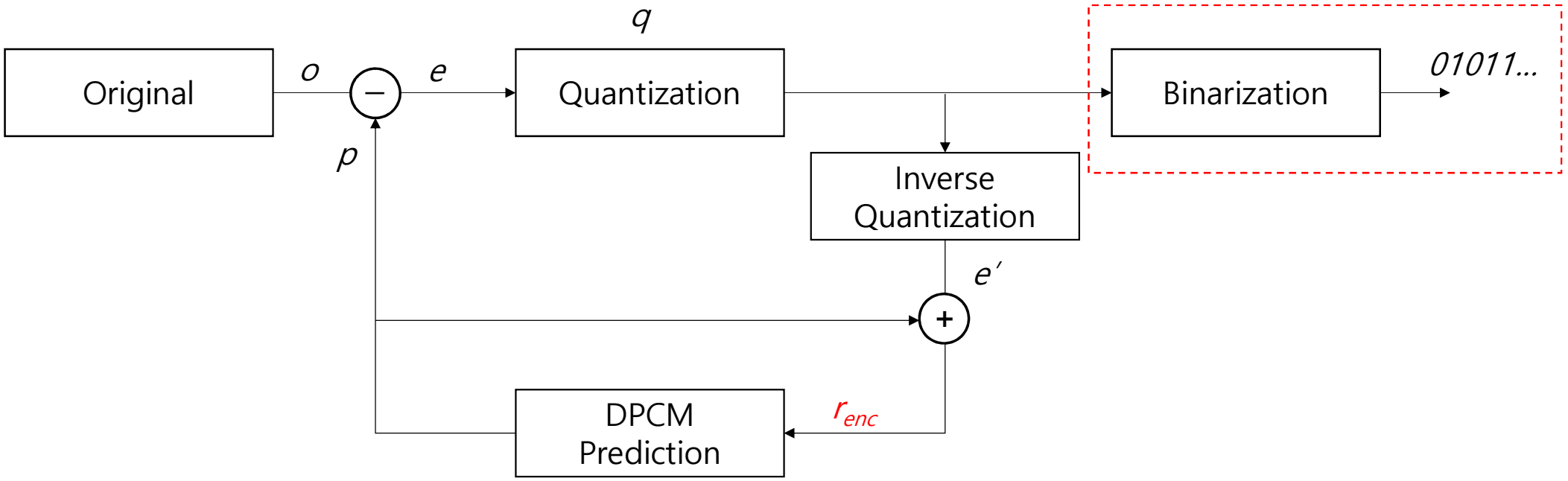
Binarization

이진영

DPCM Based Encoder



Binarization

- Conversion of data into binary numbers, such as 0 and 1
- Generation of bitstream in compression, but thresholding in other domains, such as an edge map
- Various styles for the binary code generation, for example,
  - Fixed-length codes, such as 000, 001, 010, 011, 100, 101, 110, 111
  - Unary codes, such as 0, 10, 110, 1110, 11110, 111110, 1111110, 1111111
  - …

Fixed-Length Codes (4bits)

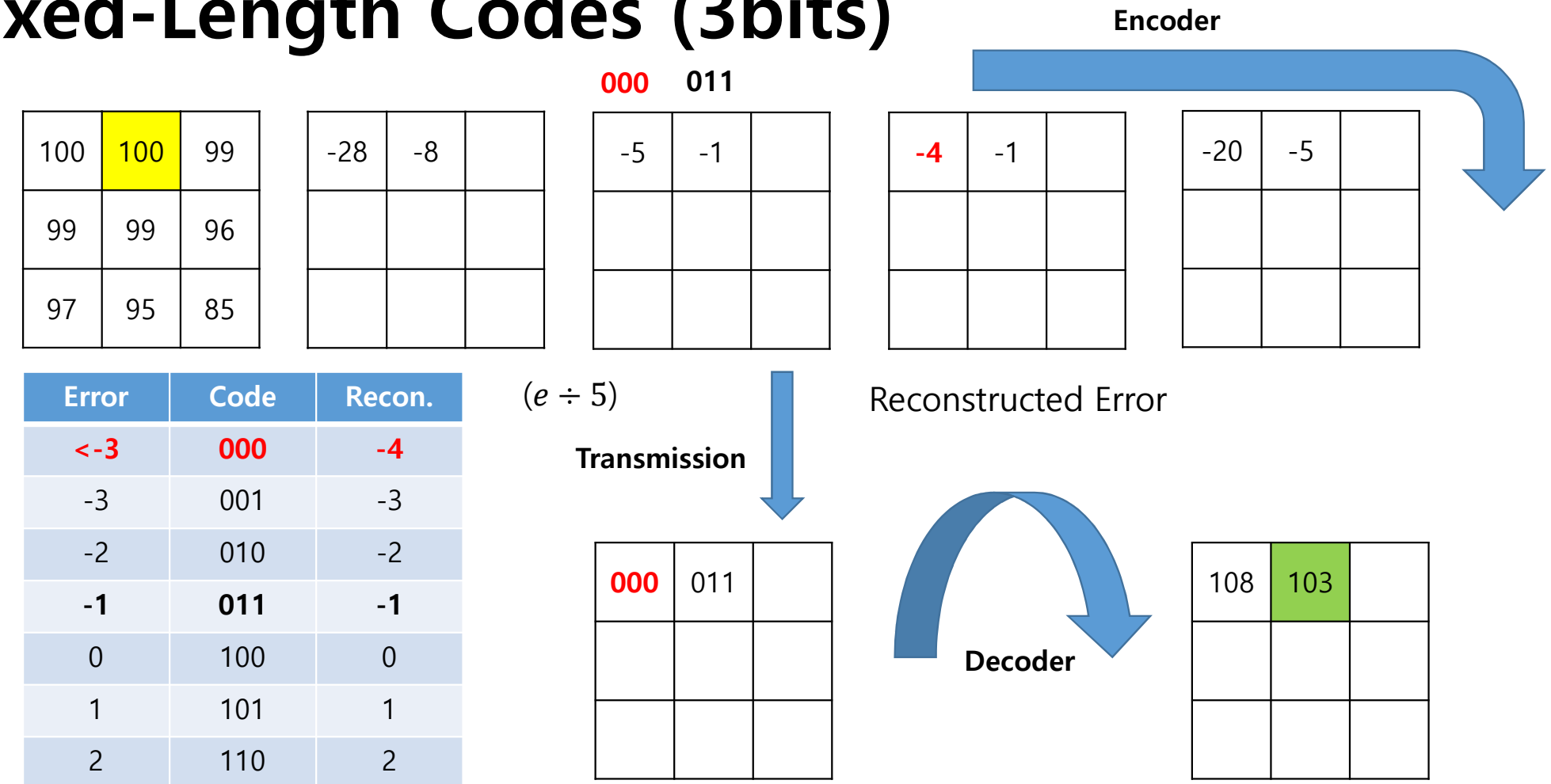
- Binary code using the same number of bits for each data
- Opposite of variable-length codes

Number	Code	Recon.
<-6	0000	-7
-6	0001	-6
-5	0010	-5
-4	0011	-4
-3	0100	-3
-2	0101	-2
-1	0110	-1
0	0111	0

Number	Code	Recon.
1	1000	1
2	1001	2
3	1010	3
4	1011	4
5	1100	5
6	1101	6
7	1110	7
>7	1111	8

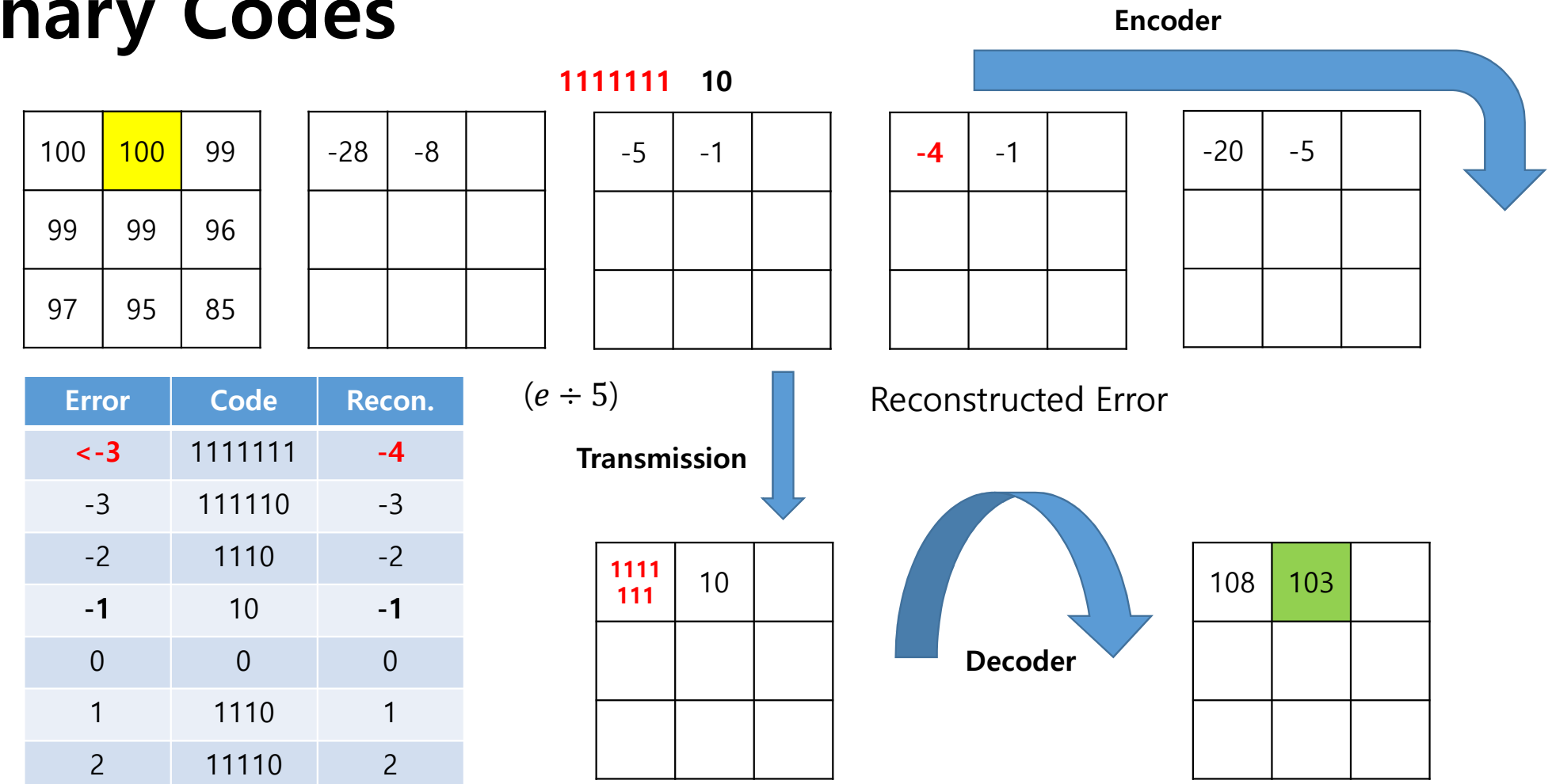
Reconstruction to -7~8

Fixed-Length Codes (3bits)



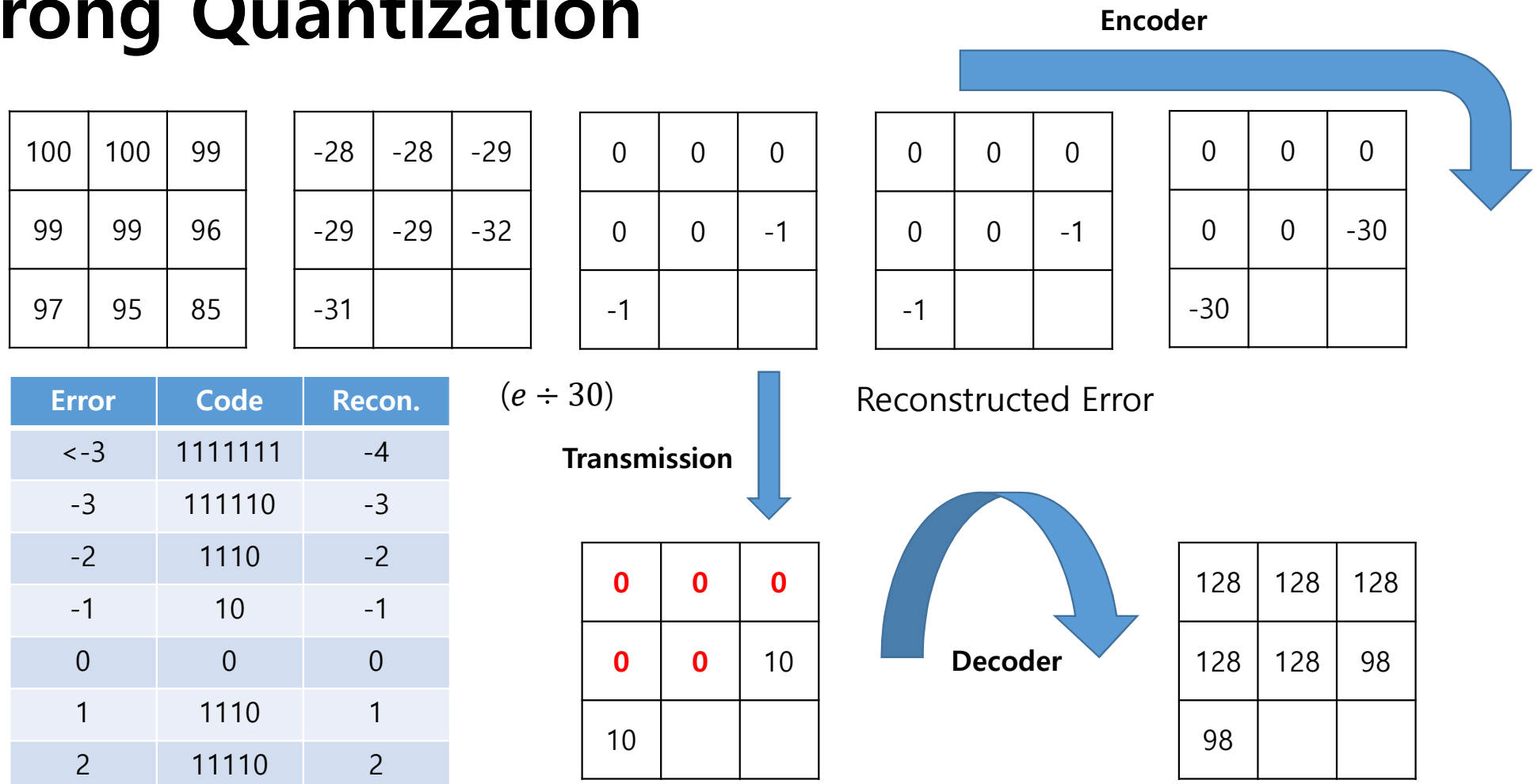
Error	Code	Recon.
<-3	**000**	**-4**
-3	001	-3
-2	010	-2
-1	**011**	**-1**
0	100	0
1	101	1
2	110	2
>2	111	3

Unary Codes



Error	Code	Recon.
<-3	1111111	-4
-3	111110	-3
-2	1110	-2
-1	10	**-1**
0	0	0
1	1110	1
2	11110	2
>2	1111110	3

Strong Quantization



Error	Code	Recon.
<-3	1111111	-4
-3	111110	-3
-2	1110	-2
-1	10	-1
0	0	0
1	1110	1
2	11110	2
>2	1111110	3

Result

$q = 5, \mathrm{PSNR} \cong 23.82dB$

$q = 10, \mathrm{PSNR} \cong 23.17dB$

In general, $q \uparrow \rightarrow PSNR \downarrow$, but not always our experiments due to the limitation of binarization

Experiment (Assignment#5)

- DPCM-based compression on AICenterY.bmp
- Calculation of prediction error, based on horizontal prediction and/or vertical prediction
- $e \div q$ for quantization
- Generation of bitstream with binarization (bitstream.txt), for example, <-3(000), -3(001), -2(010), -1(011), 0(100), 1(101), 2(110), >2(111), and then Inverse binarization with 000(-4), 001(-3), 010(-2), 011(-1), 100(0), 101(1), 110(2), 111(3)