

Poster Abstract

Guiding the development of DNA walker systems to guarantee reliability and performance

Frits Dannenberg, Milan Ceska, Nicola Paoletti, and Marta Kwiatkowska

Department of Computer Science, University of Oxford
`frits.dannenberg@cs.ox.ac.uk`

DNA ‘walker’ systems were recently shown to be capable of navigating a programmable track tethered to an origami tile [1], and can be used to create circuits that evaluate Boolean functions. Many potential applications are envisaged, including DNA biosensors and smart therapeutics, where safety is paramount. In our previous work [2], we have developed a discrete stochastic model DNA walkers based on experimental data and analysed its reliability and performance using probabilistic model checking with PRISM [3]. We extend the models by allowing intervals of rate values to reflect uncertainty in experimental evidence due to noise or inaccurate measurements. We apply a parameter synthesis technique to infer a range of values of the rates for which a given performance or reliability property, expressed in temporal logic CSL with rewards, is guaranteed to be satisfied. The method is fully automatic and can be used to guide the development of molecular walkers where it is safety-critical to ensure that a predefined level of reliability or performance is essential.

References

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