A data hiding scheme developed for encrypted RGB images, derived from the work of Wu et al.:

- **Original features:**
  - data insertion in R and B using G as a reference;
  - mean based prediction;

**Encryption:**
- for each color channel, XOR with a pseudorandom sequence generated by an encryption key.

**Data insertion:**
- divide the encrypted R and B pixels into three sets:
  - α pixels are processed in stage 1, β pixels in stage 2;
  - select groups of pixels based on a data hiding key;
  - embed bit $b$ by flipping the $t$ bit plane of a group (joint method)
  - or replace the $t$ bit plane group parity value with $b$ (separate method).

**Encryption & Data insertion**

- **Decryption & Data extraction**
  - **Decryption**:
    - XOR with the bitstream sequence used for encryption.
  - **Data extraction**:
    - divide the pixels into $\alpha$, $\beta$ and $\gamma$;
    - use the data hiding key to reform the $\alpha$ pixel groups;
    - compute $U'$ and $V'$ using the decrypted image:
      

      $$U' = R' - G$$
      $$V' = B' - G$$

    - flip the $t$ bit plane of each $\alpha$ group, obtaining $R''$ and $G''$;
    - compute $U''$ and $V''$:
      

      $$U'' = R'' - G$$
      $$V'' = B'' - G$$

    - predict the $\alpha$ pixels in $U$ and $V$ (based on the $y$ pixels):
      

      $$I_U = \frac{C_{U1} + C_{U2} + C_{U3} + C_{U4}}{4}$$
      $$I_V = \frac{C_{V1} + C_{V2} + C_{V3} + C_{V4}}{4}$$

    - for each group, select between $U'$ and $U''/V'$ and $V''$;
    - original pixels should have smaller prediction errors than their flipped counterparts;
    - repeat the process for the $\beta$ groups;

**Conclusions**

- a more efficient data hiding scheme that exploits the correlation between color channel;
- negligible increase in complexity;
- significant gain in performance on the Kodak set.