Bio-Inspired Artificial Intelligence - EMATM0029
Exercises - Molecular Computing & Micro/Nanorobots

TED talks

Watch a couple of the following videos related to Molecular Computing, reflect
on the potential and limitations of the approaches described:
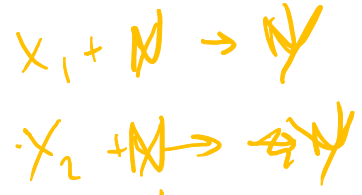
Function Computation

Given the chemical species X_1, X_2, Y (fluorescent red), and N (fluorescent
green), what reaction networks (there can be more than one) give you the fol-
lowing functions.

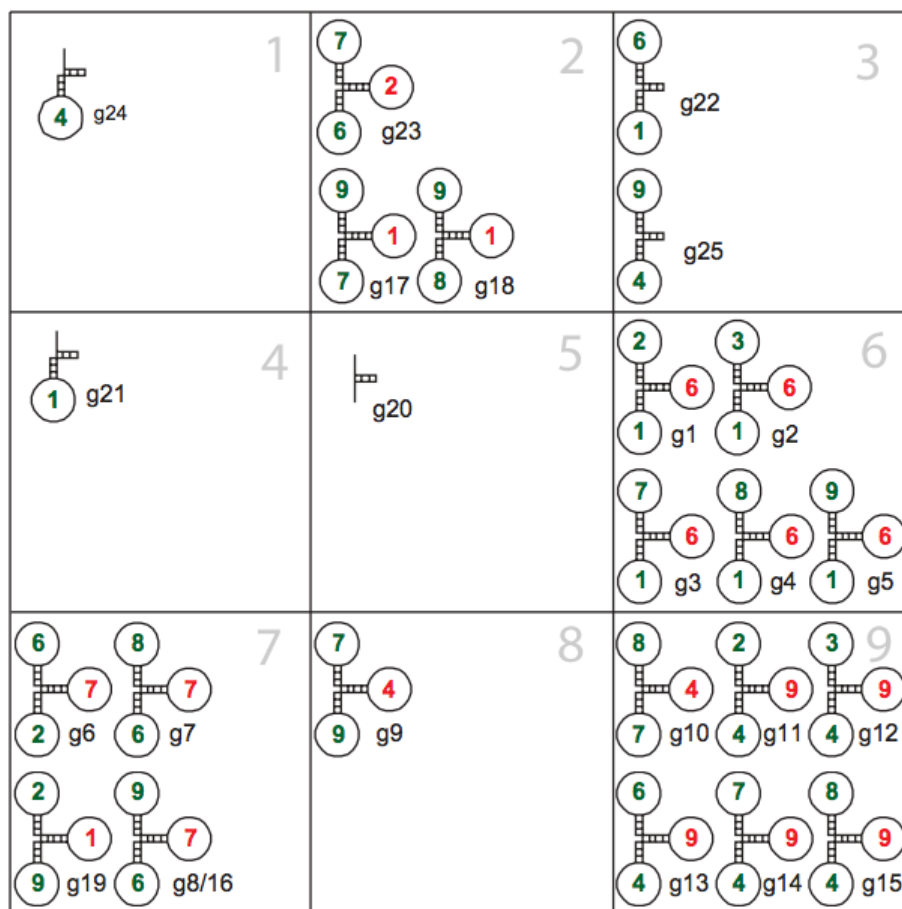1) $f(x_1)$: parity of x_1 - initial state:$\{\ x_1X_1,\ 1N\ \}$

2) $f(x_1,x_2)$: $x_1 > x_2$? - initial state:$\{\ x_1X_1,\ x_2X_2,\ 1N\ \}$

3) $f(x_1,x_2) = x_1 + x_2$ - initial state:$\{\ x_1X_1,\ x_2X_2\ \}$

4) $f(x_1) = 2x_1$ - initial state:$\{\ x_1X_1\ \}$

Tic-tac-toe

Square 1:
4 g24

Square 2:
7
2
6 g23
9   9
1   1
7 g17   8 g18

Square 3:
6
g22
1
9
g25
4

Square 4:
1 g21

Square 5:
g20

Square 6:
2   3
6   6
1 g1   1 g2
7   8   9
6   6   6
1 g3   1 g4   1 g5

Square 7:
6   8
7   7
2 g6   6 g7
2   9
1   7
9 g19   6 g8/16

Square 8:
7
4
9 g9

Square 9:
8   2   3
4   9   9
7 g10   4 g11   4 g12
6   7   8
9   9   9
4 g13   4 g14   4 g15

A player sequentially selects squares 4,9,2 by adding probes i4, i9, and i2 to the wells respectively. What sequence of actions is made by the MAYA automaton? Draw the final board.

Optional: Make your own DNA Origami

- Download and install cadnano from cadnano.org. Build a DNA origami that looks like a triangle. A tutorial on how to use the software can be found here: https://youtu.be/IcrdQYN7yn8

- Go to Nanodoc.org and play the game for the first 6 levels (currently fixing website - check next week).