Performance Verification for Behavior-based Robot Missions*

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Abstract

Certain robot missions need to perform predictably in a physical environment that may have significant uncertainty. One approach is to leverage automatic software verification techniques to establish a performance guarantee. The addition of an environment model and uncertainty in both program and environment, however, means the state-space of a model-checking solution to the problem can be prohibitively large. An approach based on behavior-based controllers in a process-algebra framework that avoids state-space combinatorics will be presented here. In this approach, verification of the robot program in the uncertain environment is reduced to a filtering problem for a Bayesian Network. Verification and Validation results are presented for various robot missions to show the effectiveness of the approach.

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Bio

Damian M. Lyons is an Associate Professor of Computer Science at Fordham University and the Director of Fordham’s Robotics and Computer Vision Laboratory. He is currently the interim Chief Research Officer and Associate VP for Academic Affairs at Fordham. He has degrees in Math (B.A.,1980), Electrical Engineering (B.A.I., 1980) and Computer Science (M.Sc., 1981) from Trinity College, University of Dublin, Ireland, and a doctorate in Computer Science from the University of Massachusetts at Amherst (Ph.D., 1986). Dr. Lyons’ research interests are in Robotics and Computer Vision. His interests include formal approaches to program and plan representation and analysis, multi-robot exploration strategies and multi-sensory fusion. His background includes over 15 years as a researcher and research program manager at the US division of Philips corporate research laboratories, responsible for research activities in task planning, multimodal user interfaces and and
automated video surveillance. He joined Fordham in 2002, and served as chair of the Department of Computer and Information Science at Fordham from 2006 to 2011. He has served on numerous program committees, has published over 100 technical papers in conferences, journals and books, and is inventor/co-inventor of 13 US patents. Dr. Lyons is a senior member of the IEEE.

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