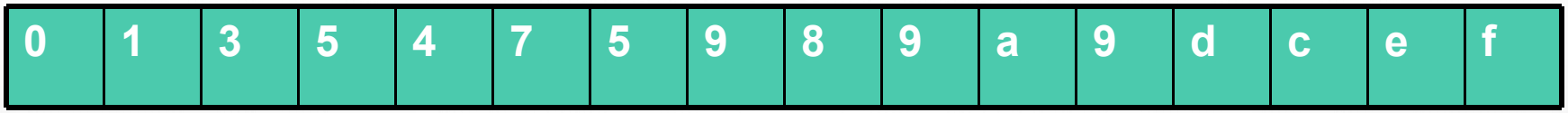
计算机图像处理

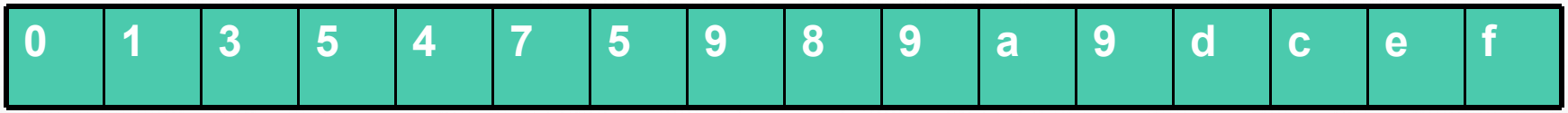
COMPUTER IMAGE PROCESSING

预测编码

f(i)



f(i)



f(i) = f(i-1)

f(i)

0	1	3	5	4	7	5	9	8	9	a	9	d	c	e	f

$\underline{f(i)} = f(i-1)$

0	0	1	3	5	4	7	5	9	8	9	a	9	d	c	e

$e(i) = f(i) - \underline{f(i)}$

f(i)

0	1	3	5	4	7	5	9	8	9	a	9	d	c	e	f

f(i) = f(i-1)

0	0	1	3	5	4	7	5	9	8	9	a	9	d	c	e

e(i) = f(i) - f(i)

0	1	2	2	-1	3	-2	4	-1	1	1	-1	4	-1	2	1

f(i)

0	1	3	5	4	7	5	9	8	9	a	9	d	c	e	f

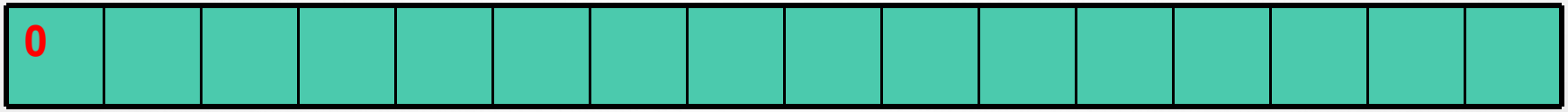
f(i) = f(i-1)

0	0	1	3	5	4	7	5	9	8	9	a	9	d	c	e

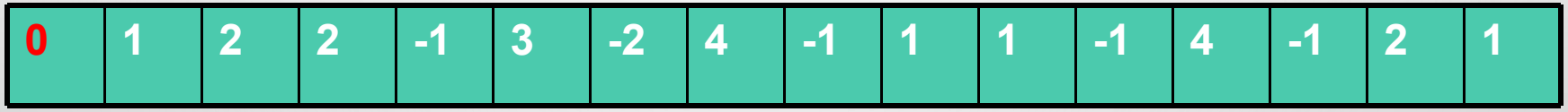
e(i) = f(i) - f(i)

0	1	2	2	-1	3	-2	4	-1	1	1	-1	4	-1	2	1

4bpp -> 3bpp



e(i)



$f(i) = e(i) + \underline{f(i)}$

0	1	3	5	4	7	5	9	8	9	a	9	d	c	e	f

$\underline{f(i)} = e(i-1) + \underline{f(i-1)}$

=

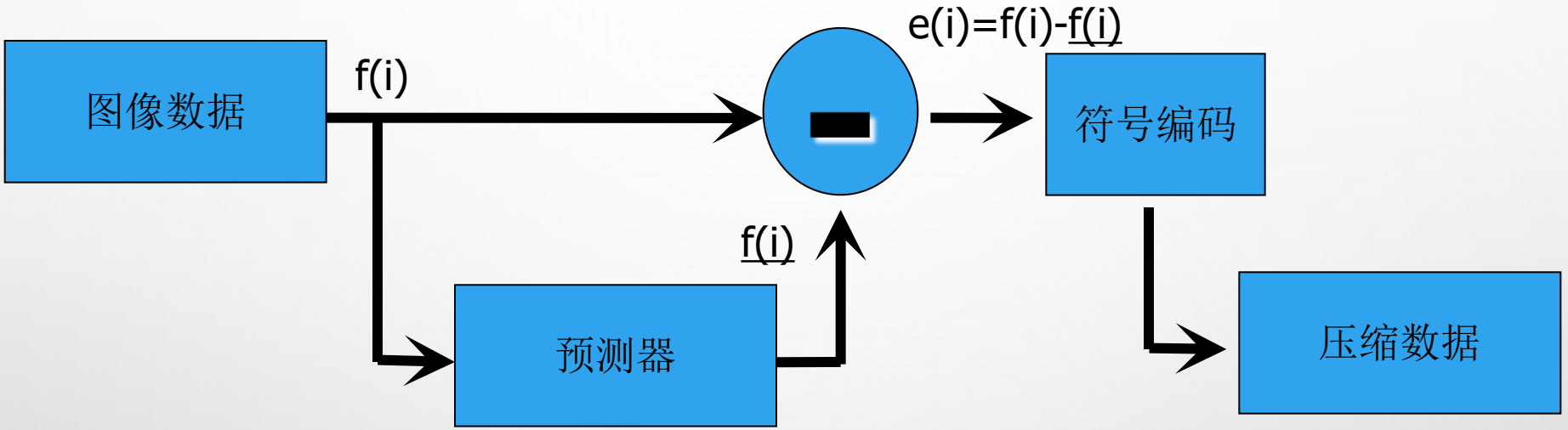
0	0	1	3	5	4	7	5	9	8	9	a	9	d	c	e

+

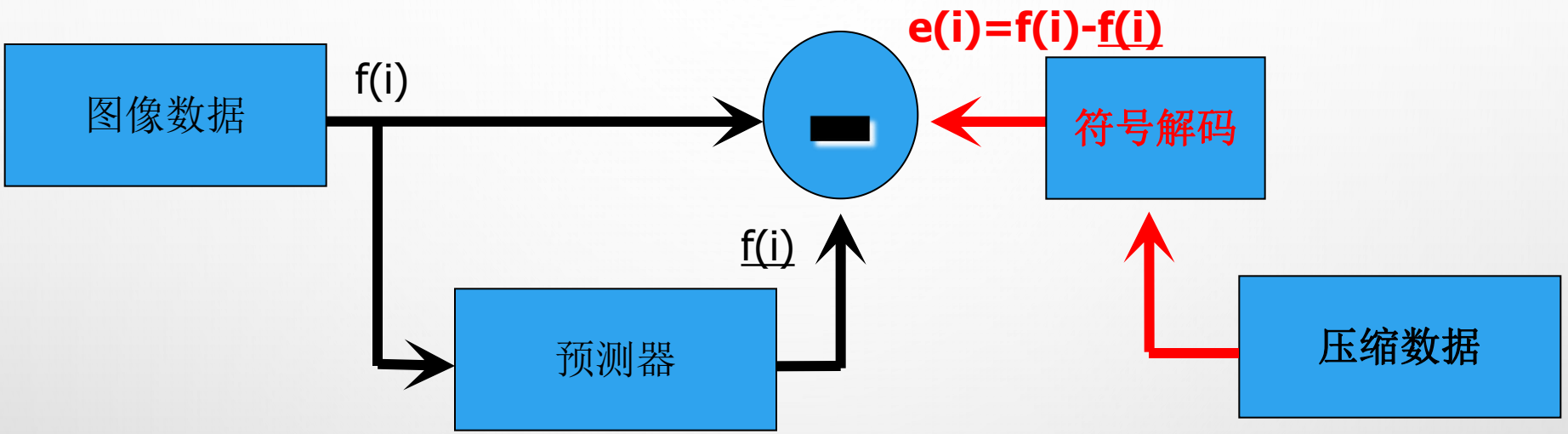
e(i)

0	1	2	2	-1	3	-2	4	-1	1	1	-1	4	-1	2	1

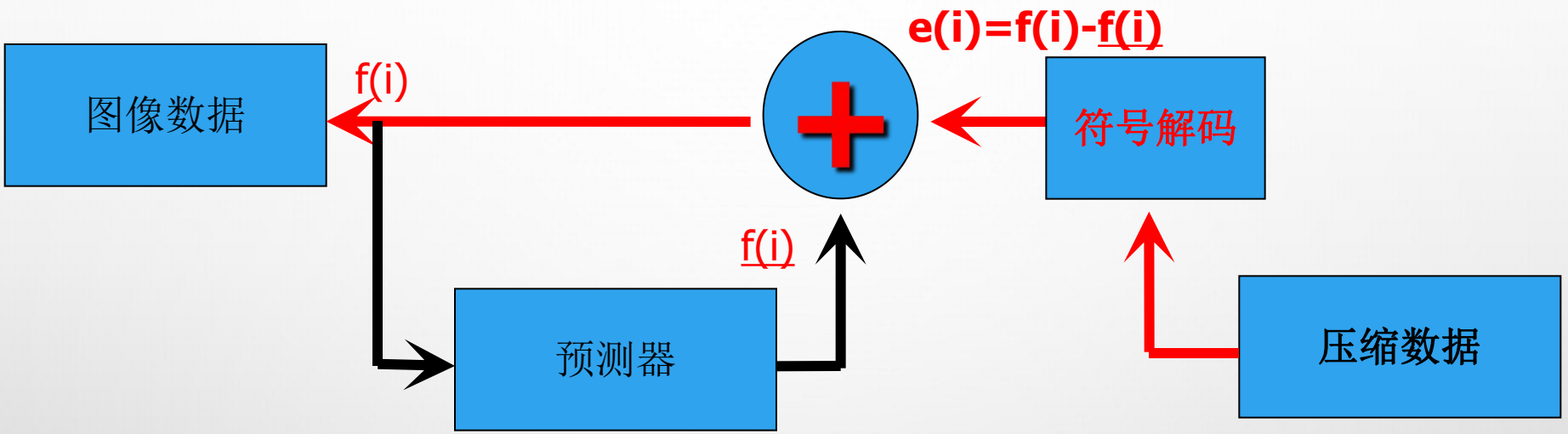
无损预测编码



解码



解码



预测器

线性预测

$$\underline{f(i)} = \Sigma a(k) f(i-k) \qquad k = 1,\ldots,m$$

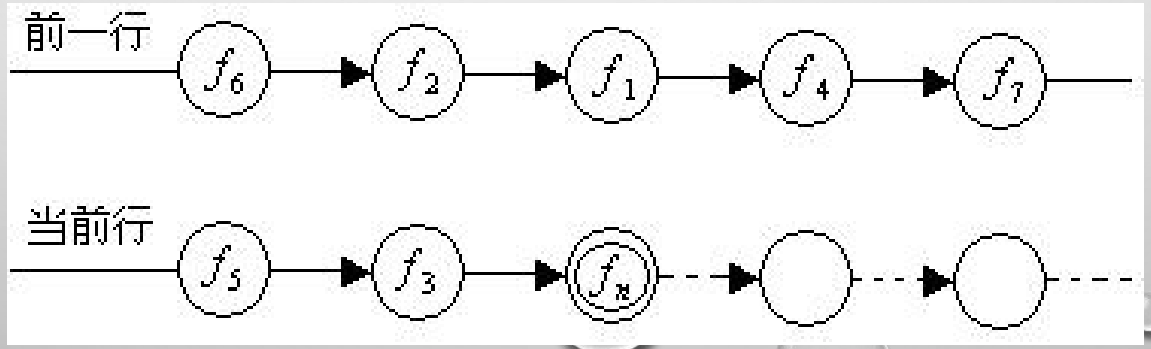
a(k) 是预测系数

预测差值

$$e(i) = f(i) - \underline{f(i)}$$

几种常见线性预测

- 前值预测：用同一行的前值预测
  - f(j,i) = a f(j,i-1)
- 一维预测：用同一行的前几个值预测
  - f(j,i) = ∑a(k)f(j,i-k)　　k = 1,...,m
- 二维预测:同一行的前几个值，前几行的值一起来预测
  - f(j,i) = ∑∑a(h,k)f(j-h,i-k)　　k = 1,...,m
  - 　　h = 1,...,n



几种常见线性预测

- 前值预测：用同一行的前值预测
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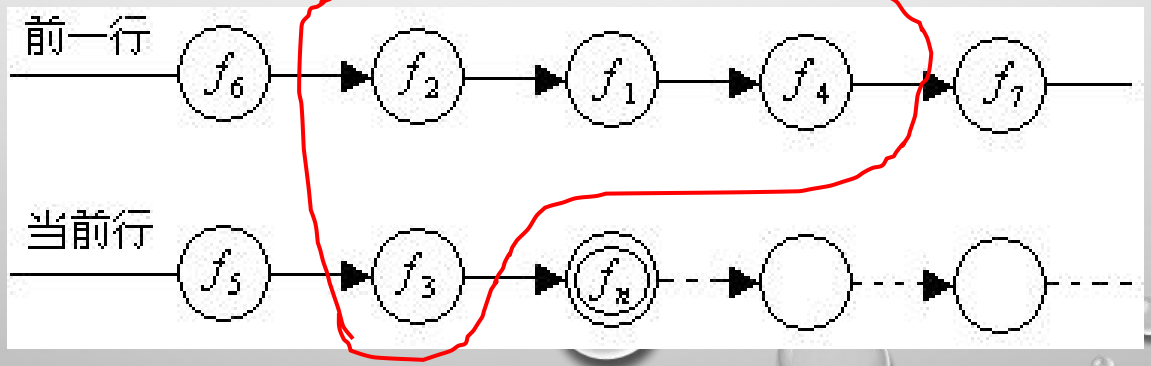
- 二维预测:同一行的前几个值，前几行的值一起来预测
  - f(j,i) = ∑∑a(h,k)f(j-h,i-k)　　k = 1,...,m
  - 　　h = 1,...,n

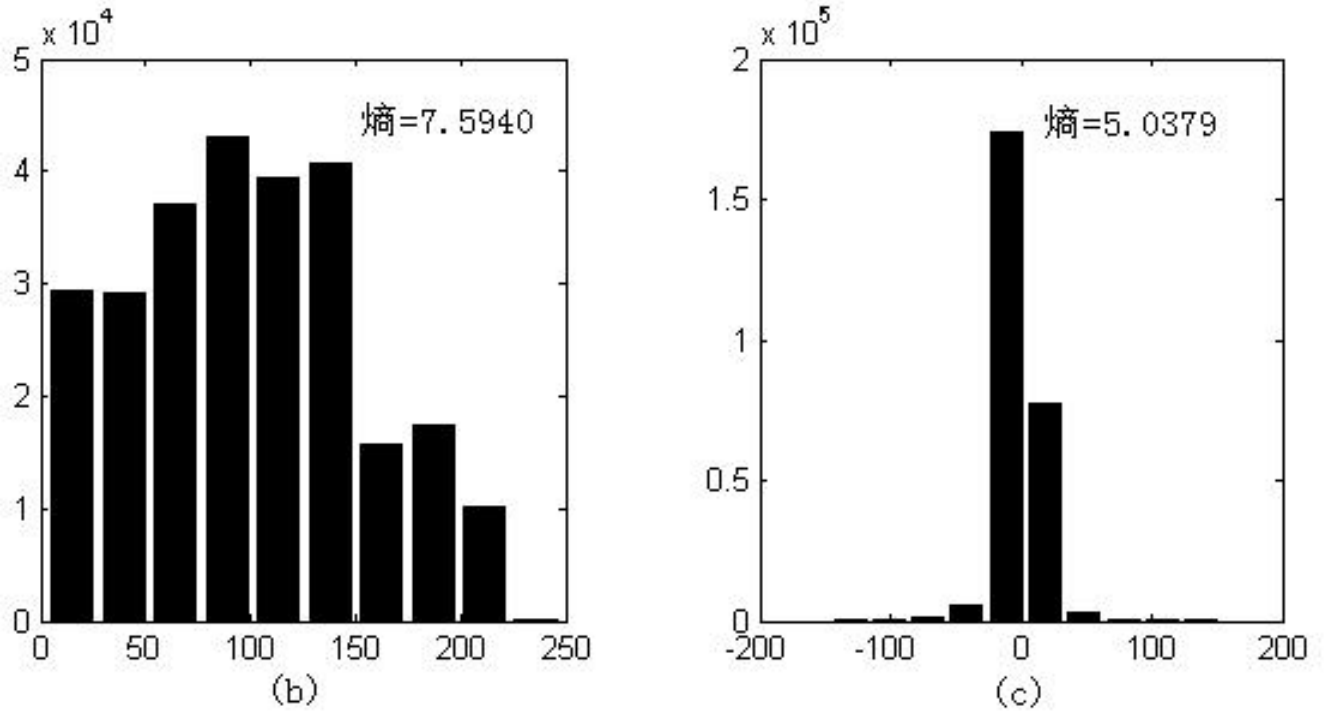


无损预测编码

对Lena图像进行无损预测编码

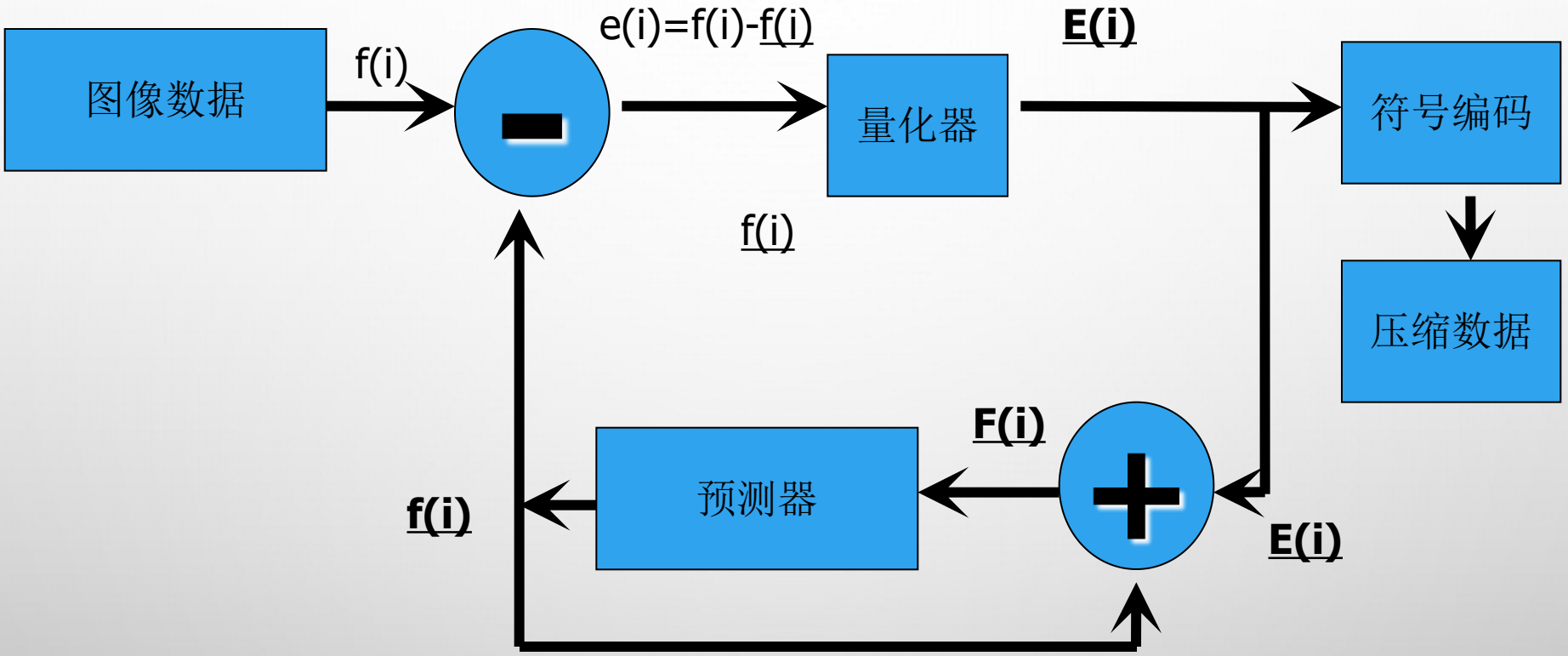
预测误差图像

无损预测编码

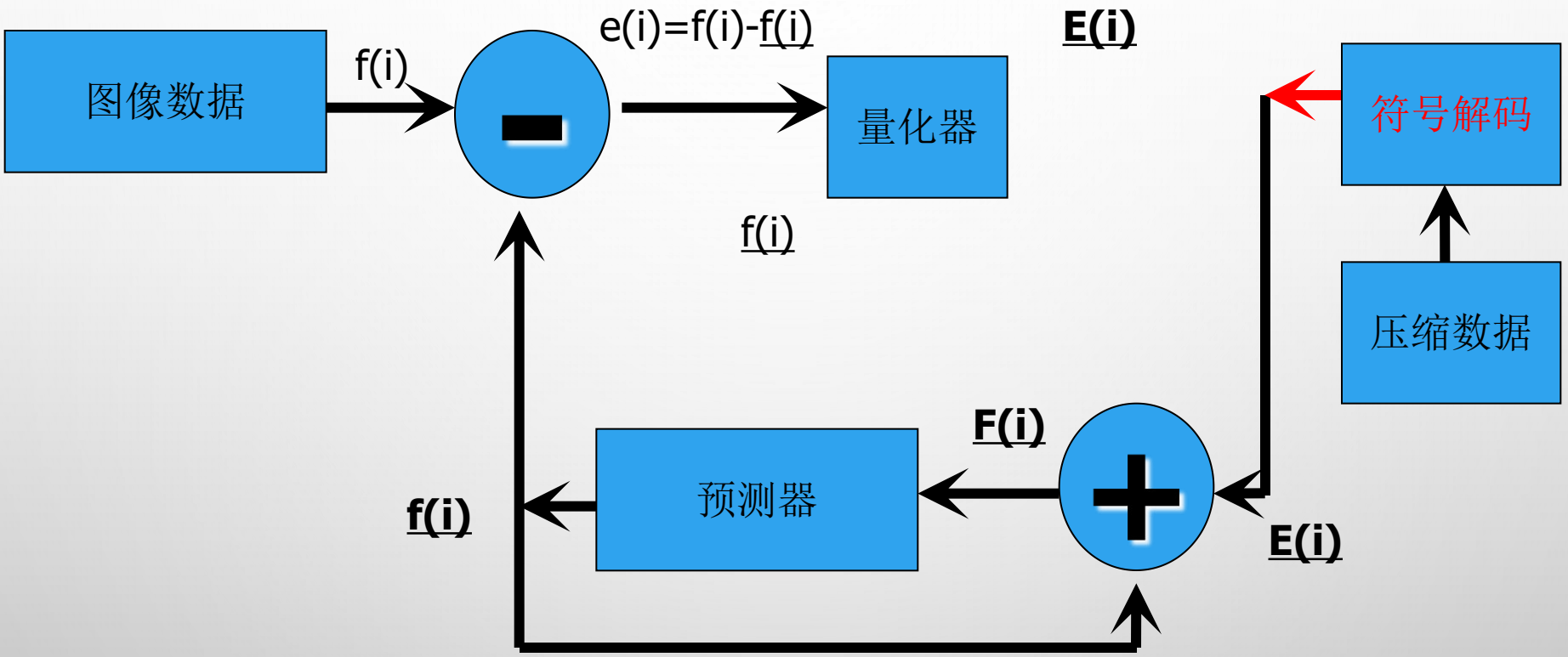


(b)原图直方图　　（c）预测误差直方图

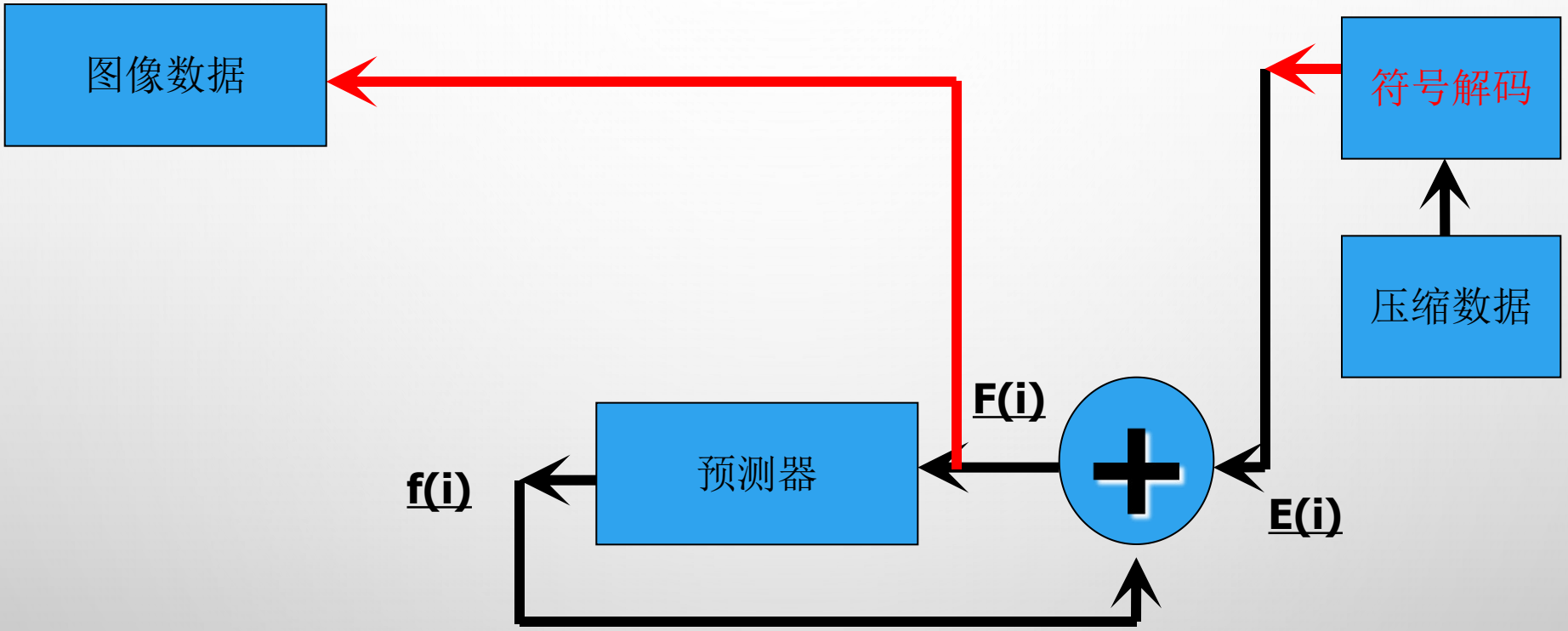
有损预测编码损预测编码



解码



解码



预测

$$\underline{f}(x,y) = round(\sum_{i=1}^{m} a_i \underline{F}(x,y-i))$$

德尔塔调制

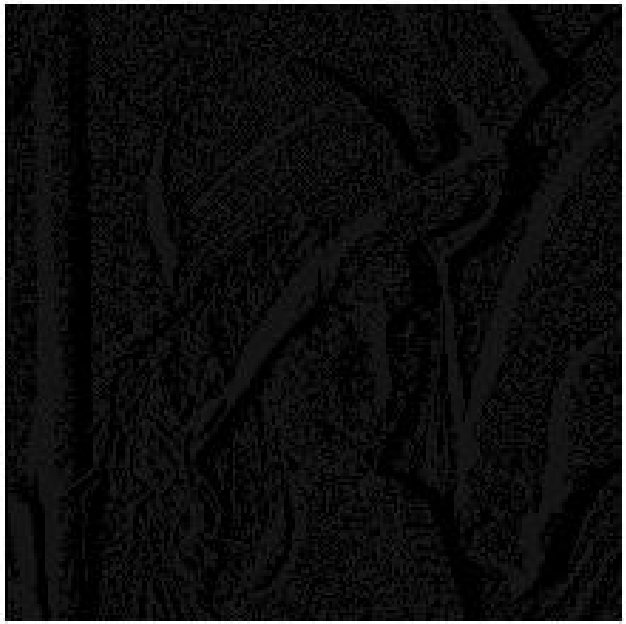
- 德尔塔调制是一种简单的有损预测编码方法，其预测器和量化器定义如下：

$$f(n) = a f(n-1)$$

$$e(n) = f(n) - f(n)$$

$$\dot{e}_n = \begin{cases} +\delta & \text{当} e_n > 0 \\ -\delta & \text{其　他} \end{cases}$$

德尔塔调制



预测误差图像

解码后图像