INFOTEHNOLOOGIA TEADUSKOND
ARVUTITEADUSE INSTITUUT
TEADUS- JA ARENDUSTEGEVUSE AASTAARUANNE 2012

1. Instituudi struktuur

Arvutiteaduse instituut, Department of Computer Science
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*);

Formal methods group (J.Vain, J.-P. Ernits, M.Kääramees, A.Anier, E.Halling) has focused its research on model-based diagnosis and synthesis of online tests for distributed and time constrained systems. The target domain of theoretical studies is model driven software development for robotic and web-based software systems.

Theoretical research integrates various domains: SMT constraint solving methods, refinement calculus for timed systems, state abstraction techniques and heuristic algorithms of resource and time constrained planning theory.

Network software group (T.Tammet, A.Luberg, E.Reilent) is focusing on two areas of research: (a) semantic analysis, classification and deduplication of tourism objects worldwide. (b) fast in-memory databases with an integrated reasoner . Some research has been also done in optimizing robot movement strategies for robot swarms. All these research areas are investigated by combining theoretical investigations with practical experimentation with the implementations.

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

Formal methods group

- has extended the reactive planning tester synthesis method to generate test data on-the-fly. The method is based on application of novel SMT constraint solving techniques and supported by heuristic algorithms. The heuristic algorithms improve the performance of test generation and online execution up to an order of magnitude.
- has studied the applicability of model refinement transformations for model-based synthesis of testers. Refinement relation has been defined for timed transition systems semantic models and shown how this refinement relation can be interpreted in Uppaal Timed Automata and Event-B formalisms. Using this interrelation we presented the way how Event-B and Uppaal tools can complement each other in refinement-based design flow of dependable systems.

Network software group

- has thorougly analyzed the relative popularity, types, names and associated information of all the places of touristic interest in the world. In particular, learning – based methods have been designed and experimented with for deduplicating information and clustering the semantic attributes of places.
- has developed the initial version of encoding and using a combination of probabilistic and fuzzy knowledge in first-order logic, with the goal to achieve high efficiency for automated reasoners emplyoing the designed methods.

2.2 Uurimisgrupi kuni 5 olulisemat publikatsiooni läinud aastal.

- Ahman, D.; Kääramees, M. (2012). Constraint-based heuristic on-line test generation from non-deterministic I/O EFSMs. In: Proceedings of the 7th Workshop on Model-Based Testing (MBT 2012): (Toim.) Petrenko, Alexander; Schlingloff, Holger. Tallinn: Open Publishing Association, 2012, (Electronic Proceedings in Theoretical Computer Science; 80), 115 - 129.
- Berthing, J.; Boström, P.; Sere, K.; Tsiopoulos, L.; Vain, J. (2012). Refinement-based development of timed systems. *In: Integrated Formal Methods : 9th International Conference, IFM 2012, Pisa, Italy, June 18-21, 2012, Proceedings: (Toim.) Derrick, J.; Gnesi, S.; Latella, D.; Treharne, H.*. Berlin: Springer, 2012, (Lecture Notes in Computer Science; 7321), 69 - 83.
- Luberg, A.; Granitzer, M.; Wu, H.; Järv, P.; Tammet, T. (2012). Information retrieval and deduplication for tourism recommender Sightsplanner. International Conference on Web Intelligence, Mining and Semantics 2012, Craiova, Romania, June 13-15, 2012. ACM, 2012.
- Luberg, A.; Järv, P.; Tammet, T. (2012). Information extraction for a tourist recommender system. Fuchs, M.; Ricci, F.; Cantoni, L. (Toim.). Information and Communication Technologies in Tourism 2012: Proceedings of the International Conference in Helsingborg, Sweden, January 24-27, 2012 (343 - 354). Springer Verlag
- Sarna, Külli; Vain, Jüri (2012). Exploiting Aspects in Model-Based Testing. *In: Foundations of Aspect-Oriented Languages 2012 : March 26, 2012, Potsdam, German:* New York: ACM, 2012, 45 - 47.

2.3 Loetelu struktuuriüksuse töötajate rahvusvahelistest tunnustustustest.

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

2.5 Aruandeaasta tähtsamad T&A finantseerimise allikad.

TAK ELIKO, EITSA

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.

J.Vain (programmkomiteed)

- The 24th IFIP Int. Conference on Testing Software and Systems - ICTSS'12

- Nordic Workshop on Programming Theory - NWPT 2012

- Baltic Electronic Conference - BEC2012

- 18th International Symposium on Formal Methods - FM 2012 (reviewer)

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):
– riiklikud programmid:

- Teiste ministeeriumide poolt rahastatavad riiklikud programmid:

- Uurija-professori rahastamine:

- SA Eesti Teadusfond/Eesti Teadusagentuur

– 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 Struktuuriüksuse töötajate poolt avaldatud 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

1.2

Ahman, Danel; Kääramees, Marko (2012). Constraint-based heuristic on-line test generation from non-deterministic I/O EFSMs. In: Proceedings of the 7th Workshop on Model-Based Testing (MBT 2012): (Toim.) Petrenko, Alexander; Schlingloff, Holger. Tallinn: Open Publishing Association,

2012, (Electronic Proceedings in Theoretical Computer Science; 80), 115 - 129.

1.3

2.1

2.2

3.1

Berthing, J.; Boström, P.; Sere, K.; Tsiopoulos, L.; Vain, J. (2012). Refinement-based development of timed systems. *In: Integrated Formal Methods : 9th International Conference, IFM 2012, Pisa, Italy, June 18-21, 2012, Proceedings: (Toim.) Derrick, J.; Gnesi, S.; Latella, D.; Treharne, H.*. Berlin: Springer, 2012, (Lecture Notes in Computer Science; 7321), 69 - 83.

Luberg, A.; Järv, P.; Tammet, T. (2012). Information extraction for a tourist recommender system. Fuchs, M.; Ricci, F.; Cantoni, L. (Toim.). Information and Communication Technologies in Tourism 2012: Proceedings of the International Conference in Helsingborg, Sweden, January 24-27, 2012 (343 - 354).Springer Verlag

Sarna, Külli; Vain, Jüri (2012). Exploiting Aspects in Model-Based Testing. In: Foundations of Aspect-Oriented Languages 2012 : March 26, 2012, Potsdam, German: New York: ACM, 2012, 45 - 47.

Vain, J.; Halling, E. (2012). Constraint-based testing scenario description language. In: BEC 2012 : 2012 13th Biennial Baltic Electronics Conference [Proceedings, Tallinn University of Technology, October 3-5, 2012, Tallinn, Estonia]: Piscataway, NJ: IEEE, 2012, 89 - 92.

Luberg, A.; Granitzer, M.; Wu, H.; Järv, P.; Tammet, T. (2012). Information retrieval and deduplication for tourism recommender Sightsplanner. International Conference on Web Intelligence, Mining and Semantics 2012, Craiova, Romania, June 13-15, 2012. ACM, 2012. [ilmumas]

Anier, A.; Vain, J. (2012). Model based continual planning and control framework for assistive robots. In: PECCS 2012 : 2nd International Conference on Pervasive and Embedded Computing and Communication Systems, 24-26 February, 2012, Rome, Italy, Proceedings: (Toim.) Benavente-Peces, César; Ali, Falah; Filipe, Joaquim. SciTePress, 2012, 403 - 406.

Reilent, E.; Kuusik, A.; Puju, M. (2012). Real-time data streaming for functionally improved eHealth solutions. In: Proceedings of the IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI 2012): International Conference on Biomedical and Health Informatics (BHI2012), Hong Kong and Shenzhen, China, 2-7 Jan 2012. (Toim.) Dr. Paolo Bonato, Dr. Carmen C.Y. Poon. IEEE, 2012, 140 - 143.

Puusepp, A.; Tammet, T.; Puju, M.; Reilent, M. (2012). Robot Movement Strategies in the Environment Enriched With RFID Tags. In: Proceedings of the 16th International Conference on system theory, control and computing (ICSTCC): IEEE 16th International conference on System theory, control and Computing - ICSTCC 2012, Sinaia, Romania, October 12-14, 2012. University of Galati: IEEE, 2012.

3.2

3.3

4.1

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

Marko Kääramees, arvutiteaduse instituut
Teema: *A Symbolic Approach to Model-Based Online Testing* (Mudelipõhine online-testimine kasutades sümbolarvutust)
Juhendajad: prof Jüri Vain ja PhD Michael Reichardt Hansen
Kaitses: 28.11.2012
Omistatud kraad: filosoofiadoktor (informaatika)

Enar Reilent, arvutiteaduse instituut
Teema: *Whiteboard Architecture for the Multi-Agent Sensor Systems* (Tahvelarhitektuur multi-agent sensorsüsteemide jaoks)
Juhendaja: prof Tanel Tammet
Kaitses: 19.12.2012
Omistatud kraad: filosoofiadoktor (infotehnoloogia)

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

2.11 Struktuuriüksuses loodud tööstusomandi loetelu

3. Struktuuriüksuse infrastruktuuri uuendamise loetelu