Designing Safe Programmed Molecular Systems (Keynote)

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Abstract

Molecular programming uses the computational power of DNA and other biomolecules to create nanoscale systems. Many of these will be safety-critical, such as bio-compatible diagnostic sensors and targeted drug-delivery devices. Design of these programmed molecular systems needs to assure safe outcomes from very many, very small, fault-prone components operating simultaneously in a dynamic environment. Some of this can be achieved by adapting existing software engineering methods, but molecular programming also presents new challenges that will require new methods. This talk discusses an example of such a challenge, describes how we design safety-critical building blocks, and presents work in progress to ascertain how robust a molecular program is. Similar approaches also will help design safe non-molecular systems with highly distributed, autonomous, fault-prone components operating in dynamic environments.

Biography

Robyn Lutz is a professor of computer science at Iowa State University. She was also on the technical staff of Jet Propulsion Laboratory, California Institute of Technology, from 1983 to 2012, most recently in the Software System Engineering group. Her research interests include safety-critical software systems, product lines, and the specification and verification of molecular programmed nanosystems. She is an ACM Distinguished Scientist. She was program chair of the International Requirements Engineering Conference in 2014 and general chair in 2006. She has served two terms as an associate editor of IEEE Transactions on Software Engineering and on the editorial boards of the journals Software: Testing, Verification and Reliability, Software and System Modeling, and Requirements Engineering.