

INFOTEHNOLOOGIA TEADUSKONNA ARVUTITEADUSE INSTITUUDI TEADUS- JA ARENDUSTEGEVUSE AASTAARUANNE 2011

1. Instituudi struktuur

Instituudi direktor Jüri Vain

- Teoreetilise informaatika õppetool, Chair of Theoretical Informatics, Jaan Penjam
- Võrgutarkvara õppetool, Chair of Network Software, Tanel Tammet
- Üldinformaatika õppetool, Chair of General Informatics, Jüri Vain

2. Instituudi teadus- ja arendustegevuse (edaspidi T&A) iseloomustus

(NB! punktid 2.1- 2.6 täidab struktuuriüksus)

2.1 struktuuriüksuse koosseisu kuuluvate uurimisgruppide

2.1.1 teadustöö kirjeldus (*inglise keeles*);

Main objectives of the research

1. Elaboration of the reactive planner synthesis method for non-deterministic and distributed systems based on constraint programming and 1st order decision algorithms. The synthesis method must comply with the resource, timing and agents' environment configuration constraints, as well as with partial knowledge.
2. Benchmarking of the method in following applications: synthesis of software tests, coordination of robot swarms, model checking reachability algorithms, trajectory planning of the scrub nurse robot manipulator.
3. Implementation of the synthesis algorithm on parallel computation architectures (multi core processors and computer grid).
4. Designing, implementing and testing algorithms for personalized recommender and planning systems with focus on the geoinformatics.
5. Developing new methods for practical probabilistic reasoning in the context of large ontology-enhanced databases.

2.1.2 aruandeaastal saadud tähtsamad teadustulemused (*inglise keeles*).

1. A model-based on-line planner generation method from non-deterministic output-observable I/O Extended Finite State Machine models has been developed. An indicative feature of this constraint-based Heuristic Reactive Planning is the capability of making efficient decisions in the presence of partially defined constraints. Planning constraints are derived by off-line static reachability analysis of the system model and planning goal specification. The advantages of the method have been demonstrated on benchmark problems. As an extension of the earlier reactive planner synthesis algorithm we adopted it for different application domains: coordination of robot swarm (coverage problem), model-based testing of non-deterministic systems (INRES protocol, city light controller, EMT client charging system, etc.). Experiments with industrial scale systems show that the reactive planning method (specially its heuristic version) scales well in the presence of linear and simpler non-linear constraints and therefore can be applied in commercial products. The theoretical and experimental results have been published as chapters in 2 books, 1 category 1.1 paper, and 1 category 3.1 conference paper.
2. Algorithms have been developed for all the crucial aspects of a semantic personal recommender in tourism. The system has been implemented and deployed for testing. In particular, we use learning as an important part of or information extraction algorithms. The main challenges in this setting are that information is spread across various information sources, it is usually stored in proprietary formats and is available in different languages in varying degrees of accuracy. We address the mentioned challenges and describe our realization and ideas how to deal with each of

them. In our papers we describe scraping and extracting keywords from different web portals with different languages, how we deal with missing multi-lingual data, and how we identify the same objects from different sources. The theoretical and experimental results have been published in three papers during 2011.

2.2 Uurimisgrupi kuni 5 olulisemat publikatsiooni läinud aastal.

- Juurik, Silver; Vain, Jüri (2011). Model checking of emergent behaviour properties of robot swarms. Proceedings of the Estonian Academy of Sciences, 60(1), 48 - 54.
- Vain, Jüri; Kull, Andres; Kääramees, Marko; Markvardt, Maili; Raiend, Kullo (2011). Reactive testing of nondeterministic systems by test purpose directed tester. Zander, Justyna; Schieferdecker, Ira; Mosterman, Pieter J. (Toim.). Model-Based Testing for Embedded Systems (425 - 452).CRC Press - Taylor & Francis Group, LLC
- Luberg, A.; Schoefegger, K.; Järv, P.; Tammet, T. (2011). Context-aware and Multilingual Information Extraction for a Tourist Recommender System. Stefanie Lindstaedt, Michael Granitzer (Toim.). i-KNOW '11, Proceedings of the 11th International Conference on Knowledge Management and Knowledge Technologies (1 - 8). ACM
- Luberg, A.; Tammet, T.; Järv, p. (2011). Extended Triple Store Used in Recommender System. In: Proceedings DEXA 2011: Twenty-Second International Workshop on Database and Expert Systems Applications, Toulouse France, 29. August - 2. September 2011. (Toim.) F. Morvan, A M. Tjoa, R. R Wagner. IEEE Computer Society, 2011, 539 - 543.
- Luberg, A.; Tammet, T.; Järv, P. (2011). Smart City: A Rule-based Tourist Recommendation System. In: Information and Communication Technologies in Tourism 2011: ENTER 11, January 26th-28th 2011, Innsbruck, Austria. (Toim.) Law, R.; Fuchs, M.; Ricci, F.. Springer-Verlag, 2011.

2.3 Loetelu struktuuriüksuse töötajate rahvusvahelistest tunnustustest.

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2.4 Loetelu struktuuriüksuse töötajatest, kes on välisakadeemiade või muude oluliste T&A-ga seotud välisorganisatsioonide liikmed.

- Jüri Vain. Abo Akademi University. Visiting professor during 01.10.10-30.06.2011

2.5 Aruandeaasta tähtsamad T&A finantseerimise allikad.

- ELIKO projekt 2.1 (Fin. Allikas EAS)

- ELIKO projekt 2.2 (Fin. Allikas EAS)

2.6 Soovi korral lisada aruandeaastal saadud T&A-ga seotud tunnustusi (va punktis 2.3 toodud tunnustused), ülevaate teaduskorralduslikust tegevusest, teadlasmobiilsusest ning anda hinnang oma teadustulemustele.

2.7 Instituudi teadus- ja arendustegevuse teemade ja projektide nimetused (*Eesti Teadusinfosüsteemi, edaspidi ETIS, andmetel*)

- Haridus- ja Teadusministeerium

sihtfinantseeritavad teemad:

baasfinantseerimise toetusfondist rahastatud projektid (sh TTÜ tippkeskused):

- BF99, Formaalsed meetodid hajussüsteemides, Vain Jüri

riiklikud programmid:

- Teiste ministriumide poolt rahastatavad riiklikud programmid:
- Uurija-professori rahastamine:
- SA Eesti Teadusfond

grandid:

ühisgrandid välisriigiga:

järeldoktorite grandid (SA ETF ja Mobilitas):

tippteadlase grandid (Mobilitas):

- Ettevõtluse Arendamise SA

eeluuringud:

arendustoetused:

- SA Archimedesega sõlmitud lepingud

infrastruktuur (nn „mini-infra“, „asutuse infra“):

Eesti tippkeskused:

riiklikud programmid:

muud T&A lepingud:

- SA Keskkonnainvesteeringute Keskusega sõlmitud lepingud:
- Siseriiklikud lepingud:
- EL Raamprogrammi projektid:
- Välisriiklikud lepingud:

2.8 Strukturiüksuse töötajate poolt avaldatud sihtfinantseeritava teadusteema taotlemisel arvestatavad eelretsenseeritavad teaduspublikatsioonid (*ETIS klassifikaatori alusel 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 4.1 ja 5.1*).

1.1

Juurik, Silver; Vain, Jüri (2011). Model checking of emergent behaviour properties of robot swarms. Proceedings of the Estonian Academy of Sciences, 60(1), 48 - 54.

1.2

Rebane, A. (2011). Verifying driving sessions in driving schools using GPS data. ACM Transactions on Internet Technology, xx - xx. [ilmumas]

1.3

2.1

2.2

3.1

Luberg, A.; Schoefegger, K.; Järv, P.; Tammet, T. (2011). Context-aware and Multilingual Information Extraction for a Tourist Recommender System. Stefanie Lindstaedt, Michael Granitzer (Toim.). i-KNOW '11, Proceedings of the 11th International Conference on Knowledge Management and Knowledge Technologies (1 - 8).ACM

Vain, Jüri; Kull, Andres; Kääramees, Marko; Markvardt, Maili; Raiend, Kullo (2011). Reactive testing of nondeterministic systems by test purpose directed tester. Zander, Justyna; Schieferdecker, Ira; Mosterman, Pieter J. (Toim.). Model-Based Testing for Embedded Systems (425 - 452).CRC Press - Taylor & Francis Group, LLC

Luberg, A.; Tammet, T.; Järv, p. (2011). Extended Triple Store Used in Recommender System. In: Proceedings DEXA 2011: Twenty-Second International Workshop on Database and Expert Systems Applications, Toulouse France, 29. August - 2. September 2011. (Toim.) F. Morvan, A M. Tjoa, R. R Wagner. IEEE Computer Society, 2011, 539 - 543.

Luberg, A.; Tammet, T.; Järv, P. (2011). Smart City: A Rule-based Tourist Recommendation System. In: Information and Communication Technologies in Tourism 2011: ENTER 11, January 26th-28th 2011, Innsbruck, Austria. (Toim.) Law, R.; Fuchs, M.; Ricci, F.. Springer-Verlag, 2011.

3.2

Vain, Jüri; Kääramees, Marko; Markvardt, Maili (2011). Online testing of nondeterministic systems with reactive planning tester. Petre, L.; Sere, K.; Troubitsyna, E. (Toim.). Dependability and Computer Engineering : Concepts for Software-Intensive Systems (113 - 150). Hershey, PA: IGI Global

3.3

4.1

5.1

2.9 Struktuuriüksuses kaitstud doktoriväitekirjade loetelu (*NB! struktuuriüksus lisab struktuuriüksuse töötaja juhendamisel mujal kaitstud doktoriväitekirjade loetelu*)

2.10 Struktuuriüksuses järeldoktorina T&A-s osalenud isikute loetelu (*ETIS-e kaudu esitatud taotluste alusel*)

2.11 Struktuuriüksuses loodud tööstusomandi loetelu

4. Struktuuriüksuse infrastruktuuri uuendamise loetelu