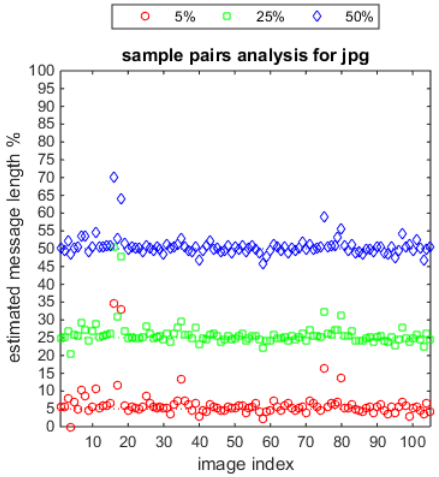
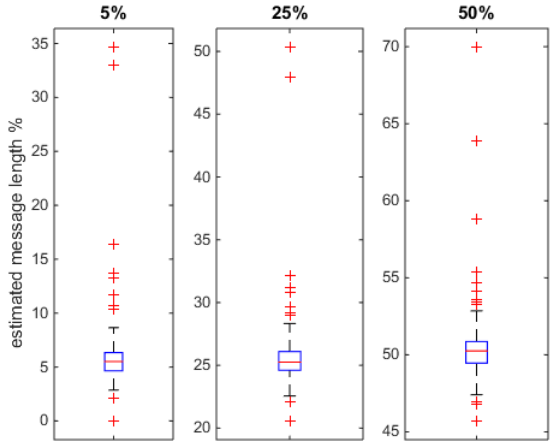
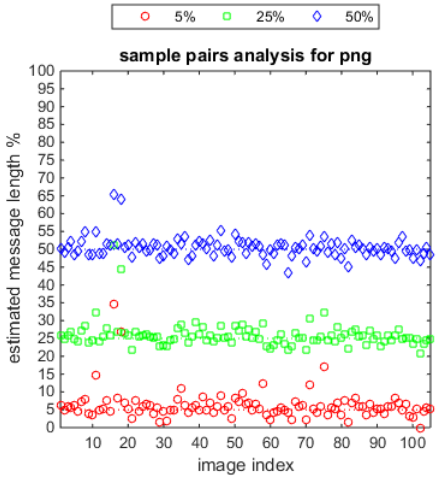
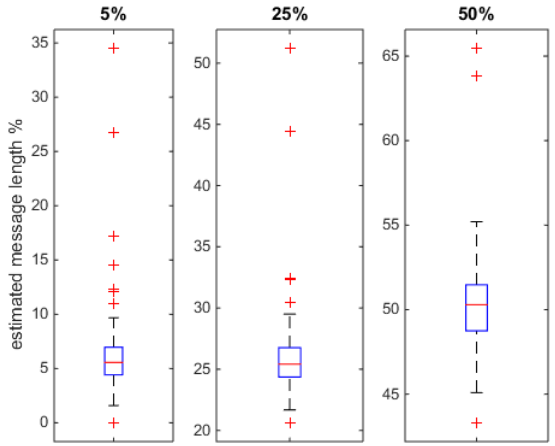
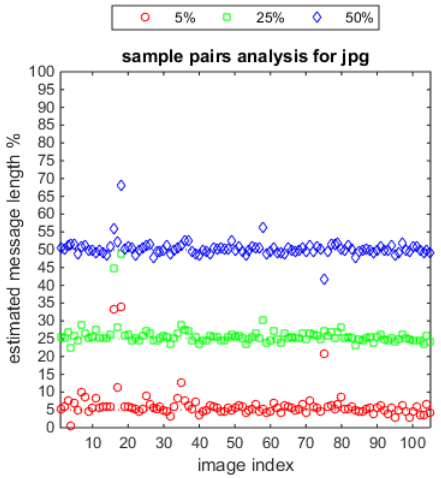
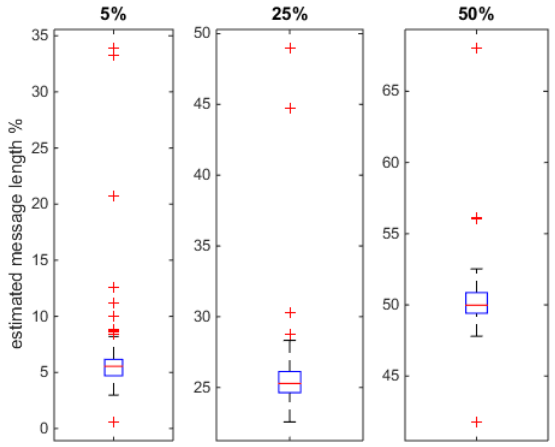
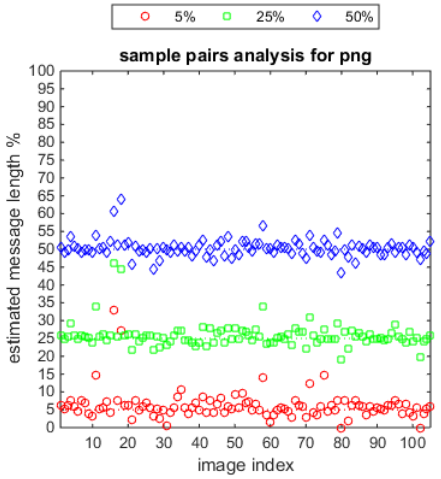
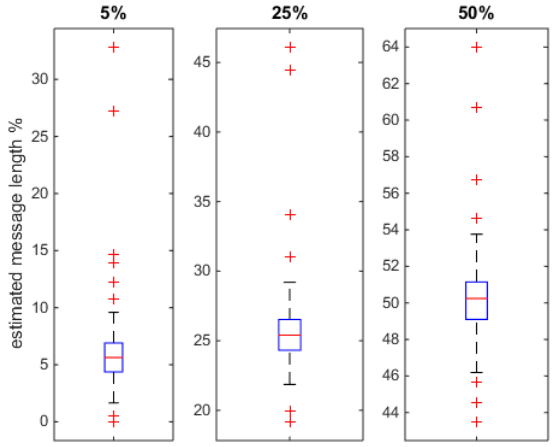
♦ sample pairs analysis for lsb embedding

每組實驗皆包含 jpg 與 png 的測試，將相同的訊息隱藏在相同的像素。

experiment 1：random generated message with seed 1		
		---------- ----------descriptive statistics---------- ---------- 5% : mean =0.063295 , variance=0.001947 , stddev =0.044121 max(16)=0.346613 , median =0.055138 , min(4)=0.000000 25% : mean =0.259585 , variance=0.001346 , stddev =0.036689 max(16)=0.503384 , median =0.252513 , min(4)=0.205645 50% : mean =0.506527 , variance=0.000829 , stddev =0.028787 max(16)=0.699702 , median =0.502527 , min(58)=0.457058
		---------- ----------descriptive statistics---------- ---------- 5% : mean =0.062425 , variance=0.001816 , stddev =0.042609 max(16)=0.345077 , median =0.055631 , min(102)=0.000000 25% : mean =0.259381 , variance=0.001392 , stddev =0.037308 max(16)=0.512150 , median =0.254151 , min(102)=0.206210 50% : mean =0.504677 , variance=0.000811 , stddev =0.028477 max(16)=0.654646 , median =0.502939 , min(65)=0.433025

experiment 2：random generated message with seed 2		
		----------descriptive statistics---------- 5% : mean =0.063025 , variance=0.001929 , stddev =0.043919 max(18)=0.338929 , median =0.055474 , min(4)=0.005837 25% : mean =0.258819 , variance=0.001025 , stddev =0.032015 max(18)=0.489740 , median =0.252842 , min(4)=0.225644 50% : mean =0.503058 , variance=0.000538 , stddev =0.023203 max(18)=0.680328 , median =0.499776 , min(75)=0.417740
		----------descriptive statistics---------- 5% : mean =0.062067 , variance=0.001742 , stddev =0.041735 max(16)=0.328130 , median =0.056364 , min(80)=0.000000 25% : mean =0.258508 , variance=0.001214 , stddev =0.034845 max(16)=0.460920 , median =0.253998 , min(80)=0.191694 50% : mean =0.503055 , variance=0.000665 , stddev =0.025788 max(18)=0.639875 , median =0.502411 , min(80)=0.434909

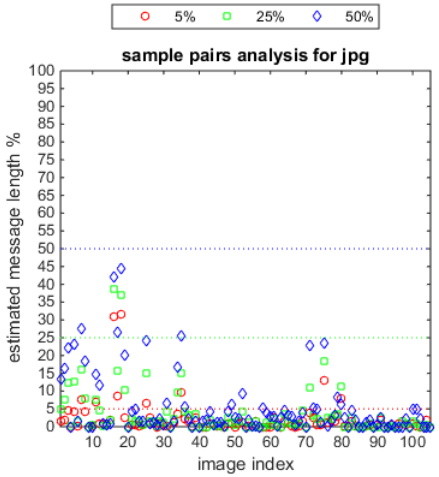
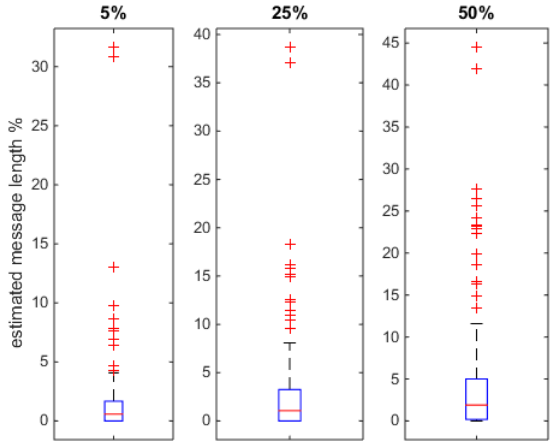
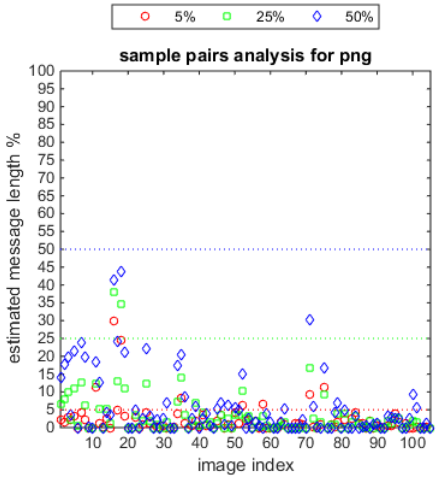
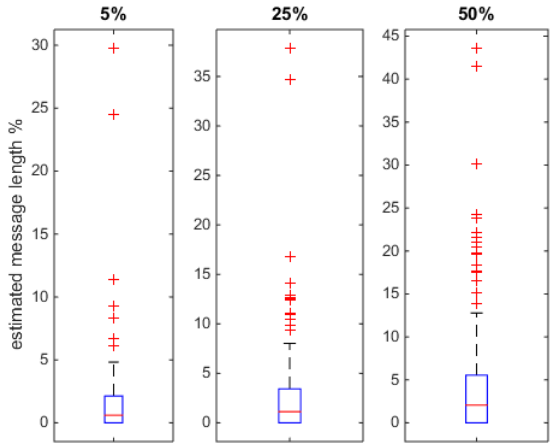
1 大部分使用 lsb embedding 的圖片 ，無論何種檔案類型，sample pairs analysis 所估計的隱藏比例 ≃ 實際值。

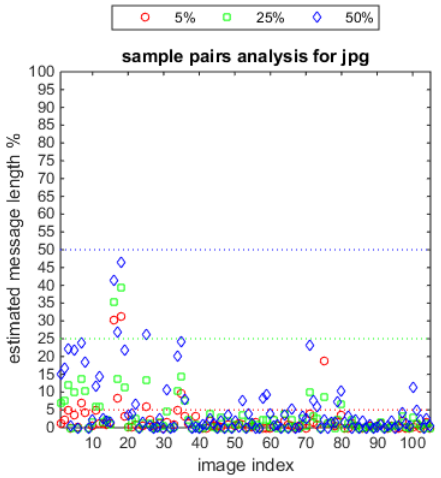
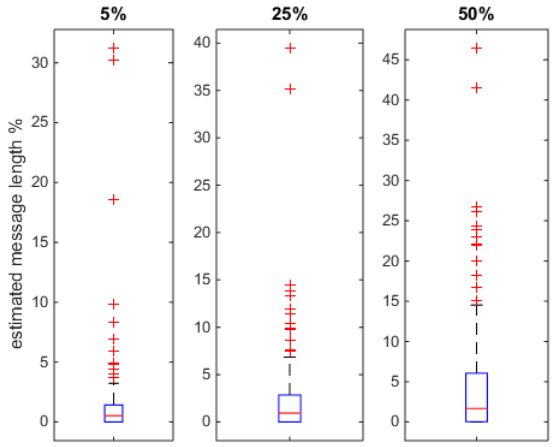
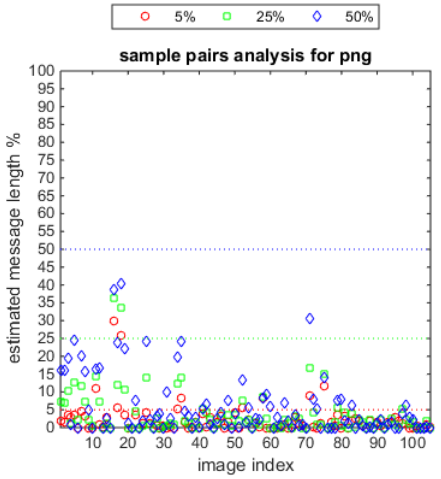
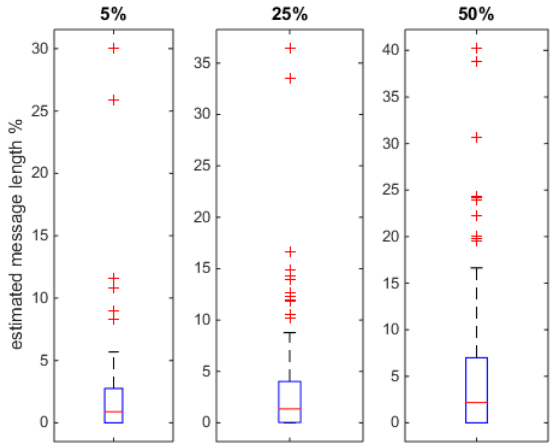
→ lsb embedding 雖然是個簡單快速的方法，卻很容易被識破。

2 少數圖片如 16、18，其相鄰像素變化差異較大，使用 sample pairs analysis 所估計的隱藏比例 ≫ 實際值。

♦ sample pairs analysis for stochastic modulation

每組實驗皆包含 jpg 與 png 的測試，將相同的訊息隱藏在相同的像素。

experiment 1：random generated message with seed 1		
		----------descriptive statistics---------- 5% : mean =0.019493 , variance=0.002195 , stddev =0.046846 max(18)=0.316474 , median =0.005810 , min(4)=0.000000 25% : mean =0.033504 , variance=0.004060 , stddev =0.063716 max(16)=0.386881 , median =0.010657 , min(9)=0.000000 50% : mean =0.053687 , variance=0.007751 , stddev =0.088041 max(18)=0.445079 , median =0.018996 , min(4)=0.000000
		----------descriptive statistics---------- 5% : mean =0.019881 , variance=0.001770 , stddev =0.042069 max(16)=0.297565 , median =0.006073 , min(6)=0.000000 25% : mean =0.032453 , variance=0.003580 , stddev =0.059831 max(16)=0.378468 , median =0.011258 , min(9)=0.000000 50% : mean =0.053637 , variance=0.007570 , stddev =0.087008 max(18)=0.435899 , median =0.020621 , min(6)=0.000000

experiment 2：random generated message with seed 2		
		----------descriptive statistics---------- 5% : mean =0.018943 , variance=0.002239 , stddev =0.047323 max(18)=0.312192 , median =0.005300 , min(4)=0.000000 25% : mean =0.031176 , variance=0.003626 , stddev =0.060218 max(18)=0.394659 , median =0.009403 , min(4)=0.000000 50% : mean =0.053683 , variance=0.007757 , stddev =0.088076 max(18)=0.464394 , median =0.016751 , min(6)=0.000000
		----------descriptive statistics---------- 5% : mean =0.021377 , variance=0.001851 , stddev =0.043026 max(16)=0.300277 , median =0.008880 , min(6)=0.000000 25% : mean =0.035447 , variance=0.003565 , stddev =0.059712 max(16)=0.364382 , median =0.013534 , min(13)=0.000000 50% : mean =0.056745 , variance=0.007181 , stddev =0.084738 max(18)=0.402308 , median =0.021819 , min(6)=0.000000

1 使用 stochastic modulation 的圖片，無論何種檔案類型，sample pairs analysis 無法正確估計隱藏比例。

2 雖然無法正確估計，但是隱藏的訊息越多，越容易發現異常。