Assignment 3: Detection of double JPEG compression

Step 1: generation of JPEG compressed and double JPEG compressed images

- One time JPEG compression (see DF_Lab3_JPEG.m as an example):
  - Investigate properties of quantization matrix (QM) for different values of quality factor (QF).
  - Generate JPEG compressed image with QF_1.

- Double JPEG compression:
  - Decode JPEG image into spatial domain
  - Generate double JPEG compressed image with QF_2 ($QF_2 \neq QF_1$).

Step 2: analysis of DCT coefficients of JPEG compressed images

- Global analysis of DCT coefficients:
  - Generate global histograms of DCT coefficients of one-time and double JPEG compressed images.
  - Analyze the behavior of global histograms of DCT coefficients for $QF_2 > QF_1$ and $QF_2 < QF_1$.

- Pairwise analysis of DCT coefficients:
  - Generate pairwise histograms of DCT coefficients of one-time and double JPEG compressed images.
  - Analyze the behavior of pairwise histograms of DCT coefficients for $QF_2 > QF_1$ and $QF_2 < QF_1$.

Step 3: detection of image manipulation based on double JPEG compression detection

- Manipulated images preparation:
  - Generate one-time JPEG compressed images.
  - Generate double JPEG compressed images.
  - Generate manipulated image in DCT domain by concatenation of DCT coefficients of one-time and double JPEG compressed images (ManImage1).
  - Generate manipulated image in spatial domain by concatenation of decoded of one-time and double JPEG compressed images (ManImage2).

- Manipulation detection:
  - Based on pairwise analysis of DCT coefficients detect presence of double compression in ManImage1 for $QF_2 > QF_1$ and $QF_2 < QF_1$.
  - Based on pairwise analysis of DCT coefficients detect presence of double compression in ManImage2 for $QF_2 > QF_1$ and $QF_2 < QF_1$.
  - Compare the results of double JPEG compression detection in ManImage1 and ManImage2 for given values of QF_1 and QF_2 in case of $QF_2 > QF_1$ and $QF_2 < QF_1$.