

Chapter 5

The quantized level has to be encoded into binary in order to suit for digital transmission. Encoding is a collection of the sign, segment number and level of the sample.

Concept of Structuring :-

For an example assume that you want to number 32 students in a classroom from 0-31. There are 4 rows of desks. Each row has 4 columns of desks. Two students can share one desk (left and right).

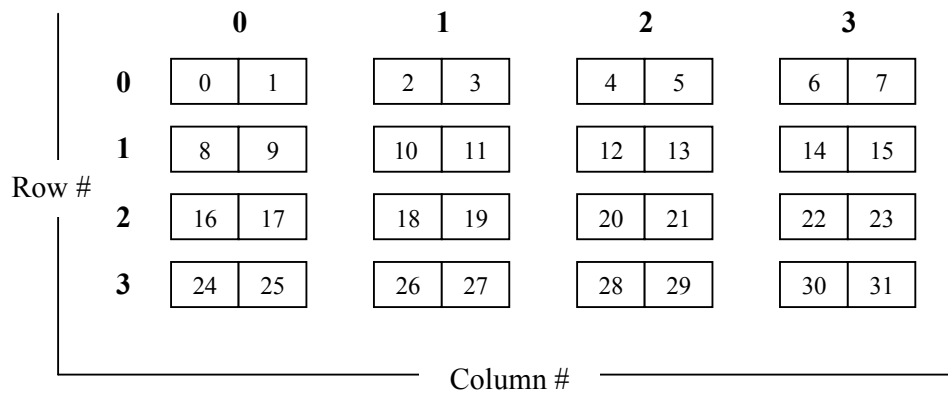


Figure 5.1

If you want to locate the student whose student number is 21, what would be your procedure?

As there are 32 students the answer must contain 5 bits. First comes the row number (2 bit), then the column number (2 bit) and finally whether the student is on the left or right (1 bit).

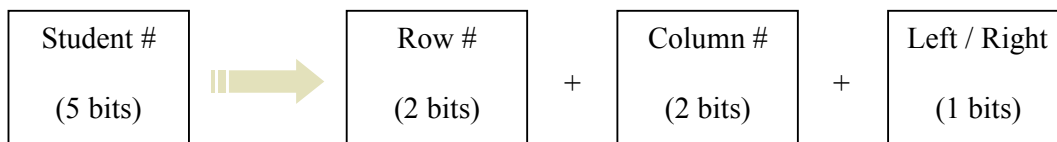


Figure 5.2

Convert 21 into binary.

$$21_{\text{dec}} = 10101_{\text{two}}$$

1	0	1	0	1	↖
Row #		Column #			
2		2			On the right

So the student number 21 should be on the 2nd row, 2nd column and on the right hand side of the desk. You can check this using figure 5.1.

The encoding of the quantized samples is done using the same technique. As there are 256 levels, the quantized value is encoded into 8 bits.

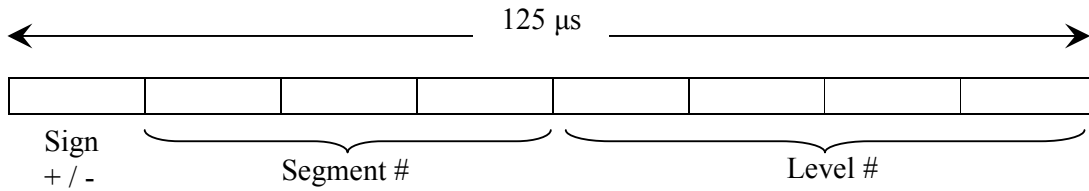


Figure 5.3

The first bit indicates whether the sampled value is negative or positive. The segment number is coded in the next three bits. Last four bits give the level number. Using the table we can convert any sampled voltage value into 8 bit binary format.

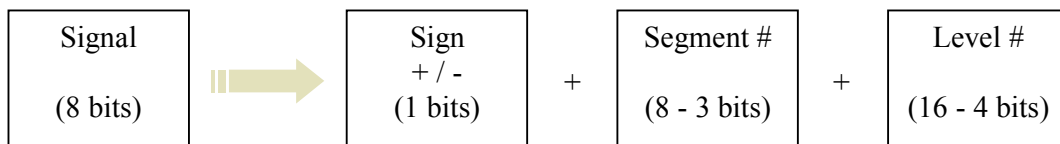


Figure 5.4

For example suppose that the sampled value is +367.

The first bit is 1 as it is positive. 367 is in the range of 192 – 384. Hence the segment number is 4 which is 100 in binary.

The level position can be calculated by dividing additional value by the appropriate increment per level for that particular segment. In this case the additional amount comes to $(367 - 192 =)175$. And the increment is 12. Therefore the level is $175 / 12$ which is 14.6. As 14.6 is closer to 15, 15 is taken as the level number.

Hence the encoded form of +367 would be as follows.

1 100 1111

Take another example value like -50V.

The first bit should be 0 as this is a negative value. 50 is in the range of 48 – 96. Hence the segment number is 2 which is 010 in binary.

The additional amount comes to $(50 - 48 =)2$. And the increment is 3. Therefore the level is $2 / 3$ which is 0.67. As 0.67 is closer to 1 it is taken as the level number.

Hence the encoded form of -50 would be,

0 010 0001

Likewise any voltage level is converted into binary and is transmitted.