Minimizing the Oracle Problem for Self-Adaptive Cyber-Physical Systems

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Motivation

- Address assurance for self-adaptive cyber-physical systems at design-time and run-time in the face of uncertainty via **oracle** verification and adaptation
- Mitigation of uncertainty and enhancement of user trust at design time and run time
- Develop a real-world testbed for experimentation using heterogenous devices

Scientific Impact

- Model real-world CPS as a self-adaptive system
- Enables study of adaptive requirements traceability, non-functional objective quantification, and power/security/safety optimization
- Intended for early-stage Alzheimer's patients, caregivers, and family members

Broader Impacts

- Provide an exemplar with real-world implications
- Enhance **assurance/user trust** at design-time and run-time
- **Connect** software engineering to health care domain



Summer CPS courses for K-12 students

Undergraduate/graduate CPS course

All projects/data publicly documented and **open-sourced**



Cognitive Assisted Living Architecture

Recent Publications

E. M. Fredericks, I. Gerostathopoulos, C. Krupitzer, and T. Vogel, "Planning as optimization: dynamically discovering optimal configurations for runtime situations," in 13th ieee international conference on self-adaptive and self-organizing systems, 2019.

E. M. Fredericks, K. M. Bowers, R. H. Hariri, "On incorporating search-based heuristics into real-world systems," in 2019 IEEE/ACM 12th International Workshop on Search-Based Software Testing, 2019.

R. H. Hariri, E. M. Fredericks, and K. M. Bowers, "Uncertainty in big data analytics: survey, opportunities, and challenges," Journal of big data, vol. 6, iss. 1, p. 44, 2019. K. M. Bowers, E. M. Fredericks, and B. H. C. Cheng, "Automated optimization of weighted **non-functional objectives in self-adaptive systems**," in To be published in the proceedings of the 10th symposium on search-based software engineering, 2018.

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