



DNA cryptography

Description

Developments in biotech impact on the spatial implications of cryptography. DNA involves sequences of just 4 molecules connected in pairs in a double helix configuration. These nucleotide molecules are adenine (A), cytosine (C), guanine (G), and thymine (T). The DNA in a human cell is made up of about 3.2×10^9 of these pairs, normally tangled into 23 paired strands (chromosomes).

Cut, sort, combine, fold and harvest

Genetic engineers use enzymes existing in bacteria to cut and join strands of DNA at specific sites along DNA filaments. Strands of DNA can also be reproduced and multiplied by injecting them into bacteria cells. DNA strands can be sorted into different lengths by drawing them through a gel towards a positively charged electrode. It's also possible to cut DNA strands in a way that creates conditions at the ends to encourage other strands to join on. Geneticists harvest, sort, filter and store DNA strands in liquid solutions. The combinations of nanoscale DNA strands can be inspected via electron microscopy. That's my very brief summary from the sources in the bibliography below

Bricks, blocks, plates, tubes and planks

From what I have read, these synthetic biology processes are independent of how a DNA sequence might actually function in a living organism. The artificial processes treat DNA as molecular matter, as bricks, blocks, plates, tubes and planks to be layered, joined, stacked and folded. The production process typically involves titrating precise quantities from solutions of each strand with specific properties into a mix that is heated and cooled at some optimal rate to encourage nano shapes to form.

Computer-aided design systems assist with designing 3d shapes, generally following a voxel geometry. Data from the CAD system is channelled to robotic titration machines that produce the solutions/suspensions from which these nano-shapes can form. There's generally some wastage. One of the aims is to minimise the production of mis-formed shapes and fragments.

DNA as data

ACGT sequences in DNA strands offer the potential to hold vast amounts of binary data, but the processes of manipulating DNA sequences are time consuming and expensive; as are the processes of reading sequences. Researchers consider other methods of exploiting the properties of DNA strands in data storage and encryption to be reviewed later.

In the mean time, there are some interesting images suggestive of DNA building, writing and encrypting. The caption to the thumbnail image below from Muniza Zahid, et al reads

Complex shapes designed using a DNA molecular canvas. AFM images of 100 distinct shapes, including the 26 capital letters of the Latin alphabet, 10 Arabic numerals, 23 punctuation marks, other standard keyboard symbols, 10 emoticons, 9 astrological symbols, 6 Chinese characters, and various miscellaneous symbols



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1. Architecture

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