

## Demo Abstract

### DyNAMiC Workbench: Automated design and verification of dynamic DNA nanosystems

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DNA nanotechnology has shown the potential for exquisite control over structure and function of nanoscale devices. Recent advances have moved beyond primarily static structure formation to the control over non-equilibrium dynamics, in order to build nanoscale motors, robots, and computers. Modern demonstrations of nucleic acid logic circuits now exceed over 100 different molecular species; given that the number of potential unintended interactions between species grows at least quadratically, novel software and design abstractions are needed for assisting the design of these increasingly complex systems. Here we present three pieces of software: a programming language and compiler for describing abstract behaviors and translating these behaviors to DNA sequences; a reaction enumerator for computationally predicting the dynamics of these systems; and an integrated development environment which ties these tools together with widely-used utilities for nucleic acid sequence design and thermodynamic analysis. We show the use this package, which we call DyNAMiC Workbench (the **D**ynamic **N**ucleic **A**cid **M**echanism **C**ompiler), to computationally design and evaluate several example systems based on demonstrations from the literature. This software promises to allow design and implementation of highly complex molecular structures and behaviors with unprecedented ease. The software is available as a public web service at [www.molsys.net/workbench](http://www.molsys.net/workbench). We hope that the availability of flexible abstractions, automation, and graphical interfaces will make the advances of “molecular engineering”—atomically-precise structure formation, nanoscale assembly, and massively parallel computation accessible to a wide range of scientists in diverse fields.