FOUNDATIONS AND APPLICATIONS OF ADVANCED SOFTWARE TECHNOLOGY - RESEARCH GROUP

Contact details

Name	**Foundations and Applications of Advanced Software Technology – Research Group**	
Acronym	**FAAST**	
Logo	F A A ST Fondations and Applications of Advanced Software Technology	**Continuation Semantics for Concurrency (CSC)** $$[\![s_1 \parallel s_2]\!]\kappa = [\![s_1]\!]([\![s_2]\!] : \kappa) + [\![s_2]\!]([\![s_1]\!] : \kappa)$$
Site	http://users.utcluj.ro/~eneia/faast.htm	**CSC Models & Technologies** DNA & Membrane Computing Peer-to-Peer OO Programming **Foundations & Applications** Stochastic Process Algebras Formal Verification
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Areas of expertise

Software Engineering & Programming Languages:
- Formal Methods, Programming Languages Design and Semantics
Software Solutions for Smart City:
- eBusiness, eAdministration, eHealth, Medical Databases
- Smart Traffic, Urban Traffic Image Processing
- Cloud infrastructure based integrated architectures
Semantic Models and Technologies
- Membrane Computing, DNA Computing
- Global Computing (GC), Image Processing in GC Context
Computational models based on Big Data and predictive analysis
-mathematical models of predictive analysis
- computational models

Team

Prof. Dr. Eng. Eneia Nicolae Todoran, Assoc.Prof.Dr. Paulina Mitrea, Eng. Dorin Simina

Representative projects

Next Generation Brained City, "Innovative development through informatization of the Cluj-Napoca urban ecosystem" - POSCCE/Op.1.3.3, no. 13.C01.010, cod SMIS 49752 (2014-2015); sub-projects:
- **ProcessPlayer , "Platform for the optimization of process flows for and between the public authorities"**, collaboration with ARXIA SRL & UBB (Contract POSCCE No.1CLT/800.003/8/29.04.2014 / Subproject SP1)
- **"Software services design for intelligent routing in urban road traffic in Smart City context"** (Contract POSCCE No.1CLT/800.003/8/29.04.2014 / Subproject SF1)
SemNat, "Semantic models and technologies for natural computing" - CAPABILITIES, Module III, Greece-Romania bilateral collaboration project, no. 582/16.07.2012 (2012-2014)
BETTY, "Behavioral Types for Reliable Large-Scale Software Systems", ICT COST Action IC1201, http://www.cost.eu/domains_actions/ict/Actions/IC1201 Management Committee members for Romania: Prof.Dr. Gabriel Ciobanu, Prof.Dr. Eneia Nicolae Todoran (2012-2016)
DFA@eInclusion, "Design for All for e-inclusion", FP7 project no. 033838, (2008-2010)
"Distributed System for Early Prevention, Monitoring and Treatment of the Cardio toxicity Induced by Chemotherapy and Radiotherapy in Oncologic Patients", PNII/IDEAS Project no. 1340/2009; (2008-2010)
GlobalComp, "Models, semantics, logics and technologies for global computing", ANCS, CNMP-PC, no. 11052/18.09.2007; (2007-2010).
Computational models based on Big Data and predictive analysis for the platform 24BrokerRo – POC/AP1, no 378/390054/01.10.2021 (2021-2023)

Significant results

The most representative publications of the past 5 years:
1. G. Ciobanu, E.N. Todoran, "A Process Calculus for Spiking Neural P Systems", *Information Sciences*, vol.604, pp. 298-319, 2022.
2. G. Ciobanu, E.N. Todoran, "Spiking Neural P Systems and Their Semantics in Haskell", *Natural Computing*, in press, 2022 doi: 10.1007/s11047-022-09897-z.
3. E.N. Todoran, "Continuation Semantics for Interaction and Concurrency", *Proc. IEEE ICCP 2021*, pp.189-197, 2021.
4. E.N. Todoran, "Equivalence Classes in Performance Evaluation Programming", *Proc. IEEE SYNASC 2021*, pp. 194-199, 2021.
5. G. Ciobanu, E.N. Todoran, "A Study of Multiparty Interactions in Continuation Semantics", *Proc. IEEE SYNASC 2020*, pp. 117-124, 2020.
6. G. Ciobanu, E.N. Todoran, "A Semantic Investigation of Spiking Neural P Systems", *Lecture Notes in Computer Science*, vol. 11399, pp. 108-130, Springer, 2019.
7. E.N. Todoran, "Towards Performance Evaluation Programming", *Proc. IEEE SYNASC 2018*, pp. 302-309, 2018.
8. G. Ciobanu, E.N. Todoran, "Denotational semantics of membrane systems by using complete metric spaces", *Theoretical Computer Science*, vol. 701, pp. 85-108, Nov 2017.
9. E.N. Todoran, N. Papaspyrou, "Concurrency Semantics in Continuation-Passing Style", *Fundamenta Informaticae*, vol. 153, no. 1-2, pp. 125-146, 2017.
10. E.N. Todoran, "An Approach to Performance Evaluation Programming", *Proc. IEEE SYNASC 2017*, pp. 320-329, 2017.
11. D. Mitrea, S. Nedevschi, Paulina Mitrea, et al, *The role of the cooccurrence matrix based on complex extended microstructures in discovering the cirrhosis severity grades within US images* - 10th International Congress on Image and Signal Processing, BioMedical Engineering and Informatics, CISP-BMEI 2017, pp.1-6, Shanghai, China, October 14-16, 2017. IEEE 2017
12. G. Ciobanu, E. N. Todoran, "Correct Metric Semantics for a Language Inspired by DNA Computing", *Concurrency and Computation: Practice and Experience*, vol. 28(11), pp. 3042-3060, Wiley, 2016.
13. E.N. Todoran, P. Mitrea, "Semantic investigation of a control-flow subset of BPMN 2.0", *Proc. IEEE ICCP 2015*, pp. 483-490, 2015.
14. I. Chifor, P. Mitrea, et al, "Mathematical methods for assessing the prognostic of fixed partial dentures resulting from evaluating a group of dental patients", *Computational and Mathematical Methods in Medicine*, vol. 2014, article ID 984901, http://dx.doi.org/10.1155/2014/98490, 2014.
15. S. Brad, P. Mitrea, "Functional and strategic aligned clusters towards more united economies and sustainable development", JCI 2015 Proceedings, *ISBN print: 978-3-8487-2429-1, ISBN online: 978-3-8452-6588-9, DOI: 10.5771/9783845265889-126*
16. A.I. Mitrea, S. Nedevschi, D. Mitrea, P. Mitrea, "Diseased tissue area detection and delimitation by fusion between finite difference methods and textural analysis", *Proc. AQTR 2014*, pp. 1-5, 2014.
17. E.N. Todoran, D. Simina, et al, "Mobile Objects and Modern Communication Abstractions: Design Issues and Denotational Semantics", *Proc. IEEE ISPDC 2011*, pp. 191-198, 2011.

Significant solutions:
Continuation semantics for concurrency, Denotational semantics for models of natural (membrane, DNA) computing, Denotational semantics for multiparty interaction, Denotational semantics for models of global computing, Performance Evaluation Programming – a programming paradigm supporting performance analysis and formal verification of concurrent systems using dependent types and model checking techniques

Products and technologies:
Prototype interpreter for mobile objects with multiparty interaction in peer to peer systems
Prototype interpreter for a language supporting performance evaluation programming
Prototype interpreter for a control flow subset of BPMN 2.0
Prototypes for medical image processing in global computing context
Communication prototypes for smart sensor networks

The offer addressed to the economic environment

Research & development	Formal design of reliable distributed software systems and programming languages
Consulting	Formal design of reliable distributed software systems and programming languages
Training	**Software Engineering:** software development paradigms, UML class diagrams and OO analysis, modeling interaction and behavior, architecting and designing software, software testing techniques and strategies, PRISM probabilistic model checking **Advanced Topics in Software Engineering and Programming Languages:** formal methods, denotational and operational semantics, stochastic process algebras, type systems

Last updated: February 2023