

MONTHLY TALKS CYBER-PHYSICAL SYSTEMS | 2021 Society of Iran | FALL



Azar. 10 | 5:30 P.M. - 7:30 P.M.
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SPEAKER: Borzoo Bonakdarpour, PhD, (Michigan State University)

Predicate Monitoring in Distributed Cyber-physical Systems

ABSTRACT: We consider the problem of detecting violations of predicates over distributed continuous-time and continuous-valued signals in cyber-physical systems (CPS). We assume a partially synchronous setting, where a clock synchronization algorithm guarantees a bound on clock drifts among all signals. We introduce a novel retiming method that allows reasoning about the correctness of predicates among continuous-time signals that do not share a global view of time. The resulting problem is encoded as an SMT problem and we introduce techniques to solve the SMT encoding efficiently. Leveraging simple knowledge of physical dynamics allows further runtime reductions. Our approach is fully implemented on two distributed CPS applications: monitoring of a network of autonomous ground vehicles, and a network of aerial vehicles. The results show that in some cases, it is even possible to monitor a distributed CPS sufficiently fast for online deployment on fleets of autonomous vehicles

BIOGRAPHY OF THE SPEAKER: Borzoo Bonakdarpour is currently an Associate Professor of Computer Science at Michigan State University. His research interests include formal methods and its application in distributed systems, computer security, and cyber-physical systems. He has published more than 100 articles and papers in top journals and conferences. His work in these areas have received multiple best paper awards from highly prestigious conferences, including, SRDS'17, SSS'14, and SIES'10. He chaired the Technical Program Committee of the SRDS'20, SSS'16, and RV'14 conferences.



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