The implication and taxonomy of linear and nonlinear data structure

By

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Declaration

I declare that this dissertation is my own original work. Where collaborations with other researchers are involved, or materials generated by other researchers are included, the parties and/or materials are acknowledged or are explicitly referenced as appropriate.

This work is being submitted for the degree of Master in Computer Science at the University of Management Science and technology. This thesis has not been submitted to any other university or institution for any other degree or examination.

Date

Signature

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Publications

Some ideas, figures and tables of this dissertation have previously appeared in the following six publications:

Muhammad Shoaib Farooq, Aqsa Ali, Adnan Abid (2014) What Should Be Taught About Arrays In Cs2? 2nd International Conference on Computational and Social Sciences (ICCSS-14), Vol (3), pp. 2904-2913.

Farooq, M. S., Ali, A., Abid, K., & Abid, A. (2015). Learning Stack: Structured, Object Oriented, Generic, and Design Pattern Approach. *JOURNAL OF FACULTY OF ENGINEERING & TECHNOLOGY*, *21*(2), 191-203.

Muhammad Shoaib Farooq, Aqsa Ali, Adnan Abid (2014) What Should Be Taught About Arrays In Cs2? J. Appl. Environ, Biol. Sci Vol(4) issue 7s, pp. 22-32.

Farooq, M. S., Ali, A., Abid, (2015). Learning Queue: Structured, Object Oriented, Generic, and Design Pattern Approach. *JOURNAL OF FACULTY OF ENGINEERING & TECHNOLOGY*. (Submitted).

Farooq, M. S., Ali, A., Abid, (2015). Learning Linked List for the Course of Data Structures. J*OURNAL OF RESEARCH AND REFLECTION IN EDUCATION* (Submitted).

Farooq, M. S., Ali, A., Abid, (2015). Learning Tree for the Course of Data Structures. *JOURNAL OF RESEARCH AND REFLECTION IN EDUCATION* (in progress).

Dedication

This thesis is dedicated to my parents

And

My husband, their proficient

Guidance and splendid inspiration had

Positively influenced my life and made me capable

Of attaining this degree

Successfully.

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Abstract

The Linear and nonlinear Data Structures are core part of computer science or curriculum. Linear data structure covered all types of consecutive indexed and reference wise ordinal data structures. For example, array, linked list and linear collection of abstract data types. We cover binary tree in nonlinear data structure. All these topics were covered in most of CS related core courses and included in data structure text book. Major issue is that what topic is to be covered and what subtopics is to be taught by undergraduate students. This study propose classification of topics and subtopics in linear and nonlinear data structure. Major contribution of this research is to figure out all variants of linear and nonlinear data structure topics and provide standard taxonomies. Each dimension has explained in terms of structured, object oriented, memory diagrams, applications, implementation and complexity and have also discussed its application using design patterns. It will facilitate students to learn and visualize more about linear and nonlinear data structure concepts and for teachers to revise their course outlines, implement standard code and visualize memory diagrams.