Europass Curriculum Vitae

Personal information

First name(s) / Surname(s)	**Đurica Nikolić**
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Homepage	http://profs.sci.univr.it/~nikolic/ http://www.cosbi.eu/index.php/people/people-research/1135-durica-nikolic
Nationality	Serbian
Date of birth	February 20th, 1983
Gender	male

Current Position

- **Postdoctoral Researcher at ETH Zurich**

Working and Accademic Experience

Dates	October 1st, 2013 -
Occupation	**Postdoctoral Researcher**
Institute	**ETH Zurich, Switzerland**
Research Ares	• Static analysis of contract-based programming languages • Combination of static analyses and automated testing for bug detection in contract-based programming languages

Dates	January 1st, 2013 – September 30th, 2013
Occupation	**Postdoctoral Researcher**
Institute	**Dipartimento di Informatica, University of Verona, Italy**
Research Area	Formalization and Implementation of Static Analyses for Java and Android at the Java bytecode level in the Julia static analyzer (**www.juliasoft.com**). I have also been working on an Eclipse plugin for the Julia analyzer which will be soon available.

Dates	Febryary 1st, 2012 – December 31st 2013
Occupation	**Researcher**
Institute	**Microsoft Research – University of Trento Centre for Computational and Systems Biology**
Research Area	• Formalization of the L Programming Language for Simulation of Biological Systems • Simulation of Biological Systems • Qualitative and Quantitative Static Analysis of Modeling Languages for Biological Systems

Dates	September 1st, 2009 – December 31st, 2009
Occupation	Research Associate
Project	**Abstract Slicing Obfuscation and De-Obfuscation**
Tutor	Roberto Giacobazzi

Publications

Published papers:

- Đ. Nikolić, F. Spoto. **Definite Expression Aliasing in Java Bytecode Programs: a Constraint-based Static Analysis**. To appear in High Order and Symbolic Computation (HOSC).
- Đ. Nikolić, F. Spoto. **Reachability Analysis of Program Variables**. ACM Transactions on Programming Languages and Systems (TOPLAS), *Volume* 35, Issue 4, Article 14 (January 2014). DOI=10.1145/2529990.
- Đ. Nikolić, F. Spoto. **Inference of Class Invariants for Arrays.** Theoretical Computer Science, volume: 484, pages: 16-40, 2013.
- Đ. Nikolić, R. Zunino, C. Priami. **A Rule-based and Imperative Language for Biochemical Modeling and Simulation**. Invited paper in Proceedings of the 10th International Conference on Software Engineering and Formal Methods (SEFM 2012). Lecture Notes in Computer Science, volume: 7504, pages: 16-32.October 1st–5th 2012, Thessaloniki, Greece.
- Đ. Nikolić, F. Spoto. **Definite Expression Aliasing Analysis for Java Bytecode**. In Proceedings of the 9th International Colloquium on Theoretical Aspects of Computing (ICTAC 2012). Lecture Notes in Computer Science, volume: 7521, pages: 74-89. September 24th–27th 2012, Bangalore, India.
- R. Giacobazzi, I. Mastroeni, Đ. Nikolić. **Strong Preservation by Model Deformation**. In Proceedings of the 6th IEEE International Symposium on Theoretical Aspects of Software Engineering (TASE 2012), pages: 33-40. July 4th-6th 2012, Beijing, China.
- Đ. Nikolić, F. Spoto. **Reachability Analysis of Program Variables**. In Proceedings of the 6th International Joint Conference on Automated Reasoning (IJCAR 2012). Lecture Notes in Artificial Intelligence, volume: 7364, pages: 423-438. June 26th–July 1st 2012, Manchester, UK.
- Đ. Nikolić, F. Spoto. **Automaton-based Array Initialization Analysis**. In Proceedings of the 6th International Conference on Language and Automata Theory and Applications (LATA 2012). Lecture Notes in Computer Science, volume: 7183, pages: 420-432. March 5th–9th 2012, A Coruña, Spain.
- I. Mastroeni, Đ. Nikolić. **Abstract Program Slicing: From Theory Towards an Implementation.** In Proceedings of the 12th International Conference on Formal Engineering Methods (ICFEM 2010). Lecture Notes in Computer Science, volume: 6467, pages: 452-467. November 16th -19th 2010, Shanghai, China.

Talks

- **Constraint-based Static Analyses of Java Bytecode Programs**. **Best student talk award** at Student session of the 40th Symposium on Principles of Programming Languages (POPL 2013). January 2013, Rome (Italy).
- **Reachability Analysis of Program Variables**. Student session at the 10th International School on Modelling and Verifying Parallel Processes (MOVEP). December 2012, Marseille (France).
- **Definite Expresssion Aliasing Analysis for Java Bytecode**. At the 9th International Colloquium on Theoretical Aspetcts of Computing (ICTAC 2012). September 2012, Bangalore (India).
- **Strong Preservation by Model Deformation**. At the 6th IEEE International Symposium on Theoretical Aspects of Software Engineering (TASE 2012). July 2012, Beijing (China).
- **Reachability Analysis of Program Variables**. At the 6th International Joint Conference on Automated Reasoning (IJCAR 2012). June 2012, Manchester (UK).
- **Automaton-based Array Initialization Analysis**. At the 6th International Conference on Language and Automata Theory and Applications (LATA 2012). March 2012, A Coruña (Spain).
- **Abstract Program Slicing: from Theory Towards an Implementation**. At the 12th International Conference on Formal Engineering Methods (ICFEM 2010). November 2010, Shanghai (China).

Teaching

2012 - 2013	• Teaching assistant in **Fundamentals of Computer Science**
	• Teaching assistant in **Programming 1 (Java)**
2011 - 2012	• Teaching assistant in **Fundamentals of Computer Science**
	• Teaching assistant in **Programming 1 (Java)**
2010 - 2011	• Teaching assistant in **Fundamentals of Computer Science**
	• Teaching assistant in **Programming 1 (Java)**
2009 - 2010	• Teaching assistant in **Programming 1 (Java)**

Education

Dates	January 1st, 2010 – December 31st, 2012
Occupation	**PhD Student in Computer Science**
Institute	**Dipartimento di Informatica, University of Verona**
Thesis	**A General Framework for Constraint-based Static Analyses of Java Bytecode Programs**
Research Area	• Static Analysis • Programming Languages • Abstract Interpretation • Verification and Formal methods
Supervisors	**Prof. Nicola Fausto Spoto, Prof. Roberto Giacobazzi**
Main activities	Static Analysis, Abstract Interpretation, Program Verification, Model Checking, Program Slicing, Semantics

Project

Julia (www.juliasoft.com), a static analyzer for Java bytecode, finds bugs in **Java** and **Android** programs well before they are run. It is is a semantical tool, based on a mathematical theory known as **abstract interpretation**. Julia checks all possible executions of a software and finds all possible bugs, inside the categories considered by the tool. The analyses that can be performed are: ***checks*** - *a* very simple and quick analysis that detects a great amount of information about the analyzed program; ***nullness*** - performs a deep, complete nullness analysis of the program which covers all program's executions; ***termination*** – this analysis proves termination of program's methods: they will not hang unexpectedly.

I have been working on different static analyses which deal with memory management and which improve the precision of principal Julia's analyzers. Among others, I have been working on both theoretical formalization and implementation of **Array Initialization Analysis**, **Reachability Analysis of Program Variables**, **Definite Expression Aliasing Analysis**. Our analyses are abstract interpretation-based, and our abstract domains are quite simple, which turn our analyses very fast. Moreover, experimental evaluations performed on real life programs (e.g., Android programs written by Google) of these analyses shows that they are very efficient, since they improve the precision of both nullness and termination analyses.

Background

During the first year of my PhD I studied the theory of a lot of techniques for formal verification on programs. In particular, I concentrated on Abstract Interpretation and Model Checking, and I studied the way these two formal methods can interact. I gained some knowledge about the most used model checkers, such as SLAM and BLAST. These two tools use the well-known CEGAR (Counter-Example Guided Abstraction Refinement) technique, which was the main subject of the first year of my PhD.

International Schools

1. **The 10th International School on Modelling and Verifying Parallel Processes (MOVEP)** by Alessandro Cimatti, Javier Esparza, Hugo Gimbert, Marta Kwiatkowska, Kim G. Larsen, Moshe Y. Vardi, Gilles Barthe, Ahmed Boujjani, Martin Leucker, Antoine Miné and Ružica Pisckac. December 3rd - December 7th 2012, Marseille, France.

2. **Tools for Practical Software Verification**, **8th LASER Summer School on Software Engineering** by Edmund Clarke (Carnegie Mellon), Patrick Cousot (École Normale Supérieure), Patrice Godefroid (Microsoft Research), Rustan Leino (Mcrosoft Research), Bertrand Meyer (ETH Zurich), César Muñoz (NASA Langley Research Center), Christine Paulin-Mohring (Université Paris-Sud) and Andrei Voronkov (University of Manchester). September 4th – September 11th 2011, Elba Island, Italy

3. **International School on Abstract Interpretation** by Roberto Giacobazzi. June 1st – June 20th 2010, Universidad Politecnica de Madrid, Madrid, Spain

4. **First International Summer School on Information Security and Protection** by Christian Collberg, Jack Davidson, Roberto Giacobazzi and Yuan Xiang Gu. July 26th – July 31st 2010, Institute of Automation, Chinese Academy of Science, Beijing, China.

Courses Attended

1. **Static Analysis and Software Protection** by Roberto Giacobazzi, January 2011 – April 2011, University of Verona, Italy

2. **Automatic Verification of Programs** by Maria Paola Bonacina, January 2011 – April 2011, University of Verona, Italy

3. **Special Topics in Artificial Intelligence** by Maria Paola Bonacina, April 2011 – May 2011, University of Verona, Italy

Dates	October 1st, 2007 – July 24th, 2009
Title of qualification awarded	**Master Degree in Computer Science**
Thesis	**An Abstract Interpretation-Based Framework for Program Slicing**
Valuation	**110/110 cum laude**
Supervisors	**Prof. Roberto Giacobazzi, Dr. Isabella Mastroeni**
Principal subjects/occupational skills covered	• Imperative and Functional Programming Languages • Semantics • Abstract Interpretation • Security
Name and type of organization providing education and training	**Faculty of Mathematical, Physical and Natural Science, University of Verona, Italy**
Interesting Projects:	***ZigBee****: implementation of a middleware which detects ZigBee devices and which is used by the main node for a communication with detected nodes. In collaboration with prof. Franco Fummi* ***Thesis – An Abstract Interpretation-Based Framework for Program Slicing (Costruzione di un modello per lo Slicing basato su Interpretazione Astratta)****:* A review of the most well-known techniques of program slicing. An introduction to a framework used for definition of different forms of Program Slicing and for their comparison. We insert 4 forms of Conditional Program Slicing into existing hierarchy. We define a novel technique of Program Slicing based on Abstract Interpretation and we call it Abstract Program Slicing. We generalize the existing framework by defining Abstract Formal Framework and Abstract Unified Equivalence which permit insertion of new forms of slicing, Abstract Slicing, into existing hierarchy. We show that abstract forms of slicing are weaker than the corresponding concrete forms.Supervisor: dr. **Isabella Mastroeni**.
Dates	October 1st, 2005 – July 18th, 2007
Title of qualification awarded	**Bachelor Degree in Computer Science**
Valuation	**110/110 cum laude**
Supervisor	**Dr. Roberto Posenato**
Principal subjects/occupational skills covered	• Programming languages (Java and C) • Operative Systems • Fundamentals of Informatics • Mathematical Analysis • Algebra
Name and type of organization providing education and training	**Faculty of Mathematical, Physical and Natural Science, University of Verona, Italy**
	Thesis – An efficient solution for Really Simple Syndication in a dynamic web page: an optimization of a Java class which handles the notification page of all of the websites of the faculties of University of Verona. I implemented a data structure which memorizes all the relevant news until a new insertion or a modification of an existing database entry occurs, This way it is not necessary to comunicate with the central database any time that a request for the webpage is sent by a student. When a professor or a secretary inserts a new or modifies an existing news, the data structure is deleted. When the first request arrives, another data structure is generated. Moreover, I inserted the RSS service in these pages. Supervisor: dr. **Roberto Posenato**.
Dates	October 1st, 2002 – July 10th, 2005
Title of qualification awarded	**3 years of Electronic Engineering Course**
Principal subjects/occupational skills covered	• Mathematical Analysis • Programming (Java, C, C++) • Electronics • Electrical Engineering
Name and type of organization providing education and training	Faculty of Electronic Engineering, University of Niš, Serbia

Personal skills and competences

Mother tongue(s)	**Serbian**

Other language(s)

Self-assessment	Understanding		Speaking		Writing
	Listening	Reading	Spoken interaction	Spoken production	
English	Excellent	Excellent	Excellent	Excellent	Excellent
Italian	Excellent	Excellent	Excellent	Excellent	Excellent

Computer skills and competences

Programming Languages: Java, C (basic), Pascal, Delphi (basic), Php (basic)
Operating Systems: Linux, Windows, Mac OS X