UNIVERSITY OF BUEA

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DEPARTMENT OF COMPUTER SCIENCE

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

PROJECT REPORT

~~TITLE:~~ TOWARDS A DATA STRUCTURE FOR PARAMETER PASSING STYLES.

NOUMBA LEONARD

SC17A350

SUPERVISOR: ~~DR WILLIAM S. SHU~~William S. Shu, PhD

~~18~~ SEPTEMBER 2020

DECLARATION

I hereby declare that this project report has been written by me Noumba Leonard, that to the best of my knowledge, all borrowed ideas and materials have been duly acknowledged, and that it has not receive any previous academic credit at this or any other institution.

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CERTIFICATION

This is to certify that this report entitled "TOWARDS A DATA STRUCTURE FOR PARAMETER PASSING STYLES" is the original work of NOUMBA LEONARD with Registration Number SC17A350, student ~~at~~of the Department of Computer Science at the University of Buea. All borrowed ideas and materials have been duly acknowledged by means of references and citations. The report was supervised in accordance with the procedures laid down by the University of Buea. It has been read and approved by:

William S. Shu, PhD CEng CITP MBCS — Date

University of Buea

(Project Supervisor)

Dr. Denis L. Nkweteyim — Date

Head of Department of Computer Science

DEDICATION

I dedicate this work:

~~In~~To the memory of my Uncle Numba Emmanuel who was a father to me. Your endless love and care ~~that~~ still give~~s~~ me inspiration ~~up till~~to date and shall no~~'~~t be forgotten.

To God almighty for his endless strength and blessings that have carry me through this project.

To my mother for her everyday love, care and support.

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Dr. Ali Wacka and Dr. Nyamsi Madeleine for the fundamental notions of software engineering, and~~.~~

My beloved mother, family and friends who kept on encouraging and motivating me to give my best.

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ABSTRACT

Parameter passing mechanisms are the various ways used to pass parameters to procedures or functions. A parameter passing mechanism hugely depends on how we intend to use the parameter and what factors characterise it. By. of its parameters naturethe nature, we mean how the parameters are used, their values and significance and how they could be combined and passed. Several factors such as context, evaluation strategy, and typing have been exploited and used to describe how parameters are passeding mechanisms. due to the degree to which pParameter passing mechanismstyles modify and significantly affects the meaning of computations and so, they are widely exploited in programming languages. In this project, we construct a structure for parameter passing styles and define permissible operations on this structure. That is, a data structure for major known passing styles and possibly infinitely many user define styles. This structure providelets users with the ability to add new passing style, remove undesired or/ unpleasant styles from the structureit, and alsoas well as add/remove interpretations over suchfor a style on adding/removing the passing styles from the structure. We then illustrate usefulness of one of these passing styles in safety systems. Specifically, parameter passing by value is used to prevent changes from being made to an entity before or after it is used.

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Chapter 1

Introduction

1.1 Project Motivation

Rapid growth of programming languages and software systems has increased the need for an efficient and more reliable passing mechanism for communication between modules (or functions) of these languages or systems and also across different application domains. With the ever-increasing data to be communicated between different application domains, there is the need for an efficient structure to hold this data and a passing mechanism to safely communicate this data in an efficient way.

Also, we identify values of these components that are predicted to yield good performance. And in addition, we develop functions (operations) for manipulation this data structure. Some of the permissible operations on this data structure include:

- Add a new parameter passing style.
- Remove an existing passing style.
- See various passing styles in the structure.

My interest in this project is to model and develop a data structure for parameter passing that can serve users to communicate and protect their data between application domains. Also, due to the ever-increasing amount of data to communicate, users can define and add their own new, even

more efficient passing styles in the structure. With this ability, the ever changing need for efficient parameter passing ~~is~~could be met.

1.2 Project Aims

The aim of this project is to develop a data structure (skeletal data structure) that closely examines the various parameter passing mechanisms (including novel styles) and takes into account factors that affect parameter passing such as entity passed (e.g. value or computation), evaluation strategy, and execution context as well as typing.

~~As an~~The objectives ~~to~~of this project are~~, I seek~~ to:

- Identi~~t~~fy and group (?) the various parameter passing ~~mechanisms~~styles and the relationships amongst them in terms of ~~the various.~~
- ~~Identify~~ basic components (characterising factors).~~involved in parameter passing, group them into basic classes, and combine them to define various parameter passing styles. Also, we identify values of these components that are predicted to yield good performance.~~
- Develop a data structure that holds various parameter passing styles and can be used to showcase these styles. ~~And in addition, we develop functions (operations) for manipulation this data structure. Some of the permissible operations on this data structure include:~~
    - ~~Add a new parameter passing style.~~
    - ~~Remove an existing passing style.~~

- ~~See various passing styles in the structure.~~
- Identify the various parameter passing styles with specific application domains and also explore usefulness of novel styles.

1.3 Report Structure

The rest of this report is organized as follows. Chapter 2 explores the analysis and design of the data structure. It defines the problem statement, the research aims and questions and finally the design algorithms of my program. Chapter 3 presents the implementation part of the project. In Chapter 4~~, I~~ presents the results of the project and discusses the work~~ions from the implementation of the analysis and design presented in Chapter 3~~. ~~It~~ the chapter provides results of implementation and explains the algorithm used to implement the main activities. Chapter 5 is the conclusion of the report.

Chapter 2

Analysis and Design

Requirements of the System

The aim of this project is to develop a skeletal data structure that closely examines the various parameter passing mechanisms (including novel styles) and takes into account factors that affect parameter passing such as entity passed (e.g. value or computation), evaluation strategy, and execution context as well as typing. This structure provides users with the ability to add new passing styles, remove an existing passing style and also see all available passing styles in the structure.

User defined passing styles can then be used by other organisations or users if need be. In order to achieve this, we have to answer questions such as:

- Can users get hold of the available factors for parameter passing?
- Can users create their own passing style using any number of the available factors affecting parameter passing?
- Can users newly created passing style be added in the structure?
- Can users remove a passing style they don't desire?
- Can users see list of available passing styles?

Main Entities, Activities and Data Structures

Parameter passing mechanisms are assorted and widely used in programming. The choice of a parameter passing mechanism is an important decision of in the design of a high level programming language