SCALING GEOMETRIC MONITORING OVER DISTRIBUTED STREAMS

by

Alexandros D. Keros

A thesis submitted in partial fulfillment of the requirements for the degree

of

BACHELOR

in

Electronic and Computer Engineering

Approved:	
Dr. Vasilis Samoladas	first reader
Major Professor	Committee Member
second reader Committee Member	dean

Technical University of Crete Chania, Crete, Greece

2015

Copyright © Alexandros D. Keros 2015

All Rights Reserved

Contents

	Pa	age
Lis	t of Tables	v
Lis	t of Figures	vi
Ι	INTRODUCTION AND BACKGROUND	1
1	Introduction 1.1 Overview 1.2 Motivation 1.3 Related Work 1.4 Contributions 1.5 Thesis Structure	2 2 2 2 2 2
2 II	Theoretical Background	3 3 3 4
3	Problem Statement	5
4	Implementation	6 6 6 6
II	RESULTS AND CONCLUSIONS	7
5	Experimental Results	8 8 8
6	Conclusions and Future Work	9 9 9

${\it Appendix} \; \ldots \; $	13
Chapter A Tools	14
A.1 Python	14
A.2 Numpy and Scipy	14
A.3 Openopt	14
A 4 Network X	14

List of Tables

Table Page

List of Figures

Figure Page

Part I

INTRODUCTION AND BACKGROUND

Introduction

- 1.1 Overview
- 1.2 Motivation
- 1.3 Related Work
- 1.4 Contributions
- 1.5 Thesis Structure

Theoretical Background

- 2.1 Geometric Monitoring of Distributed Streams
- 2.1.1 Distributed Streams
- 2.1.2 Computational Model
- 2.1.3 Geometric Interpretation
- 2.2 Multiobjective Optimization
- 2.2.1 Minimax
- 2.3 Maximum Weight Matching in Graphs

Part II

PROBLEM DEFINITION AND IMPLEMENTATION

Chapter 3 Problem Statement

Implementation

- 4.1 Grouped Balancing
- 4.2 Heuristic Balancing
- 4.3 Node Matching
- 4.4 Implementation Challenges

Part III

RESULTS AND CONCLUSIONS

Experimental Results

- 5.1 Heuristic Balancing
- 5.2 Node Matching
- 5.3 Overall Results

Conclusions and Future Work

- 6.1 Conclusions
- 6.2 Future Work

References

- [1] I. Hickson and D. Hyatt, "HTML5: A vocabulary and associated APIs for HTML and XHTML," W3C Working Draft, vol. 19, 2010.
- [2] G. Lawton, "New ways to build rich internet applications," *Computer*, vol. 41, no. 8, pp. 10–12, 2008.
- [3] S. J. Vaughan-Nichols, "Will HTML 5 Restandardize the Web," *Computer*, vol. 43, p. 13, 2010.
- [4] L. Paulson, "Building rich web applications with Ajax," *Computer*, vol. 38, no. 10, pp. 14–17, 2005.
- [5] J. Falkner, J. Timney, and B. Galbraith, Beginning JSP web development. Wrox Press Ltd., 2001.
- [6] H. Williams and D. Lane, Web database applications with PHP & MySQL. O'Reilly & Associates, Inc., 2004.
- [7] T. Berners-Lee, J. Mogul, L. Masinter, P. Leach, R. Fielding, H. Frystyk, and J. Gettys, "Hypertext Transfer Protocol-HTTP/1.1," http://www.ietf.org/rfc/rfc2616.txt, 1999, [Online; accessed June 8, 2012].
- [8] D. Kuhn, D. Wallace, and J. AM Gallo, "Software fault interactions and implications for software testing," Software Engineering, IEEE Transactions on, vol. 30, no. 6, pp. 418–421, 2004.
- [9] D. Kuhn and M. Reilly, "An investigation of the applicability of design of experiments to software testing," in Software Engineering Workshop, 2002. Proceedings. 27th Annual NASA Goddard/IEEE. IEEE, 2002, pp. 91–95.

- [10] C. Colbourn, "Combinatorial aspects of covering arrays," Le Matematiche (Catania), vol. 59, pp. 125–172, 2004.
- [11] R. Bryce and A. Memon, "Test suite prioritization by interaction coverage," in Workshop on Domain specific approaches to software test automation: in conjunction with the 6th ES-EC/FSE joint meeting. ACM, 2007, pp. 1–7.
- [12] R. Bryce, S. Sampath, and A. Memon, "Developing a single model and test prioritization strategies for event-driven software," *Software Engineering, IEEE Transactions on*, no. 37, pp. 48–64, 2011.
- [13] S. Sampath, R. Bryce, G. Viswanath, V. Kandimalla, and A. Koru, "Prioritizing user-session-based test cases for web applications testing," in Software Testing, Verification, and Validation, 2008 1st International Conference on. IEEE, 2008, pp. 141–150.
- [14] T. Berners-Lee, L. Masinter, M. McCahill *et al.*, "Uniform resource locators (URL)," http://www.ietf.org/rfc/rfc1738.txt, 1994, [Online; accessed June 8, 2012].
- [15] T. Burners-Lee, "Cool URIs don't change," W3C, 2008.
- [16] A. Gleyzer, M. Denisyuk, A. Rimmer, and Y. Salingar, "A fast recursive GIS algorithm for computing strahler stream order in braided and nonbraided networks," *JAWRA Journal of* the American Water Resources Association, vol. 40, no. 4, pp. 937–946, 2004.
- [17] S. Sampath, S. Sprenkle, E. Gibson, L. Pollock, and A. Greenwald, "Applying concept analysis to user-session-based testing of web applications," *Software Engineering, IEEE Transactions* on, vol. 33, no. 10, pp. 643–658, 2007.
- [18] Y. Guo and S. Sampath, "Web application fault classification-an exploratory study," in Proceedings of the Second ACM-IEEE international symposium on Empirical software engineering and measurement. ACM, 2008, pp. 303–305.
- [19] F. Ocariza Jr, K. Pattabiraman, and B. Zorn, "JavaScript errors in the wild: An empirical study," in Software Reliability Engineering (ISSRE), 2011 IEEE 22nd International Symposium on. IEEE, 2011, pp. 100–109.

- [20] Mozilla, "Mozilla Developer Network, Error Object Reference," https://developer.mozilla.org/en/JavaScript/Reference/Global_Objects/Error, 2011, [Online; accessed June 8, 2012].
- [21] I. Herman, G. Melançon, and M. Marshall, "Graph visualization and navigation in information visualization: A survey," Visualization and Computer Graphics, IEEE Transactions on, vol. 6, no. 1, pp. 24–43, 2000.
- [22] W. Wang, Y. Lei, S. Sampath, R. Kacker, R. Kuhn, and J. Lawrence, "A combinatorial approach to building navigation graphs for dynamic web applications," in *Software Maintenance*, 2009. ICSM 2009. IEEE International Conference on. IEEE, 2009, pp. 211–220.
- [23] J. Czerwonka, "Pairwise testing in the real world: Practical extensions to test-case scenarios," http://msdn.microsoft.com/en-us/library/cc150619.aspx, 2008, [Online; accessed June 8, 2012].
- [24] M. Grochtmann, J. Wegener, and K. Grimm, "Test case design using classification trees and the classification-tree editor CTE," in *Proceedings of Quality Week*, vol. 95, 1995, p. 30.
- [25] D. Kuhn, R. Kacker, and Y. Lei, "Practical combinatorial testing," NIST Special Publication, vol. 800, p. 142, 2010.

Appendix

Chapter A

Tools

- A.1 Python
- A.2 Numpy and Scipy
- A.3 Openopt
- A.4 NetworkX