CMSE492 Seminar 25.05.2021 Task on RS Steganalysis

1. Consıder a 1x4 mask M=(0,1,1,0)
2. Consider the grayscale image, I, below having 2 rows and 8 columns:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Col1 | Col2 | Col3 | Col4 | Col5 | Col6 | Col7 | Col8 |
| Row1 | 19 | 225 | 118 | 101 | 125 | 231 | 218 | 221 |
| Row2 | 215 | 231 | 119 | 121 | 27 | 211 | 117 | 21 |

1. Specify 4 pixel groups, G11,..,G14, for M
2. Classify the groups as RM, SM, R-M, S-M, UM, U-M
3. Using 5% threshold for assessing RS-steganalysis statistical hypothesis (RM= R-M , SM=S-M) decide whether the image, I, has (not) a payload according to M
4. Your homework as a pdf file named “CMSE492 Sem3 Name Surname StID.pdf” shall be uploaded into your personal Teams chat with me latest by 8.00 am, 25.05.2021. It will be graded out of 100%.

Scanning the image by rows top-bottom, left-to-right, the groups are:

G1=(19,225,118,101), G2=(125,231,218,221), G3=(215,231,119,121), G4=(27,211,117,21)

FM(G1)=(F0(19),F1(225),F1(118),F0(101))=(19,224,119,101)

F-M(G1)=(F0(19),F-1(225),F-1(118),F0(101))=(19,226,117,101)

F(FM(G1))=|19-224|+|224-119|+|119-101|=205+105+18=328

F(F-M(G1))=|19-226|+|226-117|+|117-101|=207+109+16=332

F(G1)=|19-225|+|225-118|+|118-101|=206+107+17=330

F(FM(G1))=328< F(G1)=330=>G1 belongs SM={G1}, RM={ }, UM={ }

F(F-M(G1))=332> F(G1)=330=>G1 belongs R-M={G1}, S-M={ }, U-M={ }

FM(G2)=(F0(125),F1(231),F1(218),F0(221))=(125,230,219,221)

F-M(G2)=(F0(125),F-1(231),F-1(218),F0(221))=(125,232,217,221)

F(FM(G2))=|125-230|+|230-219|+|219-221|=105+11+2=118

F(F-M(G2))=|125-232|+|232-217|+|217-221|=107+15+4=126

F(G2)=|125-231|+|231-218|+|218-221|=106+13+3=122

F(FM(G2))=118< F(G2)=122=>G2 belongs SM={G1, G2}, RM={ }, UM={ }

F(F-M(G2))=126>F(G2)=122=>G2 belongs R-M: R-M={G1, G2}, S-M={ }, U-M={ }

FM(G3)=(F0(215),F1(231),F1(119),F0(121))=(215,230,118,121)

F-M(G3)=(F0(215),F-1(231),F-1(119),F0(121))=(215,232,120,121)

F(FM(G3))=|215-230|+|230-118|+|118-121|=15+112+3=130

F(F-M(G3))=|215-232|+|232-120|+|120-121|=17+112+1=130

F(G3)=|215-231|+|231-119|+|119-121|=16+112+2=130

F(FM(G3))=130= F(G3)=130=>G3 belongs UM: SM={G1, G2 }, RM={ }, UM={G3 }

F(F-M(G3))=130=F(G3)=130=>G3 belongs U-M: R-M={G1, G2}, S-M={ }, U-M={G3}

FM(G4)=(F0(27),F1(211),F1(117),F0(21))=(27,210,116,21)

F-M(G4)=(F0(27),F-1(211),F-1(117),F0(21))=(27,212,118,21)

F(FM(G4))=|27-210|+|210-116|+|116-21|=183+94+95=372

F(F-M(G4))=|27-212|+|212-118|+|118-21|=185+94+97=376

F(G4)=|27-211|+|211-117|+|117-21|=184+94+96=374

F(FM(G4))=372< F(G4)=374=>G4 belongs SM: SM={G1, G2, G4}, RM={ }, UM={G3 }

F(F-M(G4))=376>F(G4)=374=>G4 belongs R-M: R-M={G1, G2, G4}, S-M={ }, U-M={ G3}

Hence, %RM=0/4=0%; %UM=1/4=25%; %SM=3/4=75%

%R-M=3/4=75%; %U-M=1/4=25%; %S-M=0/4=0%

|%SM-%S-M|=|75-0|=75%>5%

|%RM-%R-M|=|0-75|=75%>5%

Conclusion: Since the both differences exceed the threshold, 5%, there is payload in the image