HIGUCHI FRACTAL DIMENSION
-SUMANTH YEDDULA- (2012-04-04)

This document is based on the functions I created to calculate HFD (Higuchi Fractal Dimension). It also serves the purpose of a user guide.

The algorithm for Higuchi Fractal Dimension is taken from

1. Truong Quang Dang Khoa, Vo Quang Ha, and Vo Van Toi, "**Higuchi Fractal Properties of Onset Epilepsy Electroencephalogram**," Computational and Mathematical Methods in Medicine, vol. 2012, Article ID 461426, 6 pages, 2012. doi:10.1155/2012/461426

2. Higuchi, T. (1988). **Approach to an irregular time series on the basis of the fractal theory**. *Physica D: Nonlinear Phenomena*, *31*(2), 277-283. Springer. Retrieved from http://linkinghub.elsevier.com/retrieve/pii/0167278988900814

The present implementation has 2 methods

1.
   Uses split() and HFDCALC(). HFDCALC() uses split() to split the N- length data series to a k-series set. Then calculates the length of curve of each series in k-series set. Finds the length for total curve using average. This gives L(k) for a k. Now k is varied from 1 to kmax. Using which Df is calculated.

2.
   This method uses HFD_LCALC(). It directly calculates the HFD. It doesnt split the data series explicitly. But, implicitly calculates the length of each curve in a k-series set. Then calculates L(k). Then again k is varied from 1 to kmax. Using which Df is calculated.
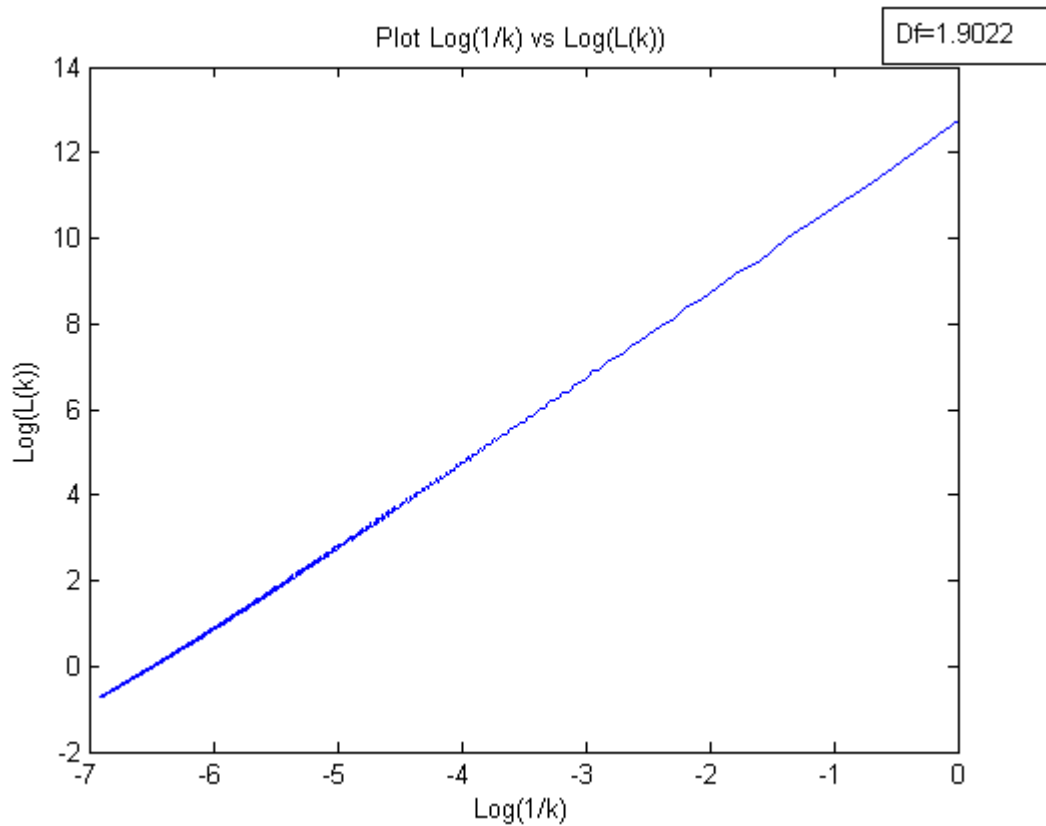HFD_LCALC is faster as it is not explicitly splitting the data.

test1.m is test file to run HFDCALC() which in turn uses split()
test2.m is test file to run HFD_LCALC().
LogBreath is a sample data
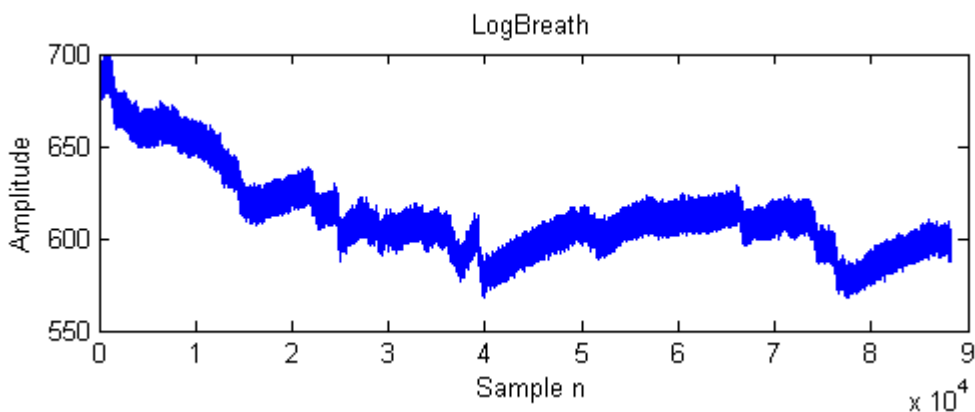
The above figure gives the LogBreath plot

The above figure shows plot between Log(L(k)) and Log(1/k). The slope generally gives Df. Both methods produce similar plot.

A sample run gave following speeds
test1.m using HFDCALC() gave elapsed time 5.362332 seconds
test2.m using HFD_LCALC() gave elapsed time 2.930115 seconds