Laboratory of Natural Information Processing

DA-IICT Gandhinagar

3DNA

User Manual

DNA Pen
User Manual

Credits & Team

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Acknowledgements

General Information

Introduction

3DNA is a software suite that can be used to model, edit and visualize complex three dimensional (3D) structures. The software provides a 3D molecular canvas interface where user can model/design complex DNA structures. It also includes a random sequence generator which computes the DNA sequences corresponding to the structure designed on the molecular canvas. Using 3DNA we have created various complex structures with intricate interior cavities and tunnels.

This manual assumes that the user is familiar with the basics of DNA base pairing. The reader should refer to Three-Dimensional Structures Self-Assembled from DNA Bricks for further technical details on the language semantics.

Installing 3DNA

The software can be installed from the website www.guptalab.org/3dna

Getting Started

Once you have successfully installed the software, open 3DNA by double clicking on the application, you will be prompted with a welcome screen with different options on the menu bar.
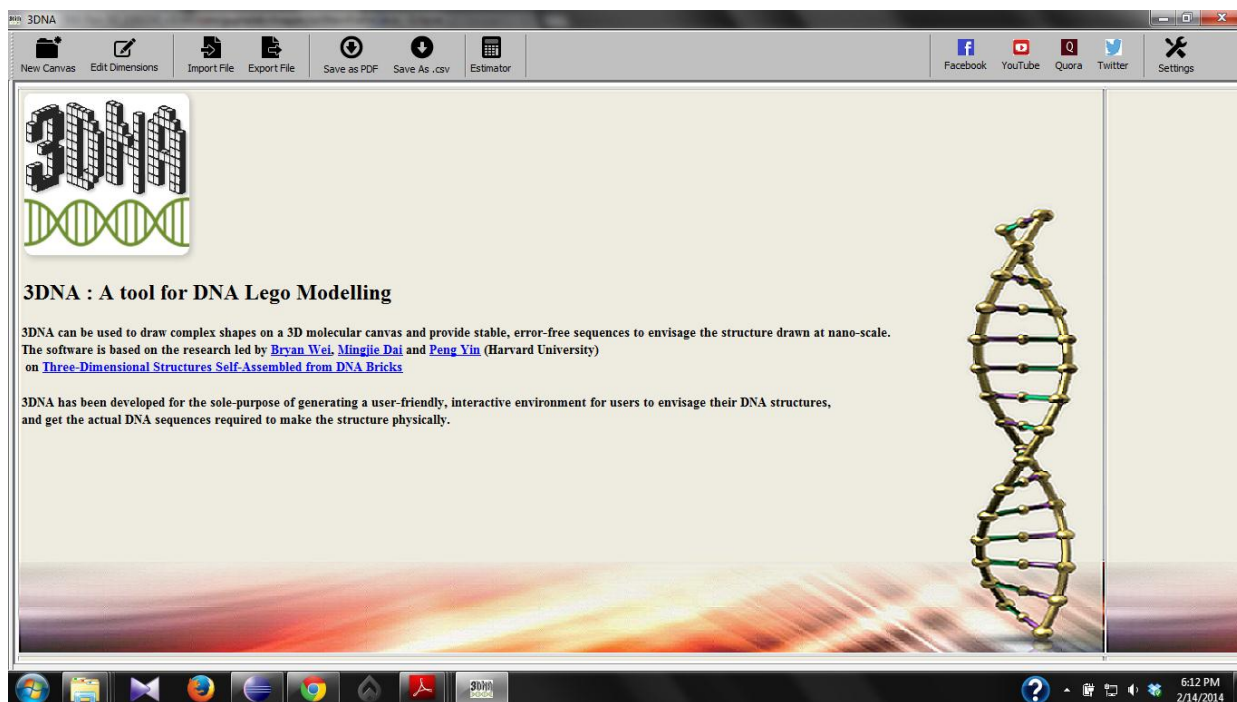

Figure 1: 3DNA Welcome Screen

The main features that the software provides the user with and which are spanned across these four options on the menu bar are:-

- Work on 3D Canvas
- Save DNA Sequences as PDF
- Save DNA Sequences as CSV file
- Edit Dimensions of the 3D Canvas
- Sequence Estimator
- Clear
- Social Media Options

Work on 3D Canvas

This option can be selected by clicking on the "New Canvas" button on the menubar. Once you select the canvas, you will be prompted to enter the dimensions i.e. length, width and depth of the 3D canvas. After entering the dimensions you will be able to see the front view of the molecular canvas of desired dimensions, with an input interface to interact with the canvas.
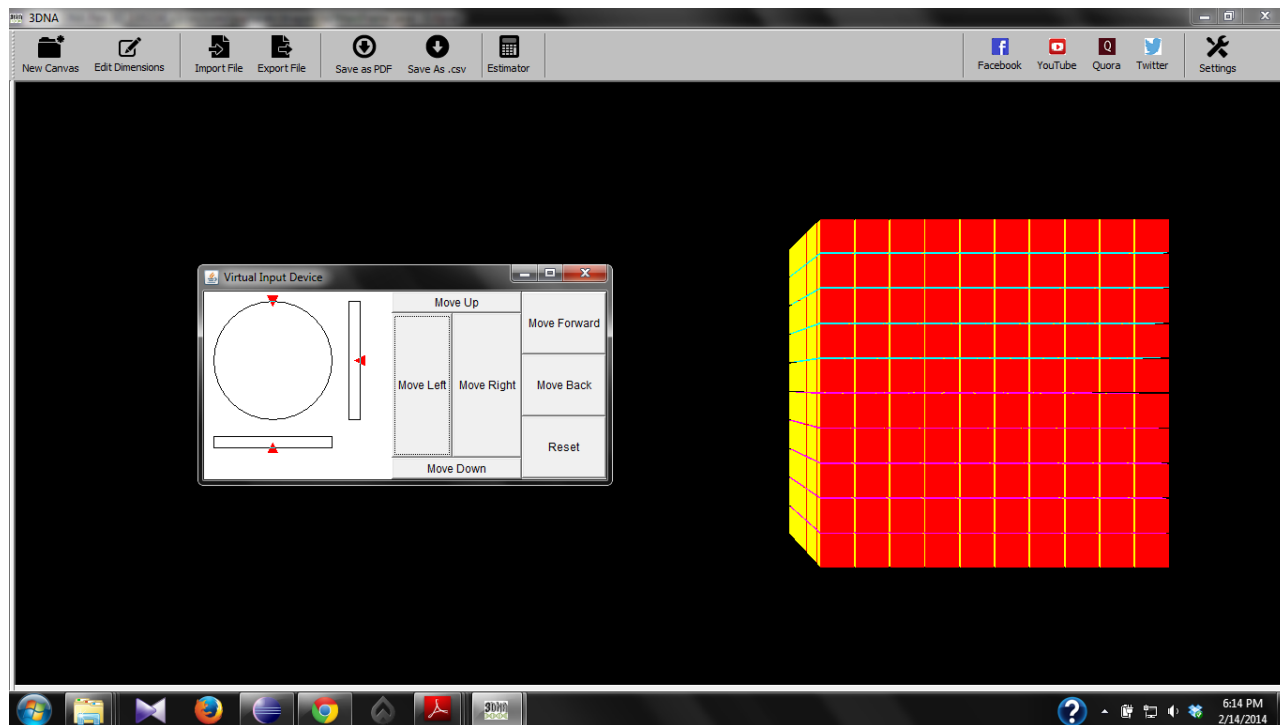

Figure 2: 3DNA 10x10x10 voxel Molecular Canvas

Drawing shapes on the canvas:

A user can model a 3D shape of his choice by deselecting DNA bricks on the molecular canvas. In total each DNA brick will be 32 base pair long.
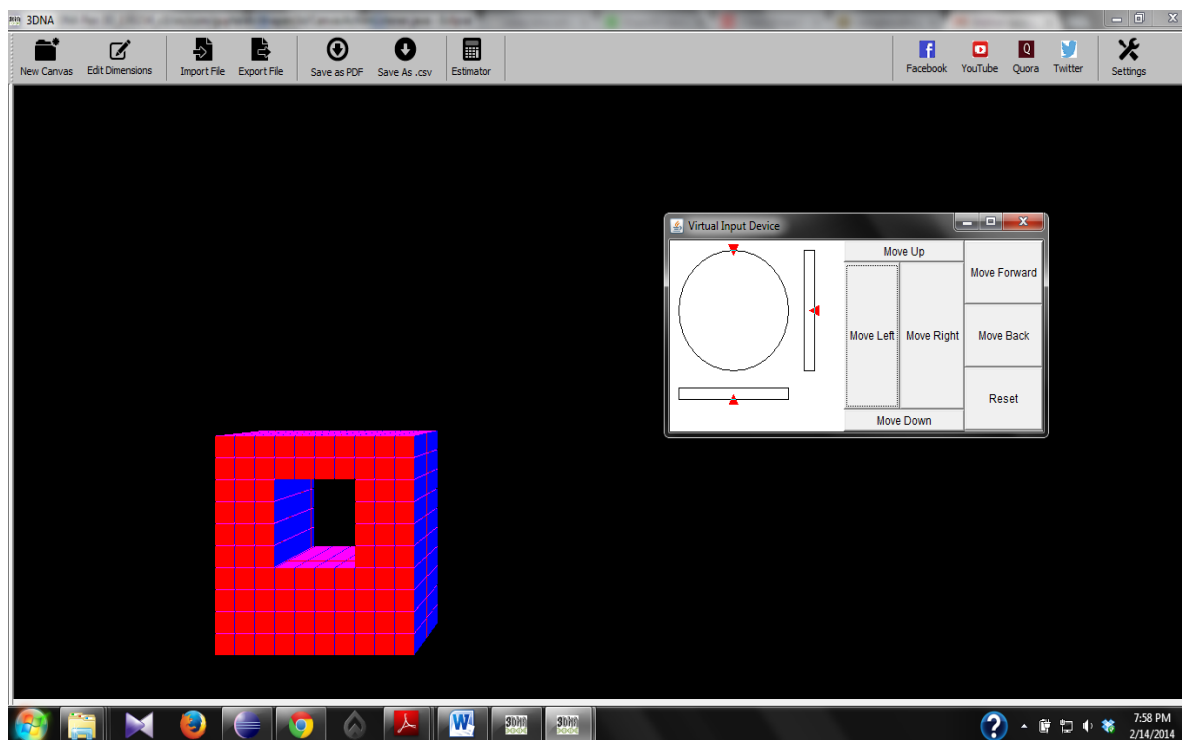

Figure 3: A structure composed on the 10x10x10 voxel Molecular Canvas

Save Options:

Once the user has drawn a custom 3D structure on the canvas he can get the corresponding DNA sequences of the shape drawn by clicking on the "Save as PDF" or "Save as .csv" options from the menu bar. The sequences generated by the software self-assemble in one step annealing reaction into prescribed 3D shapes.
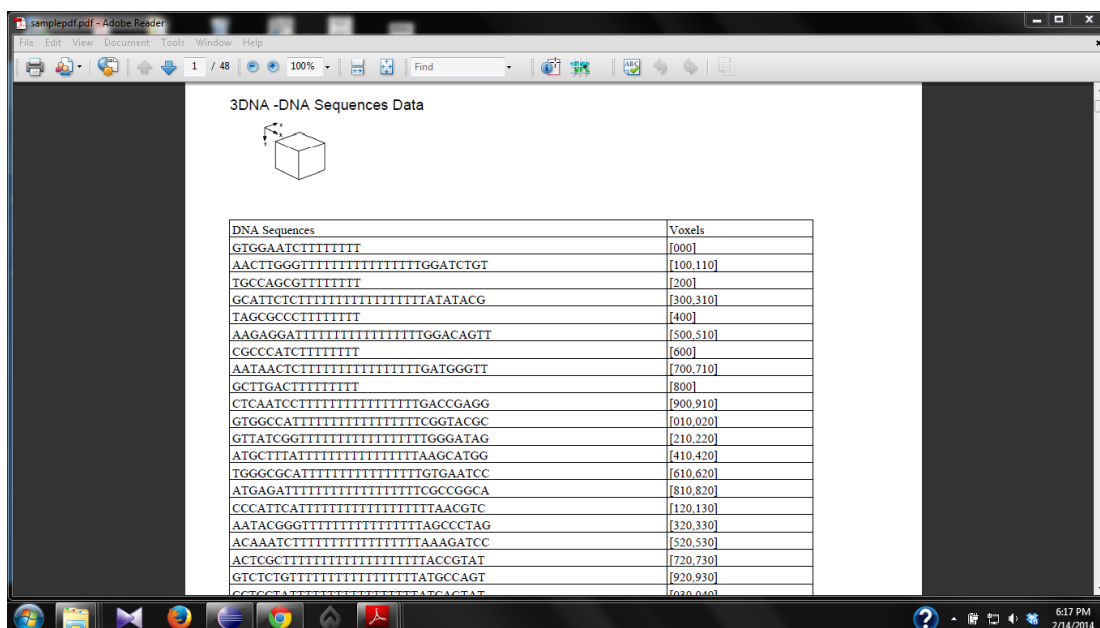
Save as PDF:

Figure 4: DNA sequences and voxels saved as .pdf file

Save as .csv:

Figure 5: DNA sequences and voxels saved as .csv file

Support and Feedback

Users are requested to contact team at the feedback page on the website www.guptalab.org/3dna for any issue with the software. Two platform specific installers (Windows and Mac) are available on the project home page along with source code.