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PERSONAL INFORMATION

Date of Birth November 29, 1985
Place of Birth Lisboa
Nationality Portuguese

ACADEMIC HABILITATIONS

Mar. 2010 – **Ph.D. Student in Computer Science**, *Departamento de Informática*, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Portugal.

PH.D. THESIS

title **A Type System for Value-dependent Information Flow Analysis**

advisor Professor Luís Caires

description Information systems are widespread and used by anyone with computing devices as well as corporations and governments. It is often the case that security leaks are introduced during the development of an application. Reasons for these security bugs are multiple but among them one can easily identify that it is very hard to define and enforce relevant security policies in modern software. This is because modern applications often rely on container sharing and multi-tenancy where, for instance, data can be stored in the same physical space but is logically mapped into different security compartments or data structures. In turn, these security compartments, to which data is classified into in security policies, can also be dynamic and depend on runtime data. In this thesis we introduce and develop the novel notion of dependent information flow types, and focus on the problem of ensuring data confidentiality in data-centric software. Dependent information flow types fit within the standard framework of dependent type theory, but, unlike usual dependent types, crucially allow the security level of a type, rather than just the structural data type itself, to depend on runtime values. Our dependent function and dependent sum information flow types provide a direct, natural and elegant way to express and enforce fine grained security policies on programs.

Namely programs that manipulate structured data types in which the security level of a structure field may depend on values dynamically stored in other fields. The main contribution of this work is an efficient analysis that allows programmers to verify, during the development phase, whether programs have information leaks, that is, it verifies whether programs protect the confidentiality of the information they manipulate. As such, we also implemented a prototype typechecker that can be found at <http://ctp.di.fct.unl.pt/DIFTprototype/>.

Sept. 2007 – **MSc. in Computer Science**, *Departamento de Informática*,
Feb. 2010 Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa,
Portugal.

Grade average: 18 out of 20

Class rank: 4th out of 118

MASTER DISSERTATION

title **Type Inference for Conversation Types**

advisor Professor Luís Caires

description The main focus of this dissertation is the design and implementation of a typechecking algorithm with type inference for conversation types. To do so, we propose and implement a prototype for a proof-of-concept distributed programming language based on Conversation Calculus. This is an interesting issue to address if we take into account that service-oriented applications can have very rich and complex protocols of services' usage, thus requiring the programmer to annotate every service invocation with a type corresponding to his role in a protocol, which would make the development of such applications quite unpractical. Therefore, freeing the programmer from that task, by having inference of types that describe such protocols, is quite desirable not only because it is cumbersome and tedious to do such annotations but also because it reduces the occurrences of errors when developing real complex systems. This work was supported by a research grant from EU Project SENSORIA.

Sept. 2003 – **BSc in Computer Science**, *Departamento de Informática*,
Jun. 2007 Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa,
Portugal.

Grade average: 15 out of 20

RESEARCH INTERESTS

My research interests lie in the area of Programming Languages Principles, Design and Implementation. In particular:

- Programming Languages
- Formal Languages
- Type Systems
- Language-based Security
- Information Flow Analysis

SCHOLARSHIPS

- FCT/MCTES Doctoral Degree Grant, March 2011 – March 2015
- Project Interfaces CMU-Portugal research grant, 2nd semester 2009/2010
- FFCUL research grant under the scope of the EU Project SENSORIA, 1st semester 2009/2010
- FFCUL research grant under the scope of the EU Project SENSORIA, 2nd semester 2008/2009
- CITI research grant, 1st semester 2008/2009

LANGUAGES

Portuguese Native
English Fluent

STANDARDIZED TESTS

iBT TOEFL Scores

Test Date Sept 19, 2009
Reading 29/30
Listening 26/30
Speaking 24/30
Writing 25/30
Total 104/120

PUBLICATIONS

Peer-reviewed Papers

- 2015 **Dependent Information Flow Types**, Luísa Lourenço and Luís Caires. In Proceedings of the 42nd Annual ACM SIGPLAN-SIGACT Symposium on Principles of Programming, POPL 2015, Mumbai, India, January 12-18 2015
- 2013 **Information Flow Analysis for Valued-Indexed Data Security Compartments**, Luísa Lourenço and Luís Caires. In proceedings of 8th International Symposium on Trustworthy Global Computing, TGC 2013, Buenos Aires, Argentina, August 30-31, 2013
- 2012 **Segurança de Dados em Aplicações Centradas em Dados por Análise de Fluxo de Informação**, Luísa Lourenço and Luís Caires. In proceedings of Simpósio de Informática, INFORUM'12, Caparica, Portugal, September 6-7, 2012.
- 2011 **A Core Language for Data-centric Processes**, Luísa Lourenço. In proceedings of Simpósio de Informática, INFORUM'11, Coimbra, Portugal, September 8-9, 2011.

- 2010 **Inference of Conversation Types for Distributed Multiparty Systems**, Luísa Lourenço and Luís Caires. In PLACES'10, 3rd International Workshop in Programming Language Approaches to Concurrency and Communication-centric Software at European Joint Conferences on Theory and Practice of Software (ETAPS'10), 2010

Technical Reports

- 2014 **Dependent Information Flow Types**, Luísa Lourenço and Luís Caires, July 2014.
- 2013 **Information Flow Analysis for Valued-Indexed Data Security Compartments**, Luísa Lourenço and Luís Caires, April 2013.

Thesis

- 2010 **Type Inference for Conversation Types**, MSc Dissertation. Supervised by Luís Caires.

PREVIOUS WORK EXPERIENCE

- Oct. 2008 – *Researcher Assistant* at the Center for Informatics and Information Technologies (CITI)
Jun. 2015

This work consisted mainly of research in the scope of both my Master's and PhD thesis but also included other similar research.

- Mar. 2007– *Teaching Assistant* at the Department of Computer Science of the
Jul. 2011 New University of Lisbon, Faculty of Sciences and Technology

I taught laboratory classes of the following courses:

- Introduction to Computers and Programming, 2006/2007 and 2008/2009
- Algorithms and Data Structures, 2010/2011
- Computational Logic 2010/2011

SUMMER SCHOOLS ATTENDED

- 2010 In June 2010 I attended the **Oregon Programming Languages Summer School 2010**, in Eugene, Oregon USA. The lecturers of this summer school were Robert Constable, Anupam Datta, Robert Harper, Xavier Leroy, Conor McBride, Greg Morrisett, Frank Pfenning, Benjamin Pierce, and Andrew Tolmach.
- 2008 In September 2008 I attended the **GLOBAN 2008, The Global Computing Approach to Analysis of Systems summer school** in Warsaw, Poland. The lecturers of this summer school were Rocco De Nicola, Andrew D. Gordon, Reiko Heckel, Martin Hoffman, Joost-Pieter Katoen, Joe Kiniry, Flemming Nielson, and Andrei Sabelfeld.

EXTRA-CURRICULAR ACTIVITIES

- 2014 – 2015 **Invited Speaker.** I gave talks for a general audience regarding my thesis work in the context of the Center for Informatics and Information Technologies's seminars as well as in the Ph.D. Computer Science program's Workshop.
- 2007 – 2012 **Volunteer at ExpoFCT.** This event is an open day where several high schools visit FCT/UNL campus to participate in activities and learn about the offered curricula. As a volunteer I helped in activities aimed at introducing programming and web programming to high school students.
- 2006, 2007, and 2009 **Volunteer at Conferences/Programming Contests.** I helped in the organisation of International Federated Conference on Distributed Computing Techniques 2009 (DisCoTec'09) and Principles and Practice of Programming in Java 2007 (PPPJ'07) conferences. I also helped in the regional programming contest SWERC 2006, South Western Europe Regional ACM Programming Contest that took place at FCT/UNL campus.
- 2007 – 2008 **Organiser of Tutorial Sessions for Freshmen Students.** During the first semester of the year 2007/2008 I helped organise a senior's students initiative to help BSc's freshmen with two of their courses (Introduction to Programming A and Introduction to Computer Systems and Networks). This consisted in helping the freshmen with their theoretical and practical questions regarding these courses and the initiative also had a classroom and schedule time reserved for this effect (2 hours per week).
- 2007 – 2008 **Student Representative of the Pedagogical Committee of CS's MSc.** As a student member of the Pedagogical Commission I elaborated a feedback annual report that compiled all the feedback received from the students during the year regarding the MSc's courses and their issues. This document highlighted some of the main problems of the courses, and gave suggestions to improve the Computer Science MSc.
- 2006 – 2008 **Translator in Linux Distribution.** Between 2006 and 2008 I helped in a project, Projecto Traduz, aimed at translating Linux distribution Debian to Portuguese.