Package ‘dnafractal’

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Version 0.0.2

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Title Generates a Fractal Image of a DNA Sequence

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Description The function takes a DNA sequence, a start point, an end point in the sequence, dot size and dot color and draws a fractal image of the sequence. The fractal starts in the center of the canvas. The image is drawn by moving base by base along the sequence and dropping a midpoint between the actual point and the corner designated by the actual base. For more details see Jeffrey (1990) <doi:10.1093/nar/18.8.2163>, Hill, Schisler, and Singh (1992) <doi:10.1007/BF00178602>, and Löchel and He
der (2021) <doi:10.1016/j.csbj.2021.11.008>.

License GPL (>= 3)

Encoding UTF-8

LazyData true

RoxygenNote 7.3.2

Imports stringr, DescTools

NeedsCompilation no

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Depends R (>= 3.5.0)

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Contents

`coordinates2sequence` *Generates a DNA Sequence Based on an X and Y Coordinate over several iterations*

Description

The function takes an X and Y coordinate and a number of bases to be represented in the DNA sequence. The function starts at the provided X and Y coordinates and then works backward, calculating every preceding base in the DNA sequence that led to that particular point in the fractal. Based on the actual X, Y point's coordinate, the base pair corresponding to that coordinate is inferred, and the DNA string will be built up and returned as the product of the function.

Version 0.0.1. Author: Dr. Matthew Cserhati Email: matthew.cserhati@cui.edu May 5, 2025

Arguments

`xstart`	the starting x coordinate in the fractal image
`ystart`	the starting y coordinate in the fractal image
`n`	the number of bases to be calculated in the DNA sequence

Value

The DNA sequence

References

Jeffrey, H. J. (1990) Chaos game representation of gene structure. Nucleic Acids Research 18(8):2163-70.

Hill, K. A., Schisler, N. J., and Singh, S. M. (1992) Chaos game representation of coding regions of human globin genes and alcohol dehydrogenase genes of phylogenetically divergent species. Journal of Molecular Evolution 35:261-269.

Löchel, H. F., and Heider, D. (2021) Chaos game representation and its applications in bioinformatics. Computational and Structural Biotechnology Journal 19(2021): 6263-6271.

Examples

```
coordinates2sequence(-10,90,25)
```

`dnafractal` *Generates a Fractal Image of a DNA Sequence*

Description

The function takes a DNA sequence up to 100 Kbp, a start point, an end point in the sequence, dot size and dot color and draws a fractal image of the sequence. The fractal starts in the center of the canvas. The image is drawn by moving base by base along the sequence and dropping a midpoint between the actual point and the corner designated by the actual base.

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Arguments

`mx`	a DNA sequence
`start`	the starting position in the sequence to be fractalized
`end`	the ending position in the sequence to be fractalized
`cex`	the size of the dots in the fractal image
`dotcol`	the color of the fractal image dots

Value

nil

References

Jeffrey, H. J. (1990) Chaos game representation of gene structure. Nucleic Acids Research 18(8):2163-70.

Hill, K. A., Schisler, N. J., and Singh, S. M. (1992) Chaos game representation of coding regions of human globin genes and alcohol dehydrogenase genes of phylogenetically divergent species. Journal of Molecular Evolution 35:261-269.

Löchel, H. F., and Heider, D. (2021) Chaos game representation and its applications in bioinformatics. Computational and Structural Biotechnology Journal 19(2021): 6263-6271.

Examples

```
dnafractal(human_mitogenome)
dnafractal(human_mitogenome,start=100,end=1000)
dnafractal(human_mitogenome,cex=1,dotcol="blue")
```

`human_mitogenome` *Human Mitochondrial Genome Sequence*

Description

Human Mitochondrial Genome Sequence

Usage

`human_mitogenome`

Format

'human_mitogenome' Human Mitochondrial Genome Sequence

`sign2base` *Returns a DNA base based on the sign value of an X and Y coordinate*

Description

The function takes the sign of an X and Y value and returns the corresponding DNA base.

Version 0.0.1. Author: Dr. Matthew Cserhati Email: matthew.cserhati@cui.edu May 5, 2025

Arguments

`sx`	sign of X coordinate
`sy`	sign of Y coordinate

Value

The corresponding base

References

Jeffrey, H. J. (1990) Chaos game representation of gene structure. Nucleic Acids Research 18(8):2163-70.

Hill, K. A., Schisler, N. J., and Singh, S. M. (1992) Chaos game representation of coding regions of human globin genes and alcohol dehydrogenase genes of phylogenetically divergent species. Journal of Molecular Evolution 35:261-269.

Löchel, H. F., and Heider, D. (2021) Chaos game representation and its applications in bioinformatics. Computational and Structural Biotechnology Journal 19(2021): 6263-6271.

Examples

```
sign2base(-1,1)
```

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