Image Watermarking

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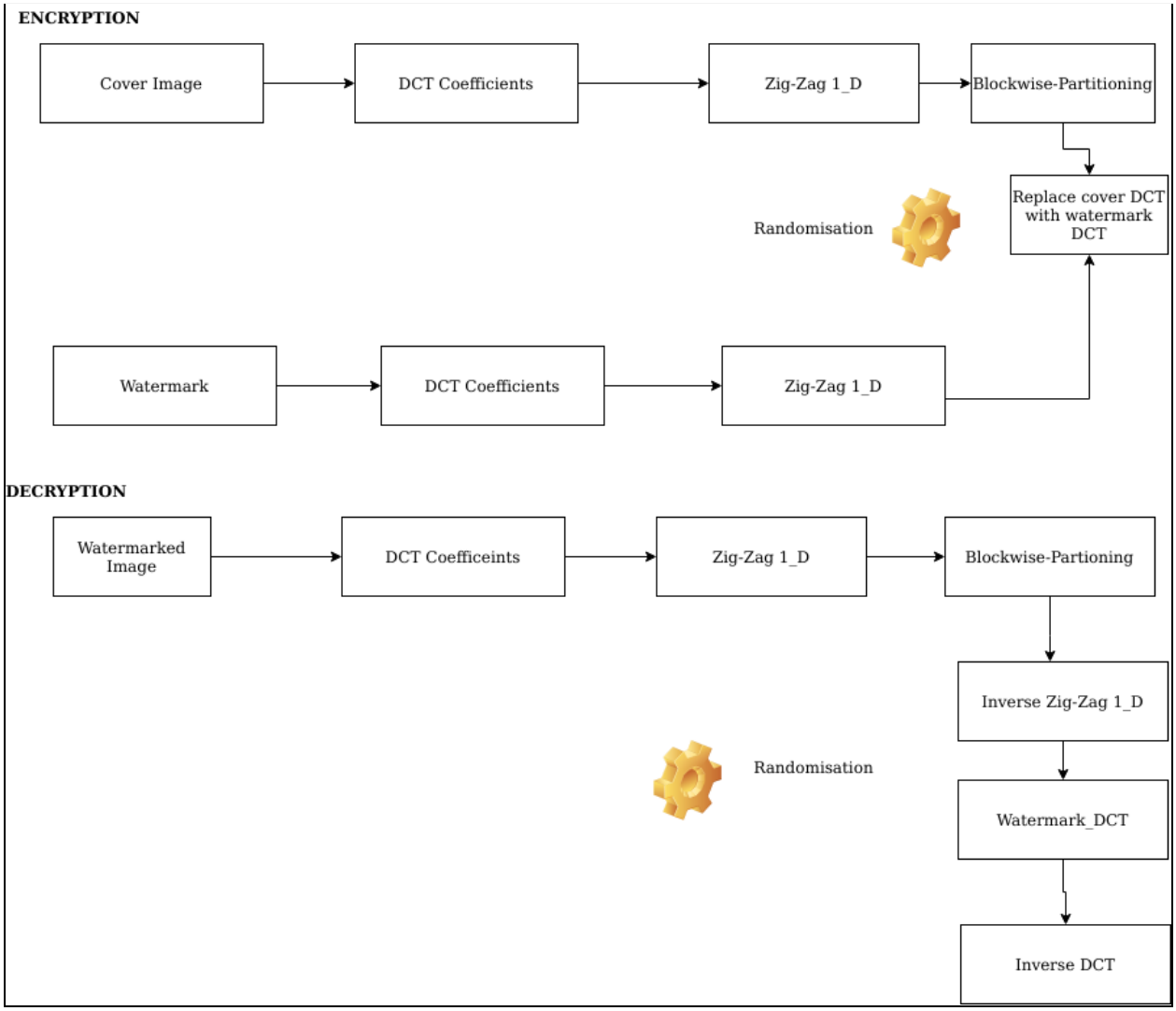
Aim: Embedding of watermark image(w x h) into cover image (W X H) i.e. w<W and h<H.

Self-Proposed Watermarking Algorithm:-



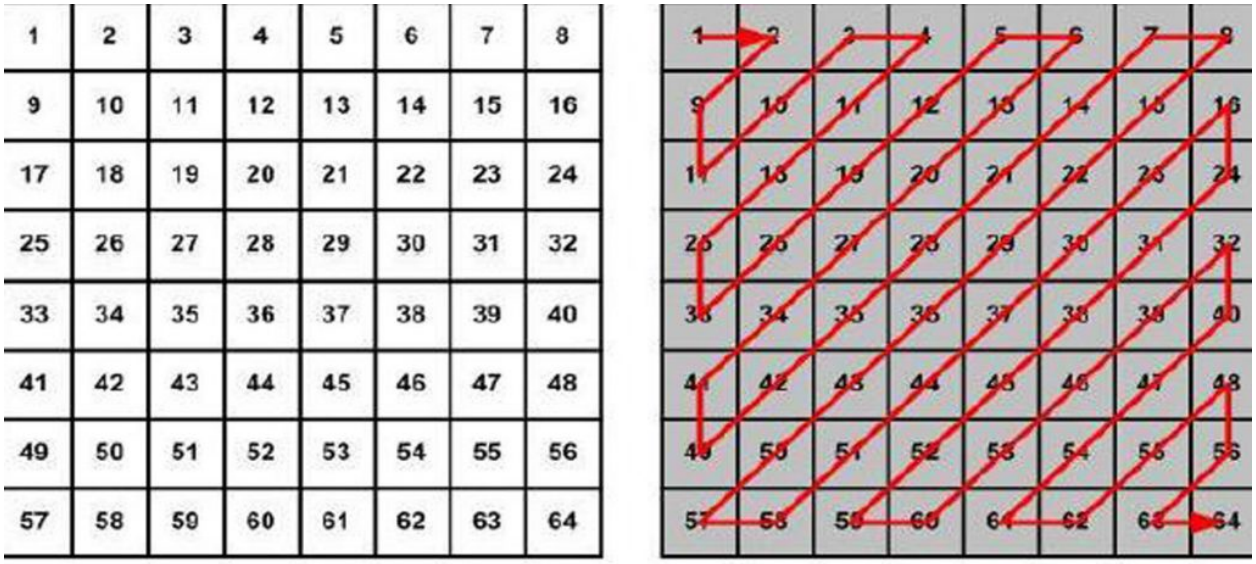


Fig: 2-D DCT to 1-D DCT Conversion

Note: The list after zigzag reading results in a sorted list of DCT coefficients from low-frequency to high-frequency components.

Zigzag_DCT =
[1,2,9,11,10,3,4,11,.....,62,55,48,56,63,64]

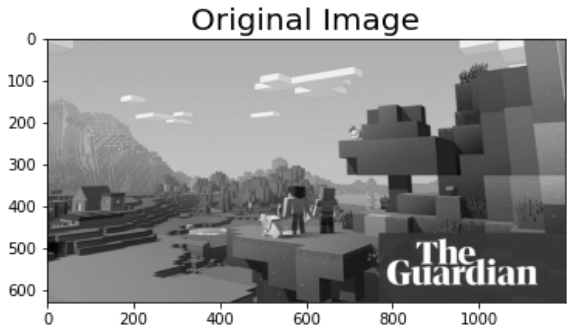
So, now Block Partitioning… It basically makes us available what all indices can be used for embedding from zigzag_DCT.

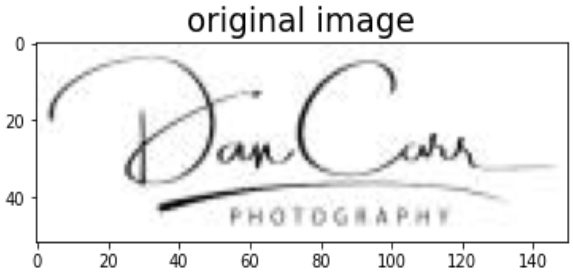
Block Size	Number of occurrences
64x64	32
32x32	256
16x16	512
8x8	2048
4x4	2048
2x2	4096
1x1	Remaining indices

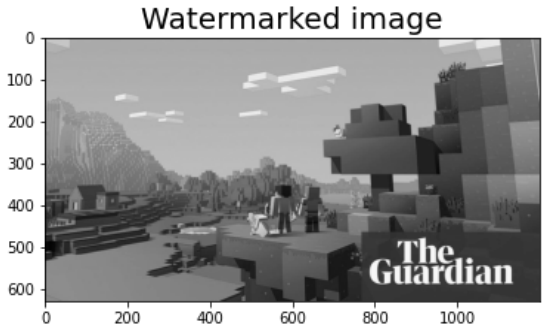
So, for above the available indices can be, [10,20,.....56,63,64]

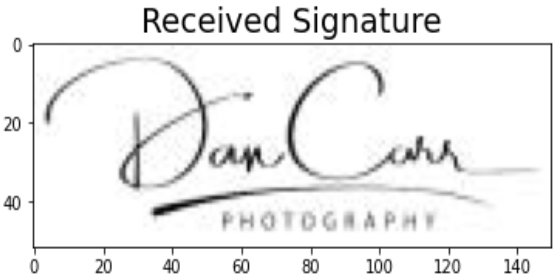
Experiments:-

1. No Attack



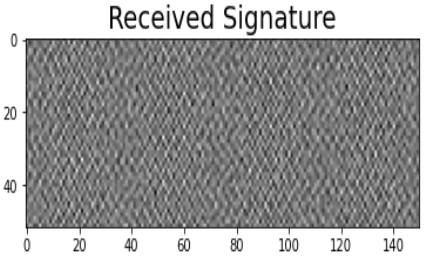






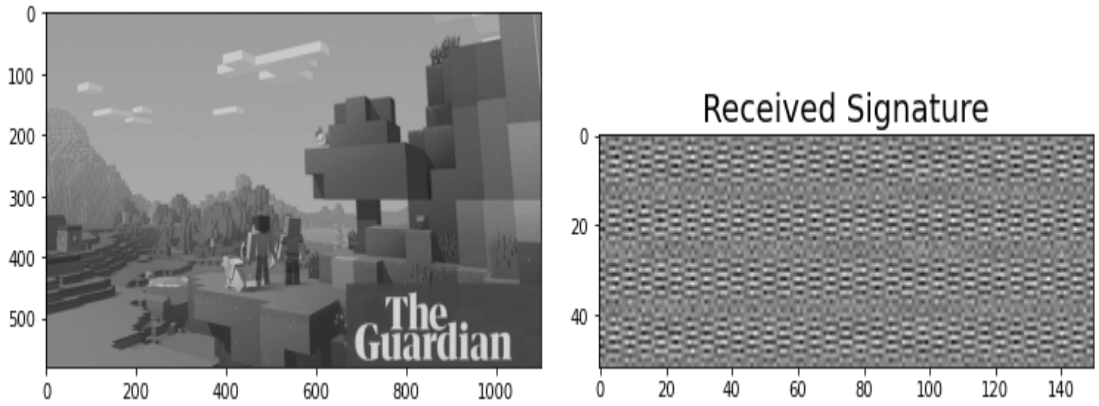
2. Geo-metric Attacks

a.) Rotation Attack



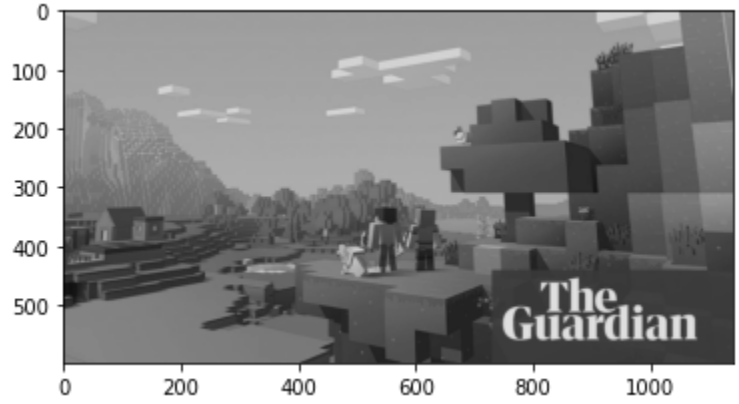
Correlation coefficient:- -0.00982649

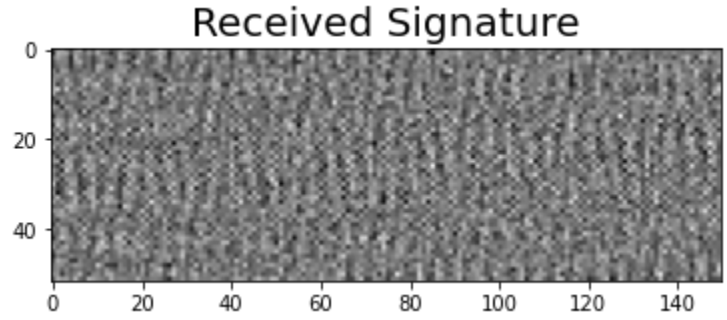
b.) Cropping Attack



Correlation coefficient:- 0.00232999

c.) Scaling Attack

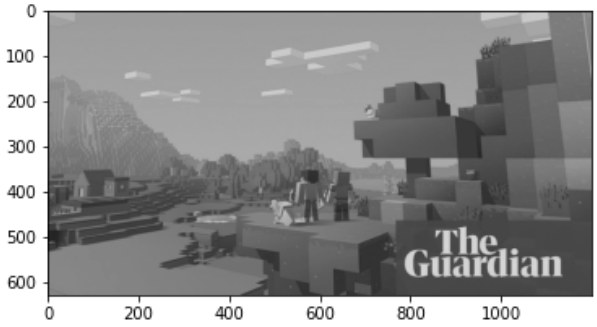


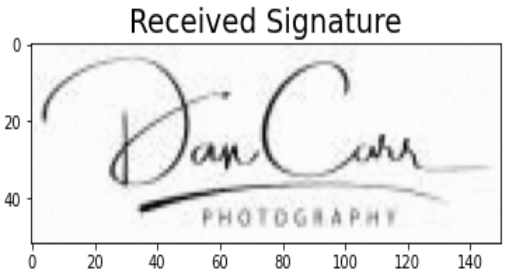


Correlation coefficient:- -0.00812392

3. Signal Attacks

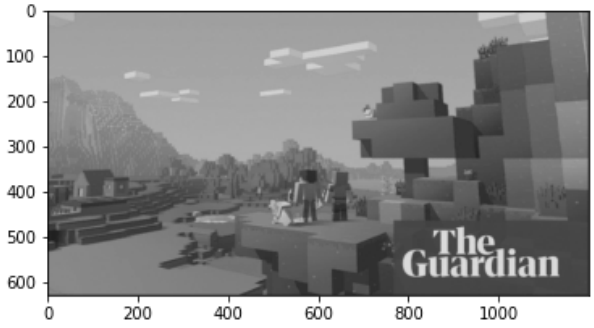
a.) Gaussian Noise

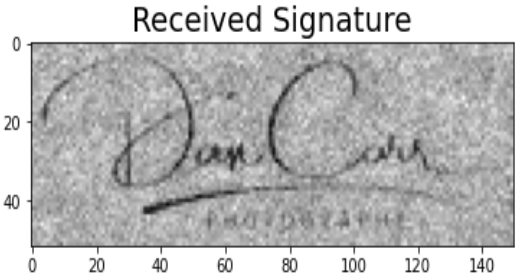




Correlation coefficient:- 0.99965918

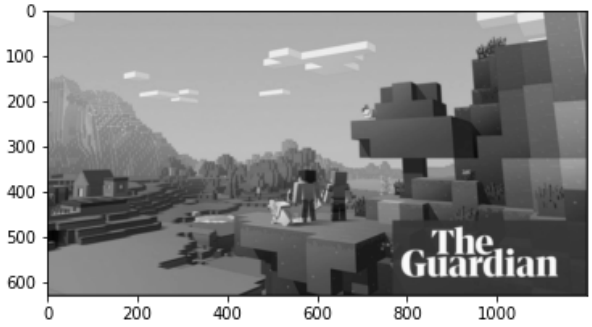
b.) Median Filter Attack

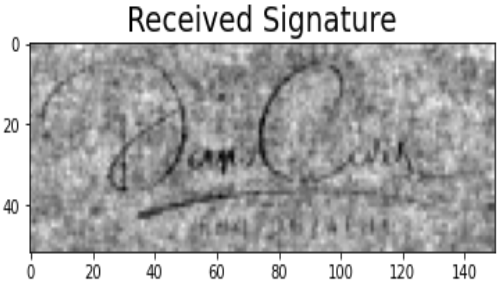




Correlation coefficient:- 0.73409364

c.) Average Filter Attack





Correlation coefficient:- 0.57994413

Conclusion:

The proposed algorithm seems to be robust against signal level attacks but fails against geometric attacks like rotation,cropping,etc. According to my survey the potential reason might be the usage of only DCT coefficients for watermarking embedding. If we can use a hybrid of several frequency domain techniques like DWT+DCT then the order of robustness might increase further.