Toghrul Karimov

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Education

since Sep 2019	PhD student at Max Planck Institute for Software Systems, Germany Supervisor: Joël Ouaknine Area: Verification of linear dynamical systems
2015-2019	MCompSci Computer Science, University of Oxford, UK First Class Honours Bachelor's thesis: On the Černý conjecture in theory of finite automata Master's thesis: Synchronization problems in Markov decision processes
2013-2015	IB Diploma Programme, 41/45 points, 7/7 in Further Mathematics Dünya School, Baku, Azerbaijan

Research Areas

- Broadly speaking, I am interested in applying techniques from algebra, number theory and logic to solving open problems in theoretical computer science.
- My PhD thesis is about finding algorithms that verify programs (for example, by proving that a given program always terminates) using the theory of linear dynamical systems.

Publications

1. T. Karimov, E. Kelmendi, J. Ouaknine and J. Worrell.
   What's decidable about linear dynamical systems?
   Principles of System Design–Thomas A. Henzinger Festschrift, LNCS 13660, 2022.

2. C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefaucheux, J. Ouaknine, D. Purser, M. Whiteland, and J. Worrell.
   Parameter synthesis for parametric probabilistic dynamical systems and prefix-independent specifications.
   Proc. of CONCUR 2022, LIPIcs 243.

3. J. D'Costa, T. Karimov, R. Majumdar, J. Ouaknine, M. Salamati, and J. Worrell.
   The pseudo-reachability problem for diagonalisable linear dynamical systems.
   Proc. of MFCS 2022, LIPIcs 241.

4. T. Karimov, E. Lefaucheux, J. Ouaknine, D. Purser, J. Worrell, and M. Whiteland.
   What's decidable about linear loops?
   POPL 2022, Proceedings of the ACM on Programming Languages, Volume 6, issue POPL.

5. C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefaucheux, F. Luca, J. Ouaknine, D. Purser, M. A. Whiteland, and J. Worrell.
   The Orbit Problem for parametric linear dynamical systems.
   Proceedings of CONCUR 2021, LIPIcs 203.

6. J. D'Costa, T. Karimov, R. Majumdar, J. Ouaknine, M. Salamati, S. Soudjani, and J. Worrell.
   The Pseudo-Skolem Problem is decidable.
   Proceedings of MFCS 2021, LIPIcs 202.

7. S. Almagor, T. Karimov, E. Kelmendi, J. Ouaknine, and J. Worrell.
   Deciding ω-regular properties on linear recurrence sequences.
   POPL 2021, Proceedings of the ACM on Programming Languages, Volume 5, issue POPL.

8. C. Baier, F. Funke, S. Jantsch, T. Karimov, E. Lefaucheux, J. Ouaknine, A. Pouly, D. Purser, and M. A. Whiteland.
   Reachability in dynamical systems with rounding.
   Proceedings of FSTTCS 2020, LIPIcs 182.

9. T. Karimov, J. Ouaknine, and J. Worrell.
   On LTL model-checking for low-dimensional discrete linear dynamical systems.
   Proceedings of MFCS 2020, LIPIcs 170.

Scholarships and awards

1. CPEC mini-project award (DFG grant 389792660 as part of TRR 248, see https://www.perspicuous-computing.science) to travel to Oxford to work with Amaury Pouly on the reachability problem for linear time-invariant systems.

2. Keble College Scholarship, 2016-2019. Awarded for the performance at the exams each year.

3. The Scholarship of the Ministry of Education of Azerbaijan covering the full costs of my study at the University of Oxford, 2015-2019.

Teaching

Summer 2020	Automata and Sequences, teaching assistant University of Saarland
Winter 2022	Topics in Algorithmic Dynamical Systems Theory, teaching assistant University of Saarland

Talks and Presentations

1. The Pseudo-Reachability Problem for diagonalisable affine dynamical systems. *MFCS 2022* and *RP 2022.*

2. The Pseudo-Skolem Problem is decidable. *MFCS 2021.*

3. Invariants and impossibility: from geometric constructions to solving polynomial equations. *Monsoon Math 2021.*

4. Deciding ω-regular properties on linear recurrence sequences. *POPL 2021.*

5. On verification of linear dynamical systems. *Lighthning Talk at MPI-SWS, 2020.*

6. On LTL model-checking for low-dimensional discrete linear dynamical systems. *MFCS 2020.*