Available online at www.sciencedirect.com
ScienceDirect
Journal of Electrical Systems and Information Technology xxx (2016) xxx–xxx
www.elsevier.com/locate/jesit

Generalized data stacking programming model with applications

Hala Samir Elhadidy [a,*], Rawya Yehia Rizk [a], Hassen Taher Dorrah [b]

[a] *Electrical Engineering Department, Faculty of Engineering, Port Said University, Egypt*
[b] *Electrical Engineering Department, Cairo University, Giza, Egypt*

Received 26 May 2015; received in revised form 13 November 2015; accepted 22 November 2015

Abstract

Recent researches have shown that, *everywhere* in various sciences the systems are following stacked-based stored change behavior when subjected to events or varying environments "*on and above*" their normal situations. This paper presents a generalized data stack programming (GDSP) model which is developed to describe the system changes under varying environment. These changes which are captured with different ways such as sensor reading are stored in matrices. *Extraction algorithm* and *identification technique* are proposed to extract the different layers between images and identify the stack class the object follows; respectively. The general multi-stacking network is presented including the interaction between various stack-based layering of some applications. The experiments prove that the concept of stack matrix gives average accuracy of 99.45%.

Keywords: Consolidity theory; Extraction algorithm; Generalized data stacking programming model; Identification technique; Multi-stacking networks

1. Introduction

Representing information, storing and retrieving it are fundamental in computer science. There are many ways of data structures. Stack is one of them and it is the arrangement of items where the most recently arrived item at the stack is the first to be retrieved. Traditionally, objects are stored in a pile form where insertion and deletion are done from the top only. However, this idea is changed in (Elhadidy et al., 2013, 2014) by introducing the Generalized Data Stacking Programming (GDSP) model. The stack is not only one class but it has more than one depending on the place where the new element is inserted.

Scientists, researchers and engineers have exerted their best efforts to introduce various mathematical techniques for understanding the behavior of the system through investigating their stability and measuring their degree of robustness thus avoiding their possible future failure or collapse. Nevertheless, some systems still continue to fail or go into chaotic states (Dorrah and Gabr, 2012). Therefore, it was found that any system responses to both time and any event subjected

* Corresponding author.
E-mail addresses: h.elhadidy@eng.psu.edu.eg (H.S. Elhadidy), r.rizk@eng.psu.edu.eg (R.Y. Rizk), dorrahht@aol.com (H.T. Dorrah).
Peer review under the responsibility of Electronics Research Institute (ERI).

ELSEVIER Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.jesit.2015.11.013

Please cite this article in press as: Elhadidy, H.S., et al., Generalized data stacking programming model with applications. J. Electr. Syst. Inform. Technol. (2016), http://dx.doi.org/10.1016/j.jesit.2015.11.013

to it during its life course by changing its parameters (Dorrah, 2014a; Little et al., 2006; Alsbouí et al., 2011). These changes follow a stack-based behavior in more general sense where the changes take a form of new layer added to or removed from the object.

The main goal of this work is to introduce the basic concepts of a new data structure technique (GDSP) which changes the old definition of the stack and therefore the way to present any physical system with its different operations on and above the normal situations. The new definition can be used in many fields so that it helps to discuss and analyze any data of a system through matrix implementation which replaces array implementation to represent the stack in all of its classes. It is based on growing (or shrinking) matrices which is equivalent to insert (or remove) items to (or from) the stack. The stack matrix which can be produced by different ways is used for modeling and analyzing the system.

In order to realize this idea, *an extraction algorithm* is applied to extract what happen to an object after it is exposed to an event. The algorithm's idea is inspired by the pattern points matching algorithm which finds the correspondence between two sets of points. If the image of an object is obtained before and after being affected by an event, the class of the stack that the object follows is identified according to *the identification technique* which is also presented. The same concept is also extended to multi-stacking systems appearing when handling various real life systems with interactions (Elhadidy et al., 2014).

The paper is organized as follows: Section 2 presents the motives of this study. Section 3 presents the generalized stack definition which includes the traditional form of stack, GDSP model having the classes in more detail, the exceptions of the model and some of multi-stacking applications. Section 4 presents stack-based layering extraction and processing. It includes the *extraction* and *identification algorithms* which depend on the point pattern point matching algorithm as tools to understand the concepts of the new model. Section 5 presents the multi-stacking layering network with applications. Section 6 presents the experiments of applying the stack matrix to a circle which represents the human artery showing that any process can be done easily with high accuracy. In this section also the extract algorithm is applied to a real image of an artery to extract the fat using the stack matrix. Section 7 presents conclusion and future works. Appendix A provides the coding of each class of our model. Appendix B presents the mathematical representation of them.

2. Motives of the study

Systems can be classified according to different criteria and lots of works have been done on the system classification. In many life sciences, real life physical systems are ***event-driven*** frameworks (Dorrah, 2012). The time, on the other hand, is governing the system state equation and consequently the system response. It is also crucial in determining the order of the sequence of the occurrence of events (Thiele, 2007).

The relation between the "***time-driven***" versus "***event-driven***" dilemma was the subject of many studies especially by the computer science researchers. As the systems handled by computer science are mainly virtually, their developed approaches could not be replicated to physical system due to difference in their nature (Dorrah, 2014b). Such problem was only solved recently by introducing the "***time driven-event driven-parameters change***" paradigm as shown in Fig. 1 (Dorrah, 2014a, 2013). This paradigm states that each event affecting the system "***on and above***" its normal situation will yield its change of parameters. This in fact reveals that real life systems are intelligent and stores all their affecting events through consecutive changes of parameters. A simple representation of this paradigm can be illustrated by the following representation (Dorrah, 2014b).

Due to wide changes of the nature and type of systems, such changes will differ from one system to another depending on their internal property denoted by the "Consolidity Index" (Dorrah and Gabr, 2012; Dorrah, 2014a, 2013; Gabr, 2015). Such index can be calculated from the knowledge of system physical equations. Consolidity (the act and quality of consolidation) is measured by the system output reactions versus combined input and system parameters reaction when subjected to varying environments and events. Moreover, consolidity can govern the ability of systems to withstand changes when subjected to incurring events or varying environments "on and above" normal operation during the system change pathway.

System changes in real life may be logically conceived to be internally stacked at every event state μ in the form of a new sub-layer (or minute sub-layer or sub-stratum) arranged in some form in relations to the other preceding existing layer(s). Such new sub-layers (or sub-strata) represent the incremental physical changes or alternations imposed on the original system basic layer(s) due to the induced effects at event state. Different classes of such stacked-based arrangements at the basic system layer(s) are discussed in the next section and described in Table 1 as follows.

Please cite this article in press as: Elhadidy, H.S., et al., Generalized data stacking programming model with applications. J. Electr. Syst. Inform. Technol. (2016), http://dx.doi.org/10.1016/j.jesit.2015.11.013