Computer Science 3A

Practical Mini-Project 2017

May 2017

Time: Deadline: 2 May 2017 - 17h00 Marks: 120

You are required to implement a practical project that will demonstrate your proficiency with the data structures discussed during this course. The following components of your practical project must be submitted on or before the deadline. This practical project will count as part of the practical component of this course. *Late submissions will not be accepted and the student will receive zero for any late assignments.*

Note: — *A signed plagiarism assignment submission form must be submitted alongside the practical assignment that will cover both the research and practical components of this assignment. The appropriate form will be made available on EVE.*

1. **Research Component (20 Marks)** — A research components that outlines the data structures that you made use of for your practical implementation. This research component should at the minimum explain your practical project, explain the data structures used, outline the history of the data structures (where and why the data structure came about), the efficiency of the data structures in terms of time and space, and why they were chosen for your implementation. [20]

   The research component must satisfy the style requirements outlined below. If you do not meet the requirements you will receive zero for the research component. Marks will be assigned based on the quality of the discussions provided, the appropriate use of diagrams and images, and the quality of the language and grammar editing.

   Note: All research assignments will be submitted to TurnItIn *in line the plagiarism policy of the University of Johannesburg.*

   1. **Minimum number of pages:** 4 pages
   2. **Maximum number of pages:** 5 pages
   3. **Minimum number of unique references:** 5 references (a list of references must be included in the document and does not contribute to the page count).
   4. **Language:** English
   5. **Page Margins:** Not exceeding the following dimensions: Top - 2.54cm, Bottom - 2.54cm, Left - 3.17cm, Right - 3.17cm
   6. **Normal Font size:** 12pt
   7. **Heading Font size:** 14pt

8. **Font family:** Times New Roman (Only!)
9. **Paper size:** A4 paper
10. **Line spacing:** 1.0
11. **Submitted file format:** PDF (Only!)
12. **Submitted File Naming Convention:** *studentnumber*_research.pdf

2. **Practical Component (100 Marks)** — A practical component that demonstrates your understanding and proficiency with the concepts discussed in class. You might need to make use of a data structure we have not yet covered in class, in this case you will need to research the implementation of the appropriate data structure. The practical component must meet the following requirements: [100]

    1. **Programming Language:** Java
    2. **Submitted File Format:** Zip (Only!)
    3. **Submitted File Naming Convention:** *studentnumber*_miniproject.zip
    4. The ZIP file must contain the following directory structure:
        (a) `source` – that contains all of the Java source files.
        (b) `dist` – that contains a executable `jar` file.
        (c) `ra` – that contains the research assignment that relates to your mini project assignment.
    5. The use of third-party libraries for primary functionally is strictly **prohibited**.
    6. Your assignment must be executable from a `jar` file. If the assignment cannot be executed, you will receive zero.
    7. Your assignment must at least make use of either a **tree-based structure** or a **graph-based structure**.
    8. The use of other data structures for auxiliary operations is encouraged (List, Stack, Queue, Heap, Dictionary, etc.)
    9. You must write the data structures yourself, you may use the textbook to guide you in the implementation of your data structures.
    10. You may not do a practical implementation that has already been assigned during the course.

    Your practical implementation must make use of an appropriate data structure as a primary component of an application. You are free to choose the assignment that you will create. Examples of such applications that you can create could be:

    1. **A Computer Vision Application** — where an image or signal processing algorithms is implemented manually to solve a respective research problem.
    2. **A Pattern Recognition Application** — where any pattern in data is found and automated using the appropriate algorithms.
    3. **A Scheduling Application** — where resources are managed according to supply and demand.

4. **A Map application** — where navigation is calculated for multiple way points using appropriate data structures.
5. **A No-SQL Database Management System** — where an efficient data structure is used to create a No-SQL Database management system. Your project should include a query mechanism (HTTP REST-based) that returns structured data. You should include a component to demonstrate your solution. *Such a system should be scalable and thread safe*.
6. **Any other data structure-based program** — where you make use of a complex data structure to create some other program, which makes use of the data structures as a primary component of the application. *Please confirm your choice with the lecturer to ensure that your application is of the correct scope*

Examples of applications you may **NOT** use include (i.e. the ban list that will result in you getting zero):

1. **A Game** — where a data structure is used for some aspect of the game play.
2. **A Utility library** — where a data structure is used for some aspect of a usable utility library.
3. **Anything copied from the Internet** — This is plagiarism and the appropriate disciplinary action will follow should this occur.

You will receive marks based on the scope of your practical assignment, your use of appropriate data structures, the style of your implementation, and the ease of operation.

You must confirm your individual project by **3 April 2017**. The method of confirming the project topic will be a Google Form (the URL will be provided closer to the time).

Submission: The following submission guidelines must be followed:

1. The soft copy of the research assignment must be uploaded to EVE.
2. The soft copy of the research assignment must be named as indicated above.
3. A copy of the practical component must be submitted on EVE.
4. The copy on EVE must be named as indicated above.
5. You must provide a *Plagiarism Cover Page* with the soft copy of the research assignment. If you do not submit this cover page your assignment will not be marked.
6. CLEARLY LABEL YOUR SUBMISSIONS!