

Software Components

Class DesignPR ()

Summary: set ups the graphical user interface where the users can input information about primer design and DNA sequences. The information from the user is then used to generate preliminary primer designs. The length of the primers is then adjusted to optimize GC content and annealing temperatures.

Functions

GUI_setup()

Create entry boxes and radio buttons for primer design information from user.
Create entry box for results where primer design will get displayed.

update_sequence_fields()

Update entry box titles based on primer purpose defined by users. The updated titles will help guide user inputs.

action_buttons()

Define two action buttons to “Design Primers” to run primer design functions or “Clear” to clear-out entry boxes.

When selected by the user, the design_primers and/or the clear_all functions are called.

check_SEQ()

Check the sequence entries by the user for valid and appropriate DNA sequences.
Output an error messages if invalid sequences are entered.

design_primers()

Using the following information from the user 1) Primer purpose and 2) DNA sequence entries, generate forward and reverse primers that contain two regions.

- Region one => template DNA annealing (15 base pairs)
- Region two => overlap region between two fragments

As designed, primers are then sent to optimize_primers() where optimized primers and parameter information is returned.

Optimized primers and parameters are then sent to display_primers()

optimize_primers()

optimize primers based on GC and annealing temperature, measured using biopython packages.

Iteratively adjust the length of the primers until appropriate GC and annealing temperatures conditions are met.

display_primers()

Take the final design primers and display them in the result entry box of the GUI, including information about the final GC content and annealing temperature.

Interactions to Accomplish Use Cases

Use case: design primers to insert a short (10 nucleotide) DNA sequence

Install package, and run GUI

- The GUI pop up window should allow for user inputs

Fill in user inputs

- Specify primer purpose as “Insertion”
- Input DNA sequence
- Input Insert sequence
- Press “Design Primers”

Result output

- Forward and reverse primer designs
- GC and annealing temperatures