CS5760: Cryptanalysis of DES and DES-like Iterated Cryptosystems

Gautam Singh

Indian Institute of Technology Hyderabad

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2. Exploit XOR between plaintext pairs to find key bits.

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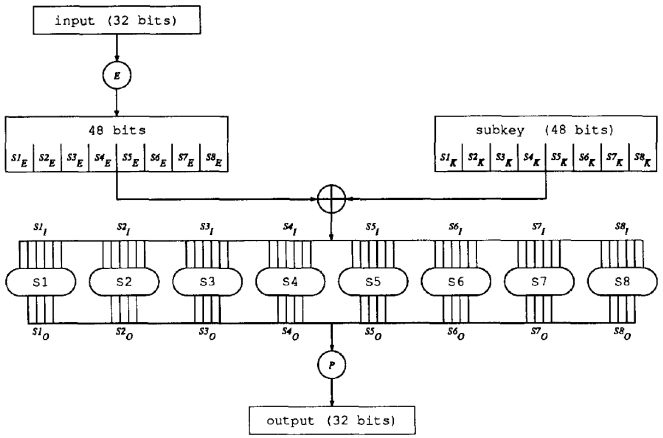
   - *Invariant* in key mixing with subkey S_K to get $S_I = S_E \oplus S_K$.
   - *Linear* in permutation P on S_O after S boxes.
   - *Invariant* in XOR operation connecting rounds.



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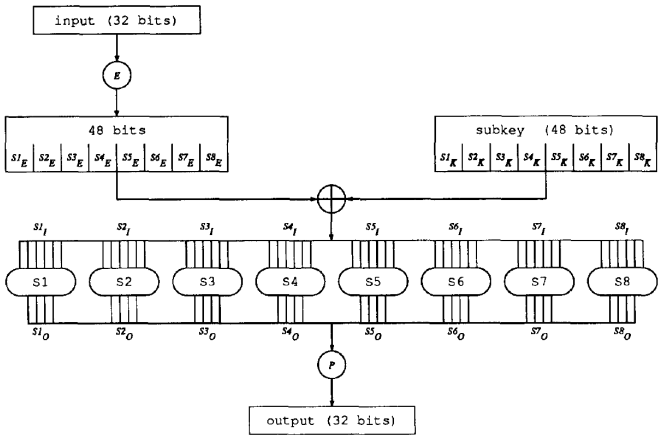
4. S boxes are *nonlinear*. Probability analysis performed between input and output XOR.



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   - 64-by-16 joint probability mass function.
3. This joint PMF can reduce the number of possible (sub)keys. Used to drive choice for the plaintext XOR.
   - Approximately 80 % of entries are non-zero/possible for each S box (some have lesser percentages).