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clc
close all
clear

RGBImage = imread('dogs.jpeg');
Image = rgb2gray(RGBImage);
Height = size(Image,1);
Width = size(Image,2);
Simulations = 1e3;
Iterations = 20; %%Iterations of cellular automata
AdjacentPixelCorr = zeros(Simulations,3);
SamePixelCorr = zeros(Simulations,2);
KeySensitivity = zeros(Simulations,2);

for i=1:Simulations
    %% Encryption
    Password = [3.9+0.1*rand(),rand()];
    Mu = Password(1); %%Logistic Map parameter:  $3.9 < \mu < 4.0$ 
    X0 = Password(2); %%Logistic Map initial value:  $0 < X_0 < 1$ 
    Sequence = LogisticRandomSequence(Height*Width,Mu,X0);

    LifeEncoded = Encoder(Image,Sequence,'Life',1,Iterations);
    FredkinEncoded = Encoder(Image,Sequence,'Fredkin',1,Iterations);

    %% Correlation tests

    AdjacentPixelCorr(i,:) = ...
        [CorrelationOfAdjacentPixels(Image),...
        CorrelationOfAdjacentPixels(LifeEncoded),...
        CorrelationOfAdjacentPixels(FredkinEncoded)];

    SamePixelCorr(i,:) = ...
        [corr2(Image,LifeEncoded),...
        corr2(Image,FredkinEncoded)];

    %% Key sensitivity test

    PerturbedSequence = Sequence;
    ChangedIndex = randi(length(PerturbedSequence));
    PerturbedSequence(ChangedIndex) = 1-PerturbedSequence(ChangedIndex);

    PerturbedLifeEncoded = Encoder(Image,PerturbedSequence,'Life',
        Iterations,1);

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