Graduate and Undergraduate Students Help Create Language for Molecular Programming Model

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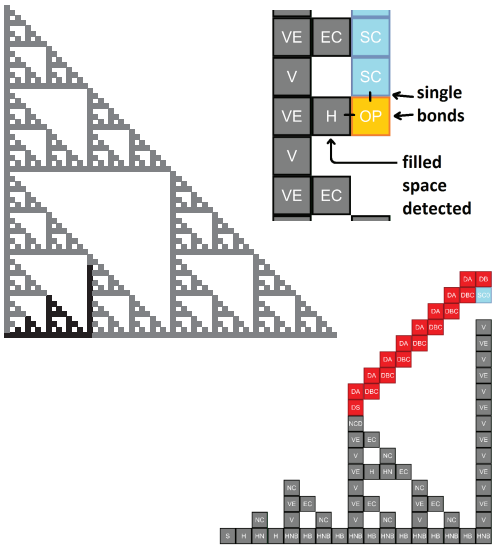
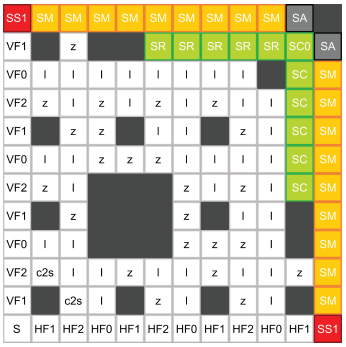
We introduce ALCH, an imperative language for describing programs in the CRN-controlled tile assembly model (CRN-TAM), as well as an ALCH compiler and simulator. ALCH supports many of the features of the C programming language and contains a nondeterministic "branching" structure that allows us to query assemblies as they are built.

We also present a strict construction of the discrete Sierpinski triangle (DST) in the CRN-TAM. It has already been shown that the CRN-TAM is as powerful as the aTAM and that it is impossible to strictly construct the DST in the aTAM; therefore our construction demonstrates that the CRN-TAM is strictly more powerful than the aTAM. ALCH allows us to describe the DST construction in a convenient high-level form. We can therefore abstract away details of chemical species and reactions and reason at the level of algorithms.

Using the ALCH language we show other shapes and fractals can be defined and then compiled into the language of molecules.






```
activate S;
bool not_done = true;
parallel{
  single{ add B; add B; add B; add B;
          add B; add B; add R; }
  single{ add L; add L; add L; add L;
          add L; add L; add T; }
  unbounded{
    while(not_done){
      branch {
        true(){add F;}
        true(){add FT;}
        true(){add FR;}
        true(){} }}
    finish; }
  single{ add D;
          not_done = false; } }
activate Q;
```

What Students Learned
Molecular programming paradigms
Molecular programming techniques
How to write a simulator
How to design a programming language
How to write a compiler
Computer science data structures
How to write proofs about complex systems
Computer science algorithms
How to present research to a scientific audience

Find the entire paper from **DNA 26 here.**
You can also find the poster from **DNA 25 here.**

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