Image Encryption System Based on Self-correlation Permutation

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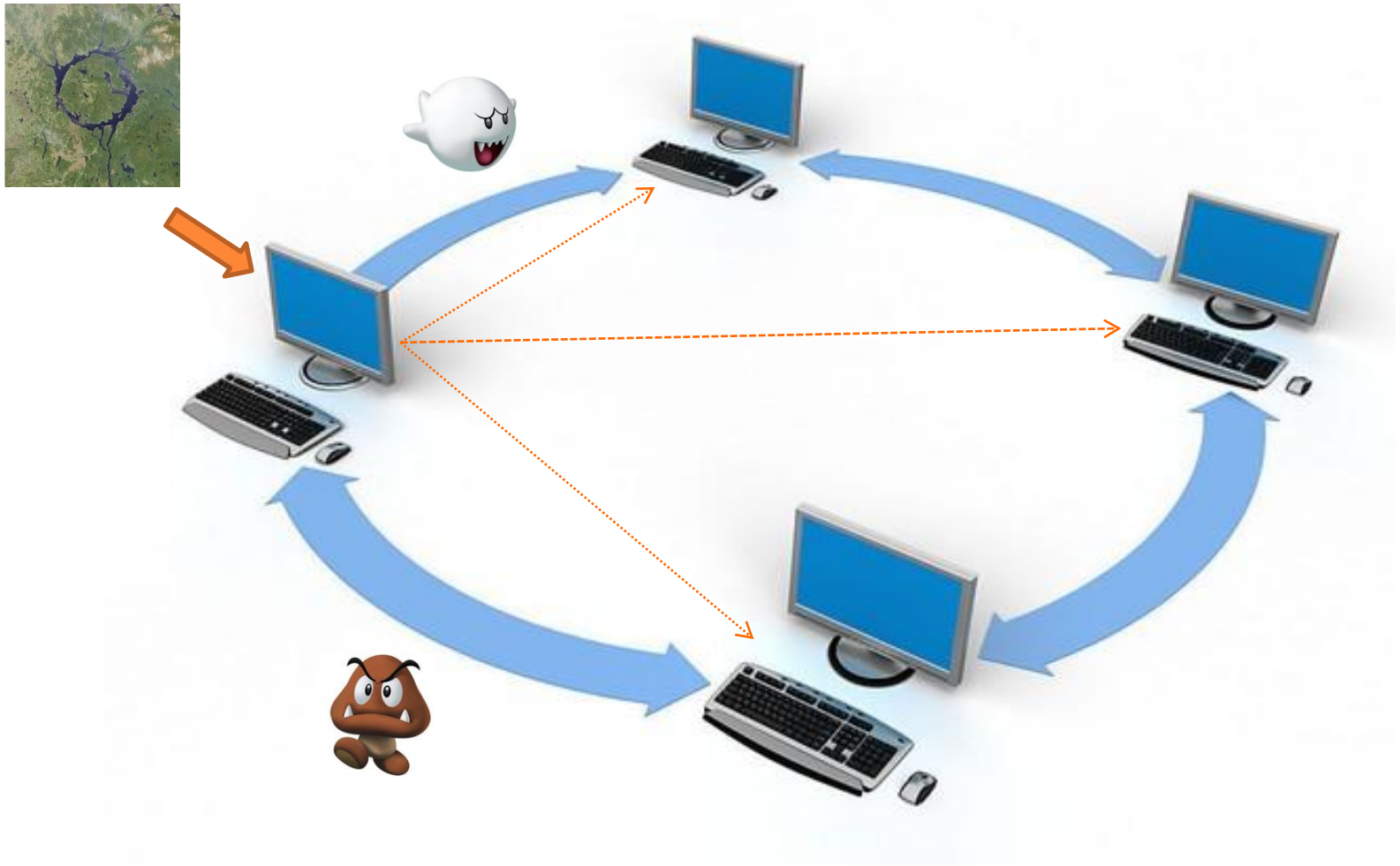
Introduction on image encryption



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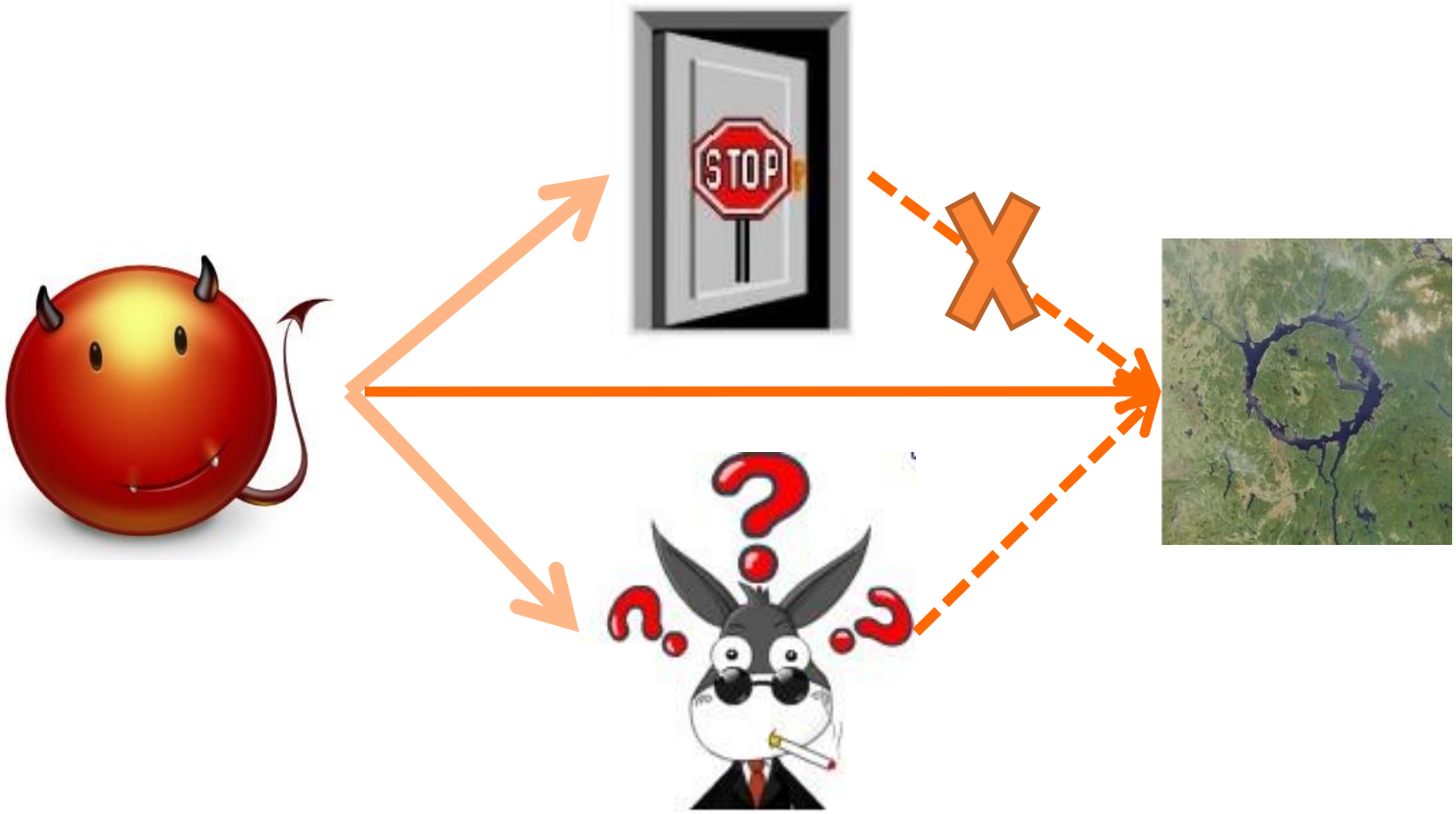
INTRODUCTION ON IMAGE ENCRYPTION



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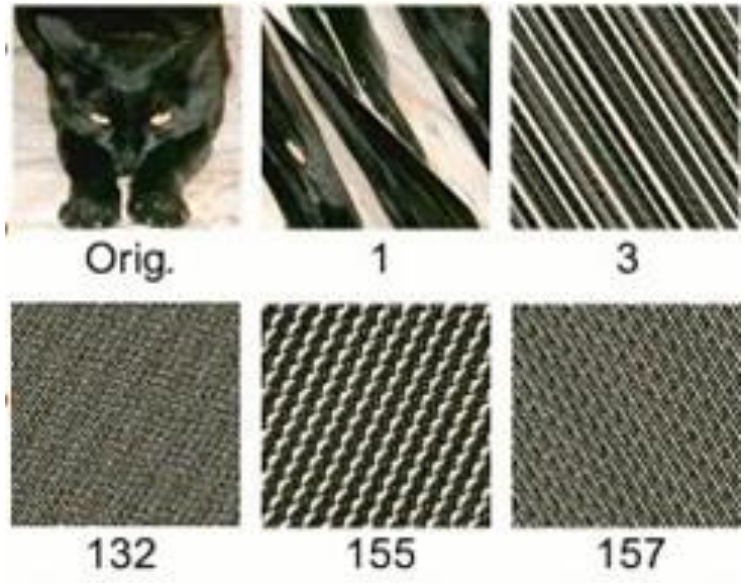
INTRODUCTION ON IMAGE ENCRYPTION

Security of image data

- Characters of image data
- Drawbacks of tradition cipher

Generalized Arnold cat map



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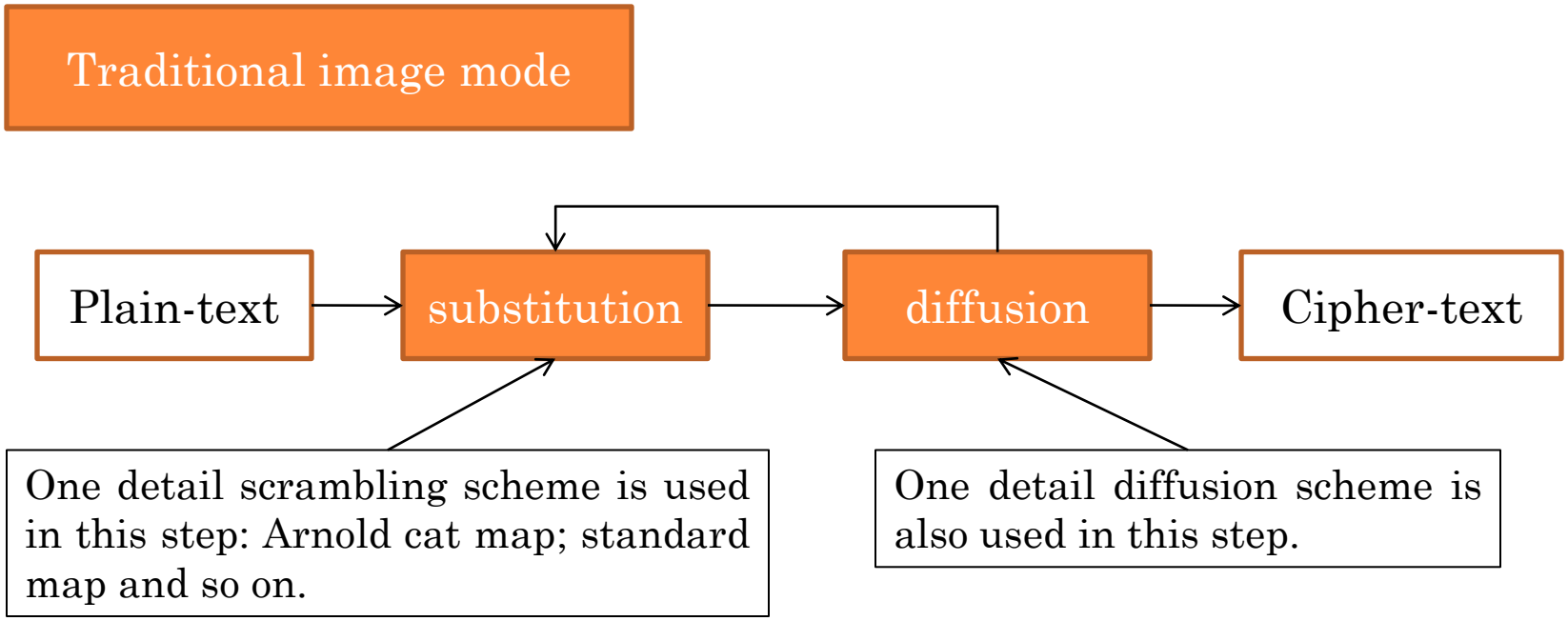
SC-PCC Framework



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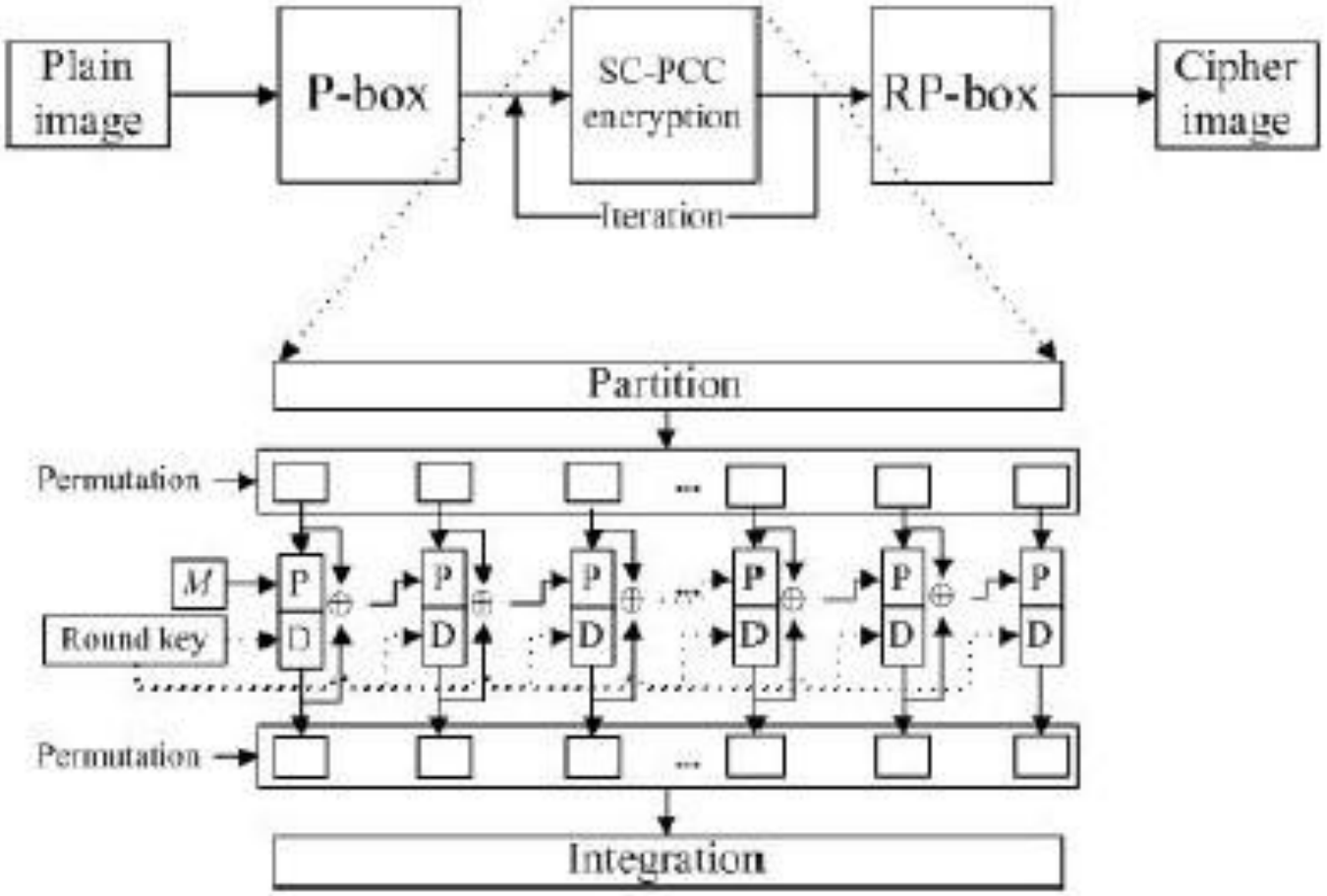

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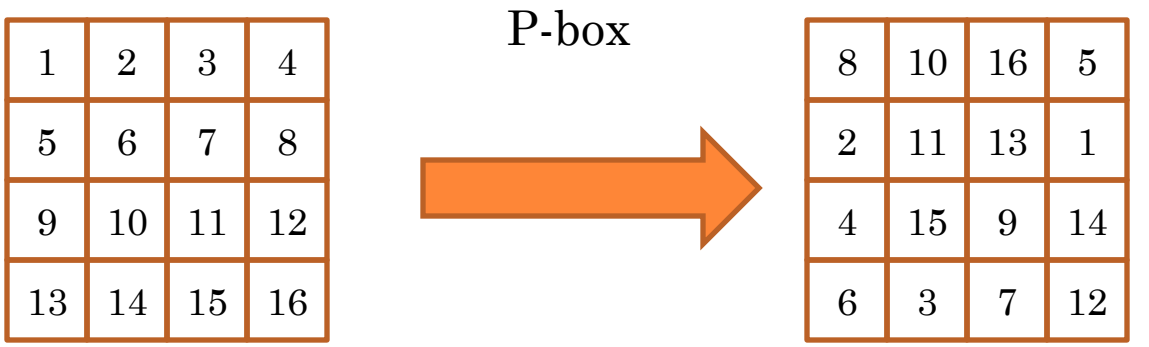

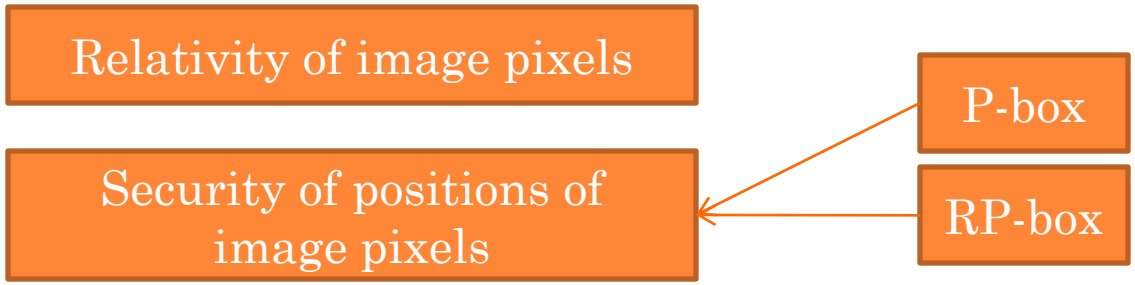

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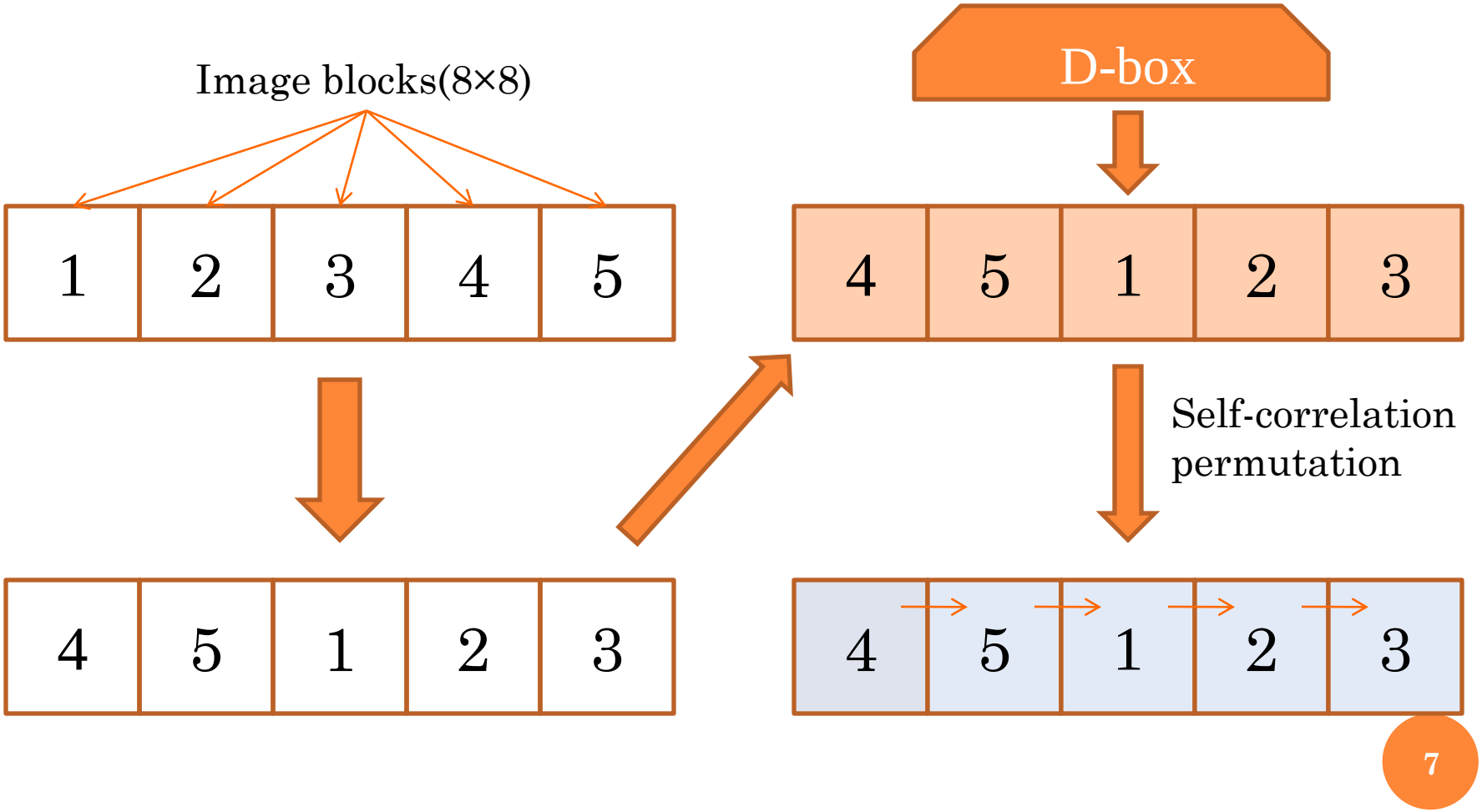

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SC-PCC Framework

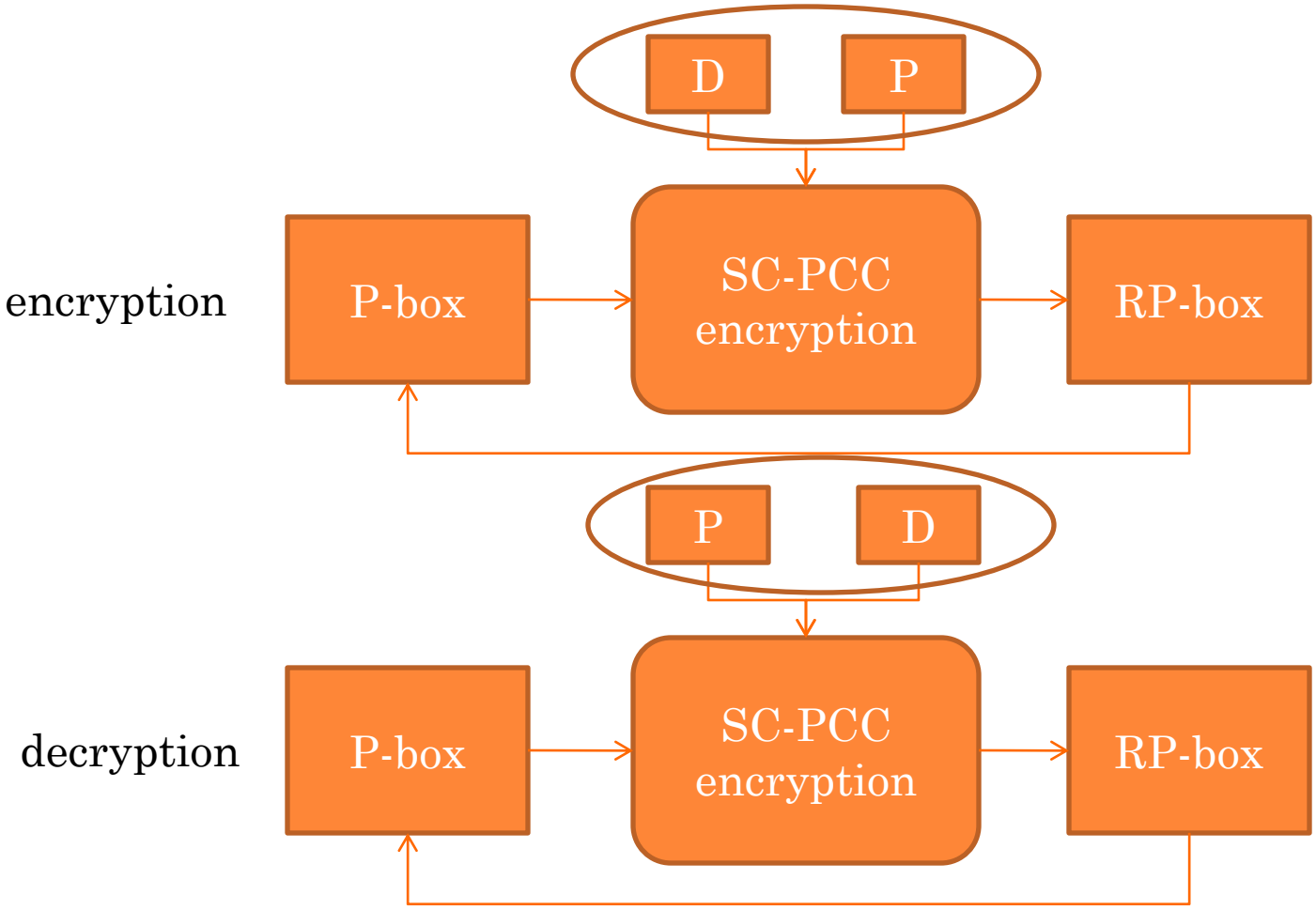

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Image Encryption Based on SC-PCC Framework

- P-box and RP-box:

$$\begin{bmatrix} x_{n+1} \\ y_{n+1} \end{bmatrix} = \begin{bmatrix} 1 & p \\ q & pq+1 \end{bmatrix} \begin{bmatrix} x_n \\ y_n \end{bmatrix} \bmod N$$

- Random number generation:

$$x_{t+1}^i = (1-\varepsilon)g(x_t^i) + \varepsilon g(x_t^{i-1})$$

$$x_{t+1}^i = \begin{cases} x_t^i/q^i, & x_t^i \in (0, q^i) \\ (1-x_t^i)/(1-q^i), & x_t^i \in [q^i, 1) \end{cases}$$

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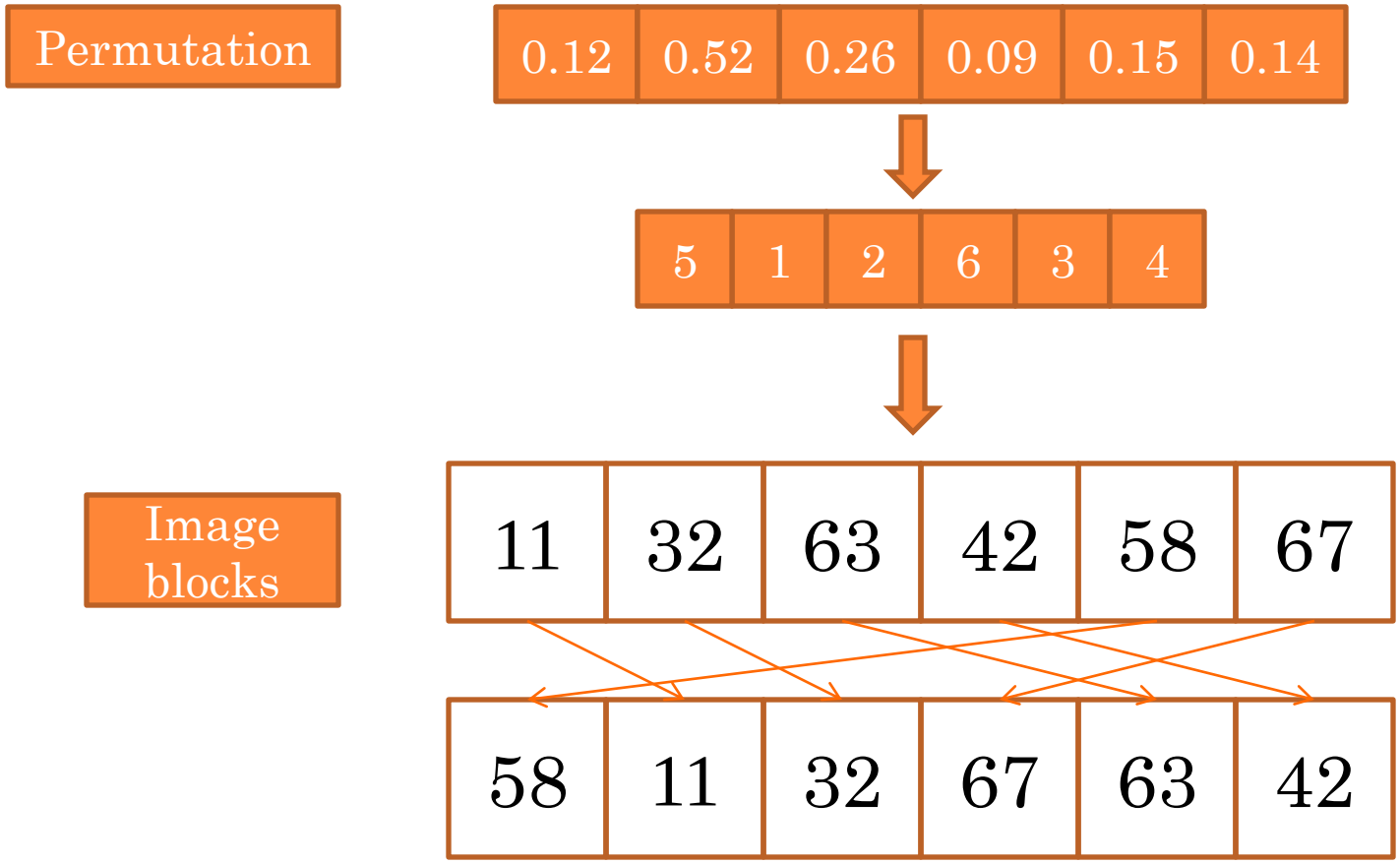
IMAGE ENCRYPTION BASED ON SC-PCC FRAMEWORK



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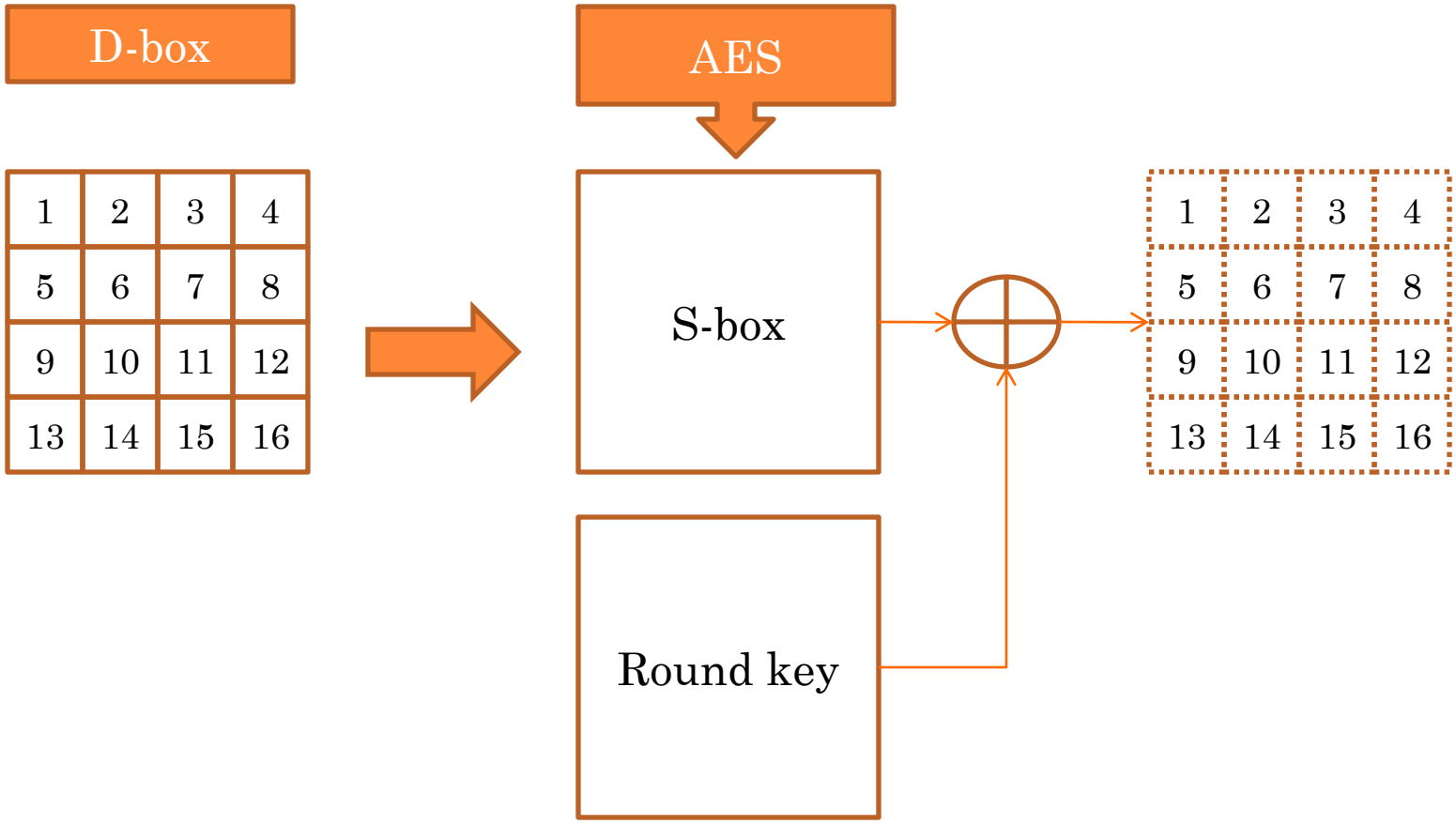

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Image Encryption Based on SC-PCC Framework

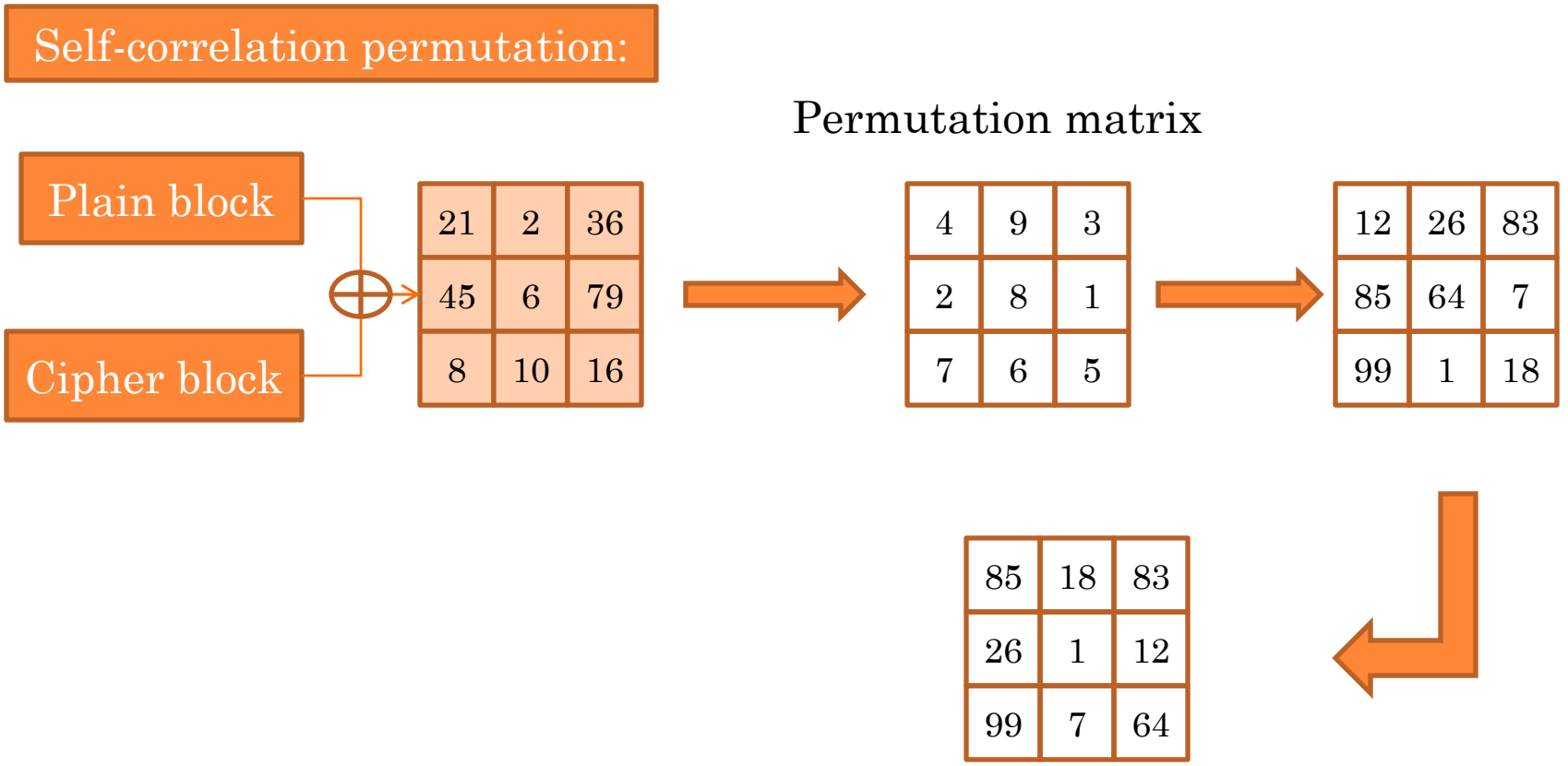

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Image Encryption Based on SC-PCC Framework

- Simulation result:

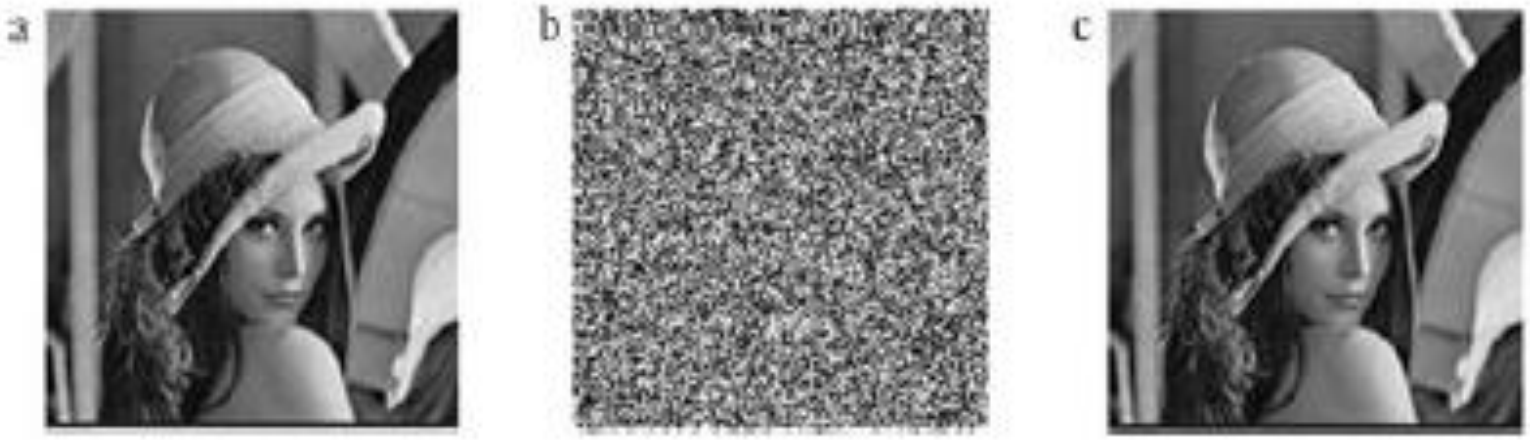

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IMAGE ENCRYPTION BASED ON SC-PCC FRAMEWORK

- Test results:

Table 1: Entropy of cipher images

Test image	Size	Proposed scheme
Lena	128×128	7.9898
Baboon	128×128	7.9892
Clock	256×256	7.9144
Moon surface	256×256	7.9144
Elaine	512×512	7.9994

Table 2: Correlation coefficients of two adjacent pixels in plain image and corresponding cipher image

	Plain image					Cipher image				
	Lena	Baboon	Clock	Moon surface	Elaine	Lena	Baboon	Clock	Moon surface	Elaine
Horizontal	0.9418	0.8463	0.9707	0.9364	0.9703	0.0271	0.0039	-0.0424	0.0104	0.0099
Vertical	0.8903	0.8442	0.9569	0.8996	0.9739	-0.0599	-0.0263	0.0126	-0.0229	0.0152
Diagonal	0.8352	0.7917	0.9387	0.9099	0.9672	0.0052	0.0237	0.0252	-0.0434	0.0085

Table 3: NPCR and UACI of three cipher images

	Round	1	**2**	**3**	4	5	6
Lena	NPCR	0.900940	0.993896	0.996765	0.996521	0.996765	0.995728
	UACI	0.303160	0.331353	0.336692	0.333727	0.336875	0.336091
Baboon	NPCR	0.897156	0.994324	0.995728	0.996155	0.996277	0.996582
	UACI	0.300442	0.334636	0.333658	0.336958	0.336512	0.334637
Clock	NPCR	0.943039	0.994614	0.995865	0.996231	0.996338	0.996170
	UACI	0.305384	0.336289	0.335077	0.332757	0.336658	0.335189

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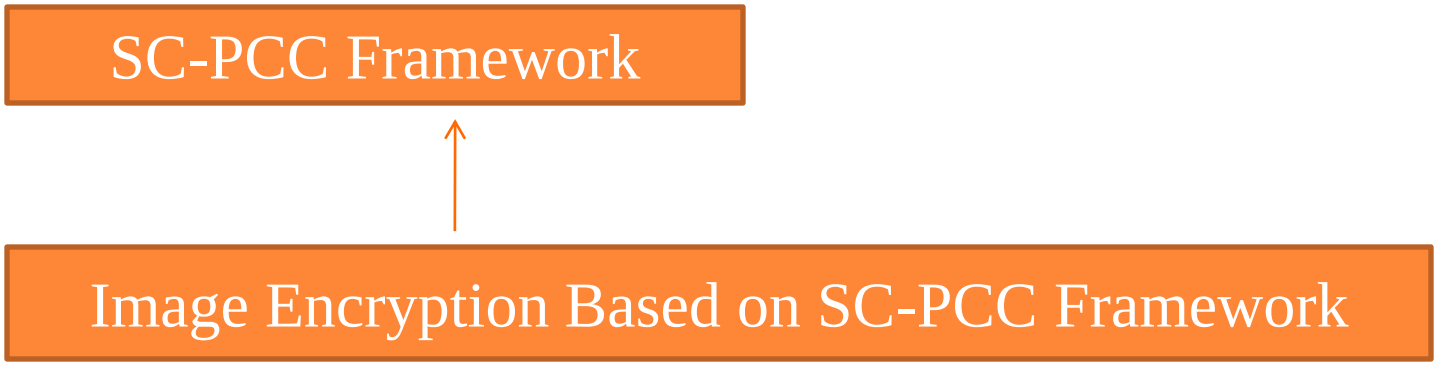
Conclusion



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Thank you very much
Q&A