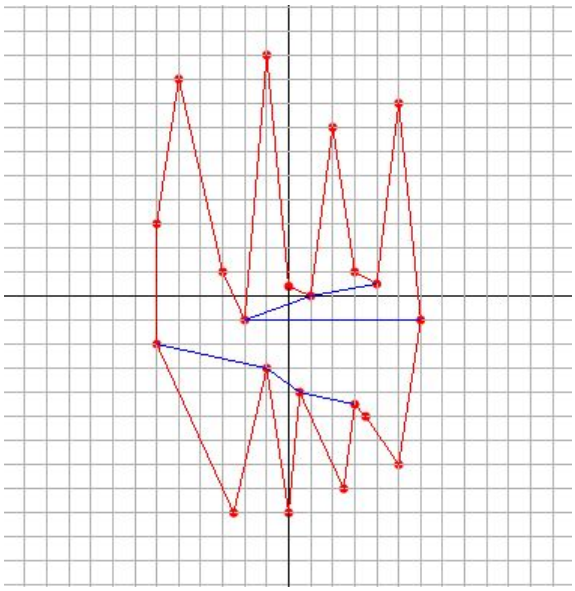

Figure 1: Sample Output for partitioning polygon in y-monotone pieces (on input1.txt).

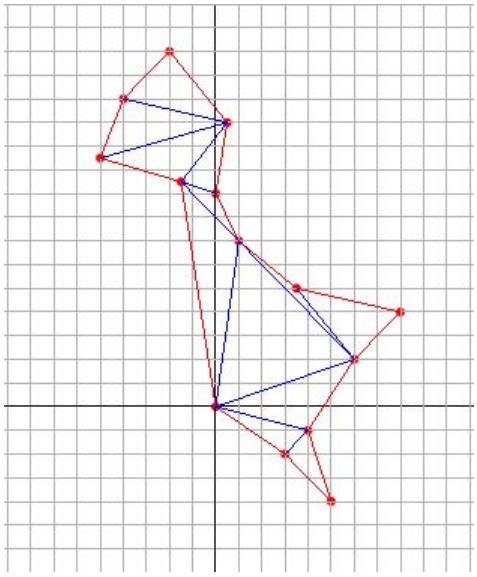

Figure 2: Sample Output for triangulating a y-monotone polygon (on input2.txt).

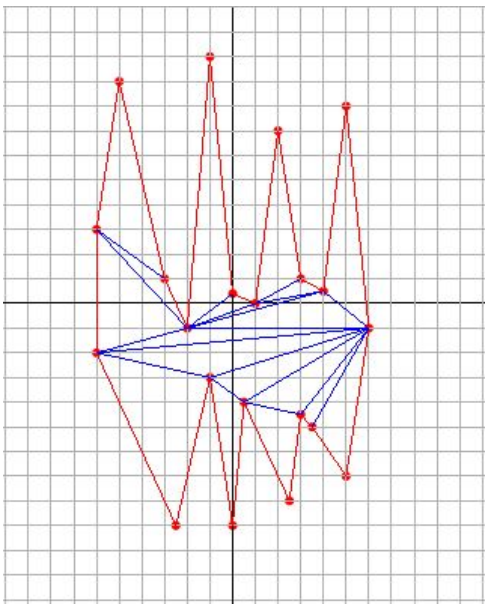

Figure 3: Sample Output for triangulation of a polygon (on input1.txt).

5 Test Cases:

You have to generate sufficient test cases including some tricky cases.

6 Report

You will have to submit a report in a doc/docx file containing the following:

- The data structures you have used to implement the algorithms.
- How you have stored the edges intersecting the current sweep line and how you have ordered the edges to find the intersecting edge immediately left to the current vertex.

7 Important Notes

Please follow the instructions listed below while implementing your assignment:

- Implement using C++/Java programming language.
- Be cautious about floating point arithmetic.

8 Marks Distribution

- Partitioning polygon into y-monotone pieces: 10
- Triangulating y-monotone polygon: 4

- Test case generation: 2
- Graphical Output: 2
- Report: 2
- [Bonus] Merging polygon partitioning and triangulation algorithm to find triangulation of a polygon: 5

9 Rules

- You have to submit all your source codes via moodle. All the file name will be in following format

  <your 7 digit student id>_<additional name>

  For example, the submitted file name would look like 1305999_PolygonParition.cpp if it is submitted by a student having 1305999 as student id. Name your input file as <your 7 digit student id>_input1.txt, <your 7 digit student id>_input2.txt and so on. Put all your source files, input files and report in a folder (even if you put all your codes in only one file) named after your 7 digit student id and create a **zipped** archive of the folder. Then submit the zip file in moodle. Failure to submit properly will cause 10% deduction.

- Any type of plagiarism is strongly forbidden. -100% marks will be given to the students who will be found to be involved in plagiarism (from book, internet, from senior/classmates code etc.). It does not matter who is the server and who is the client.

10 Deadline

Deadline is set at 5:00 am, May 12, 2018 for all lab groups.

References

[1] M. d. Berg, O. Cheong, M. v. Kreveld, and M. Overmars. *Computational Geometry: Algorithms and Applications*. Springer-Verlag TELOS, Santa Clara, CA, USA, 3rd ed. edition, 2008.