Chapter 6

Overall Conclusion and Scope for Future Work

6.1 Overall Conclusion

This Thesis describes 3 research issues and their solutions. The first issue is based on FOBP. The second one is based on unused blocks during data embedding. The third one is about steganalysis of MD PVD techniques.

The first issue is "Most of the PVD based techniques suffer from FOBP". It is addressed by proposing a QVD+PVC based technique. This scheme cuts the OI into 3×3 blocks. Out of 9 pixels, RR+QVD approach is plied on 5 pixels. These 5 pixels are the central pixel, its 2 horizontal neighbors and 2 vertical neighbors. SVs of these 5 pixels are utilized to ply PVC logic in 4 corner pixels. Performance is satisfactory. BPB is 3.92 and PSNR is acceptable (35.94 dB). There is a good trade-off between BPB and PSNR. As we have used here the concepts of substitution and differencing, so security is confirmed by RS and PDH tests. The PDH diagram for SI is not curly, so PDH test could not catch this scheme. From the RS diagrams we observed that "$R_m \approx R_{-m} > S_m \approx S_{-m}$", thus this proposed technique is undetected by RS test.

The second issue is "due to some given conditions, a majority of blocks could not be useful for data camouflaging in APVD schemes, hence HC is compromised". It is addressed by proposing a hybrid scheme. It works in 3 stages, (i) RR, (ii) AQVD, and (iii) QVC. Data hiding is done in 3×3 blocks. From a 3×3 block, we develop again 2 blocks, namely RB, and QB. RB comprises of remainders and QB comprises of quotients. Each remainder is written in 2 bits. There are 9 quotients in QB. In 4 corner quotients AQVD is plied and in rest of the quotients QVC is plied. In RR substitution is plied. Experimental data says that, HC of this scheme is obviously greater than the existing APVD schemes. It is also seen that the PSNR of this scheme is greater than the related PVD/QVD schemes. We can also judge that; the proposed scheme brought a trade-off between HC and PSNR. From the discussion over RS and PDH tests, it is

true to mention that the proposed scheme is a secured. It is the initial research contribution with integration of the 3 ideas like RR, AQVD and QVC.

The third issue is “PDH analysis could not detect multi-directional PVD techniques”. It is avoided by proposing a MDPDH scheme. The existing PDH steganalysis can only detect 1D PVD, and 2D PVD schemes. But this proposed MDPDH scheme can also detect 3D PVD, 5D PVD, and 8D PVD schemes. This scheme comprises 5 algorithms. Algorithm 1 generates 1D PDH using 1×2 blocks. Algorithm 2 generates 2D PDH using 1×3 blocks. Algorithm 3 generates 3D PDH using 2×2 blocks. Algorithm 4 generates 5D PDH using 2×3 or 3×2 blocks. Algorithm 5 generates 1D PDH using 3×3 blocks. The experimental results justify that MDPDH scheme is capable of clearly detecting the type of PVD applied on the SI during data hiding.

6.2 Scope for Future Work

The research can be further caried to check the integrity of the message at the recipient. To get this in every pixel block some control bits can be stored. These control bits shall be derived from the embedded data bits in that block.

In RR+AQVD+QVC technique, it can be worth to mention that quotients Q_2, and Q_8 have been used as references, they are not used for hiding. In future we can modify the proposed procedures to hide data in these 2 quotients too.

The steganography methodologies shall be jointed with cryptographic methodologies to acquire 2 stages of security. This idea can be plied in different practices. For example, to improve the security of the data stored in cloud, we can apply jointly cryptography and steganography.