Types of PCTL-encoded Discrete-event Markov Chain Properties Analysed in 2016-2020 Research Papers Published in Leading Software Engineering Venues

We examined the types of PCTL-encoded discrete-event Markov chain properties analysed in the leading-venue software engineering papers identified by the study carried out by the VERACITY project from [1]; a summary of that study is available on the VERACITY website - Case Studies.

[1] N. Alasmari, R. Calinescu, C. Paterson, and R. Mirandola, “Quantitative verification with adaptive uncertainty reduction,” *Journal of Systems and Software*, vol. 188, no. 111275, 2022.

The results of this examination are presented in the table below.

Research paper	**Types of reward-extended PCTL properties used to analyse software system(s) in the paper**			
	Reachability	**Reachability Reward**	**Unbounded Until**	**Other types**
Radu Calinescu, Danny Weyns; Simos Gerasimou, Muhammad Usman Iftikhar, Ibrahim Habli, and Tim Kelly. "Engineering trustworthy self-adaptive software with dynamic assurance cases." *IEEE Transactions on Software Engineering* **44**(11):1039-1069, 2018.	YES	YES		
Su, Guoxin, David S. Rosenblum, and Giordano Tamburrelli. "Reliability of run-time quality-of-service evaluation using parametric model checking." *38th International Conference on Software Engineering*, 2016.	YES	YES	YES	YES
Franco, Joao M., Francisco Correia, Raul Barbosa, Mário Zenha-Rela, Bradley Schmerl, and David Garlan. "Improving self-adaptation planning through software architecture-based stochastic modeling." *Journal of Systems and Software* **115**:42-60, 2016.	YES	YES		

Yamilet R. Serrano Llerena, Marcel Böhme, Marc Brünink, Guoxin Su and David S. Rosenblum. "Verifying the long-run behavior of probabilistic system models in the presence of uncertainty." *26th ACM Joint Meeting on European Software Engineering Conference and Symposium on the Foundations of Software Engineering*, 2018.	YES			YES
Wang X, Sun J, Chen Z, Zhang P, Wang J, Lin Y. "Towards optimal concolic testing." *40th International Conference on Software Engineering*, 2018.	YES	YES	YES	
Nakagawa, Hiroyuki, Hiromu Toyama, and Tatsuhiro Tsuchiya. "Expression caching for runtime verification based on parameterized probabilistic models." *Journal of Systems and Software* **156**:300-311, 2019.	YES		YES	
Humaira Afzal, Muhammad Rafiq Mufti, Irfan Awan, Muhammad Yousaf. "Performance analysis of radio spectrum for cognitive radio wireless networks using discrete time Markov chain." *Journal of Systems and Software* **151**:1-7, 2019.				YES
Guoxin Su, Yuan Feng, Taolue Chen and David S. Rosenblum. “Asymptotic Perturbation Bounds for Probabilistic Model Checking with Empirically Determined Probability Parameters.” *IEEE Transactions on Software Engineering* **42**(7):623-639, 2016.	YES			
Number of papers: 8 **Number of PCTL-encoded properties: 17**	**Number of reachability properties: 7 (41%)**	**Number of reachability reward properties: 4 (23%)**	**Number of unbounded until properties: 3 (18%)**	**Number of other properties: 3 (18%)**