

Research report on the project Volkswagen Stiftung I/70 564

Igor V. Tarasyuk

First time, Igor V. Tarasyuk visited the Institute of Informatics of the Hildesheim University from December 1, 1995 until February 29, 1996. The main topics of joint research were equivalence notions for Petri nets and process algebras. The main results obtained are the following:

- In the framework of Petri nets:
 1. New variants of basic behavioural equivalences (trace, bisimulation and conflict preserving) in interleaving – true concurrency semantics and their interrelations with known ones.
 2. Interrelations of the equivalences on sequential and strictly labelled nets.
 3. Treating preservation of the equivalences by transition refinements.
- In the framework of process algebras:
 1. New algebra $AFLP_2$ of labelled nondeterministic concurrent processes.
 2. Definition of denotational and operational semantics, complete and sound axiomatization of the semantic equivalence.
 3. Comparing semantic equivalence of $AFLP_2$ with basic behavioural equivalences of Petri nets and introducing of algebraic analogues of the net equivalences.

During the visit, I.V. Tarasyuk gave two talks on the topics: “Equivalence notions for design of concurrent systems using Petri nets” and “Algebra $AFLP_2$: a calculus of labelled nondeterministic processes” and produced two articles in the report of the institute: [1,2]. The paper [3] is based on the research done during the stay.

1. TARASYUK, I.V.: Equivalence notions for design of concurrent systems using Petri nets *Hildesheimer Informatik-Bericht* **4/96**, part 1, Institut für Informatik, Universität Hildesheim, Hildesheim, Germany (1996), 19 p
2. TARASYUK, I.V.: Algebra $AFLP_2$: a calculus of labelled nondeterministic processes *Hildesheimer Informatik-Bericht* **4/96**, part 2, Institut für Informatik, Universität Hildesheim, Hildesheim, Germany (1996), 18 p.
3. TARASYUK, I.V.: Petri net equivalences for design of concurrent systems Proc. 5th Workshop on Concurrency, Specification and Programming - 96 (CSP'96), *Informatik-Bericht* **69**, Institut für Informatik, Humboldt-Universität zu Berlin, Berlin, Germany (1996), 190–204

Second time, Igor V. Tarasyuk visited the Institute of Informatics of the Hildesheim University from March 1, 1997 until April 30, 1997. The main topics of joint research were equivalence notions for Petri nets and their extension by invisible transitions. The main results obtained are the following:

- In the framework of Petri nets:
 1. New variants of back-forth and place bisimulation equivalences in interleaving – true concurrency semantics and their interrelations with known ones and basic equivalence notions.
 2. Interrelations of the equivalences on sequential nets.
 3. Treating preservation of the equivalences by transition refinements.
- In the framework of Petri nets with silent transitions:
 1. New variants of basic (trace, bisimulation and conflict preserving) and back-forth equivalences in interleaving – true concurrency semantics and their interrelations with known ones.

2. Interrelations of the equivalences on sequential nets.
3. Preservation of the equivalences by transition refinements.

During the visit, I.V. Tarasyuk produced two reports of the institute: [1,2]. The papers [3,4] are based on the research done during the stay.

1. TARASYUK, I.V.: An investigation of back-forth and place bisimulation equivalences *Hildesheimer Informatik-Bericht* **8/97**, Institut für Informatik, Universität Hildesheim, Hildesheim, Germany (1997), 30 p.
2. TARASYUK, I.V.: An investigation of τ -equivalences *Hildesheimer Informatik-Bericht* **9/97**, Institut für Informatik, Universität Hildesheim, Hildesheim, Germany (1997), 28 p.
3. TARASYUK, I.V.: Back-forth equivalences for design of concurrent systems S. Adian, A. Nerode, eds. Proceedings of 4th International Symposium on Logical Foundations of Computer Science - 97 (LFCS'97), *Lecture Notes in Computer Science* **1234** (1997), 374–384
4. VIRBITSKAITE, I.B., TARASYUK, I.V.: Investigating equivalence notions for time Petri nets Proc. 4th Workshop on Logic, Languages, Information and Computation (WoLLIC'97), Fortaleza (Ceará), Brazil, August 19–22, 1997, *Logic Journal of the IGPL* **5**(6), Oxford University Press (1997)