Principles of Communications
ECS 332

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8. Intro. to Digital Commu.

Office Hours:

BKD, 4th floor of Sirindhralai building

Monday	9:30–10:30
Monday	14:00–16:00
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Logo with "hidden" symbols and meanings

Construction and Maintenance Technology Research Center(CONTEC)

- Resemble characters "C&M" which means "Construction and Maintenance"

- Symbolize "Water, Land, Road, Building&Bridge"

- Towards sustainable development and bright future

Sony VAIO Logo

Sony VAIO Logo

The Sony VAIO logo illustrates the integration of analog and digital technology. The VA letters form an analog wave and the IO part represents a binary one and zero.

Digital Message

- An ordered sequence of **symbols** (or characters)

- Produced by a discrete information source.

- The source draws from an **alphabet** of $M \geq 2$ different symbols.

  - Ex. English text source: 26 (a to z) + 26 (A to Z) + 10 (0 to 9) + Punctuation and Other Signs (. , ! @ ( ))

  - Ex. Thai text source: 44 consonants (พยัญชนะ) + 15 vowel symbols (สระ) + 4 tone marks (วรรณยุกต์) + …

  - Ex. A typical computer terminal has an alphabet of $M \approx 90$ symbols (the number of character keys multiplied by two to account for the shift key)

Ex. ASCII

- Text is commonly encoded using ASCII
- MATLAB automatically represents any string file as a list of ASCII numbers.

```
>> str='I love ECS332';        text string
>> real(str)

ans =                (decimal) ASCII representation of the text string

    73    32   108   111   118   101    32    69    67    83    51    51    50

>> dec2base(str,2)

ans =

1001001
0100000        binary (base 2) representation of the decimal numbers
1101100
1101111
1110110
1100101
0100000
1000101
1000011
1010011
0110011
0110011
0110010
```
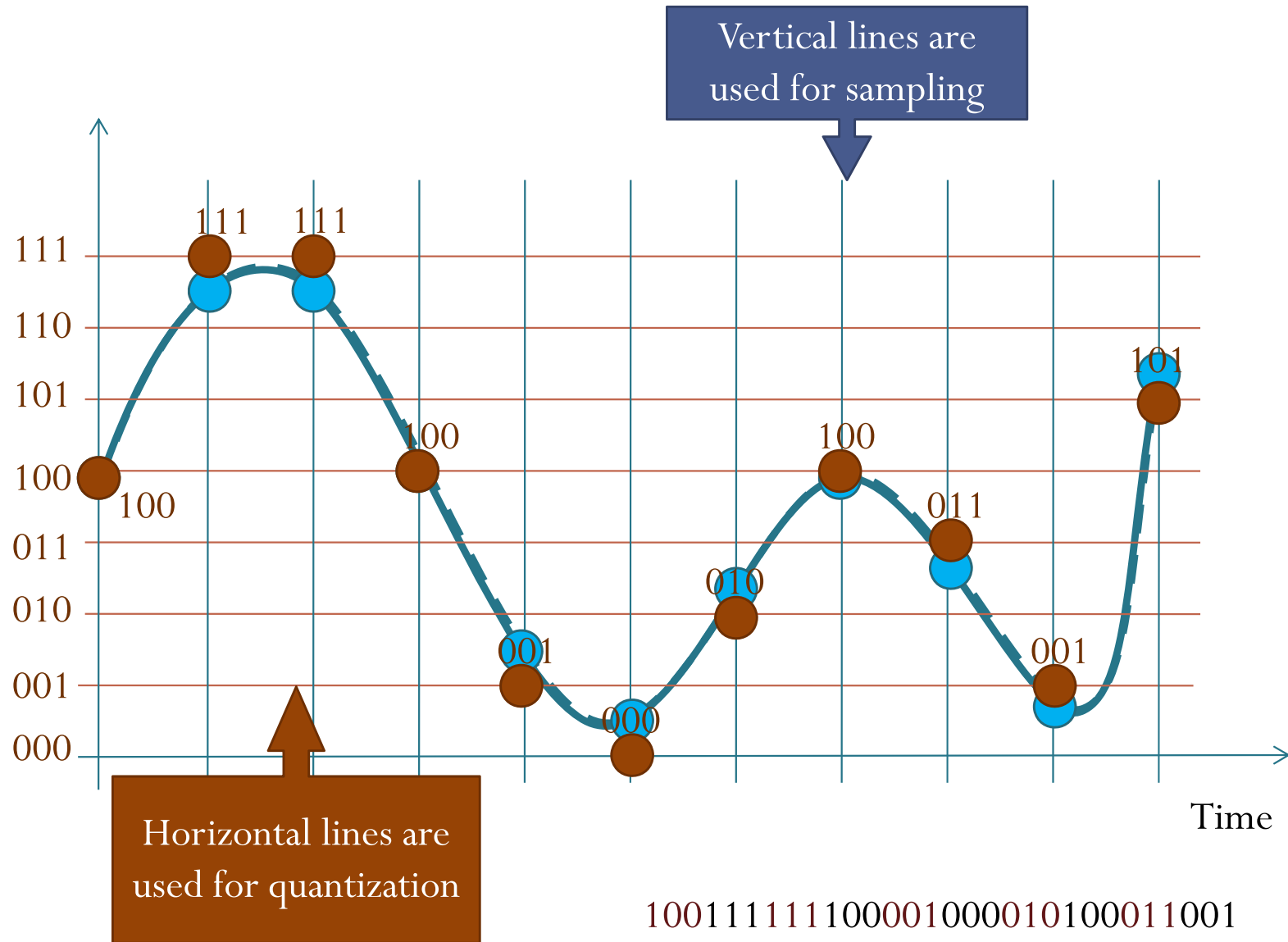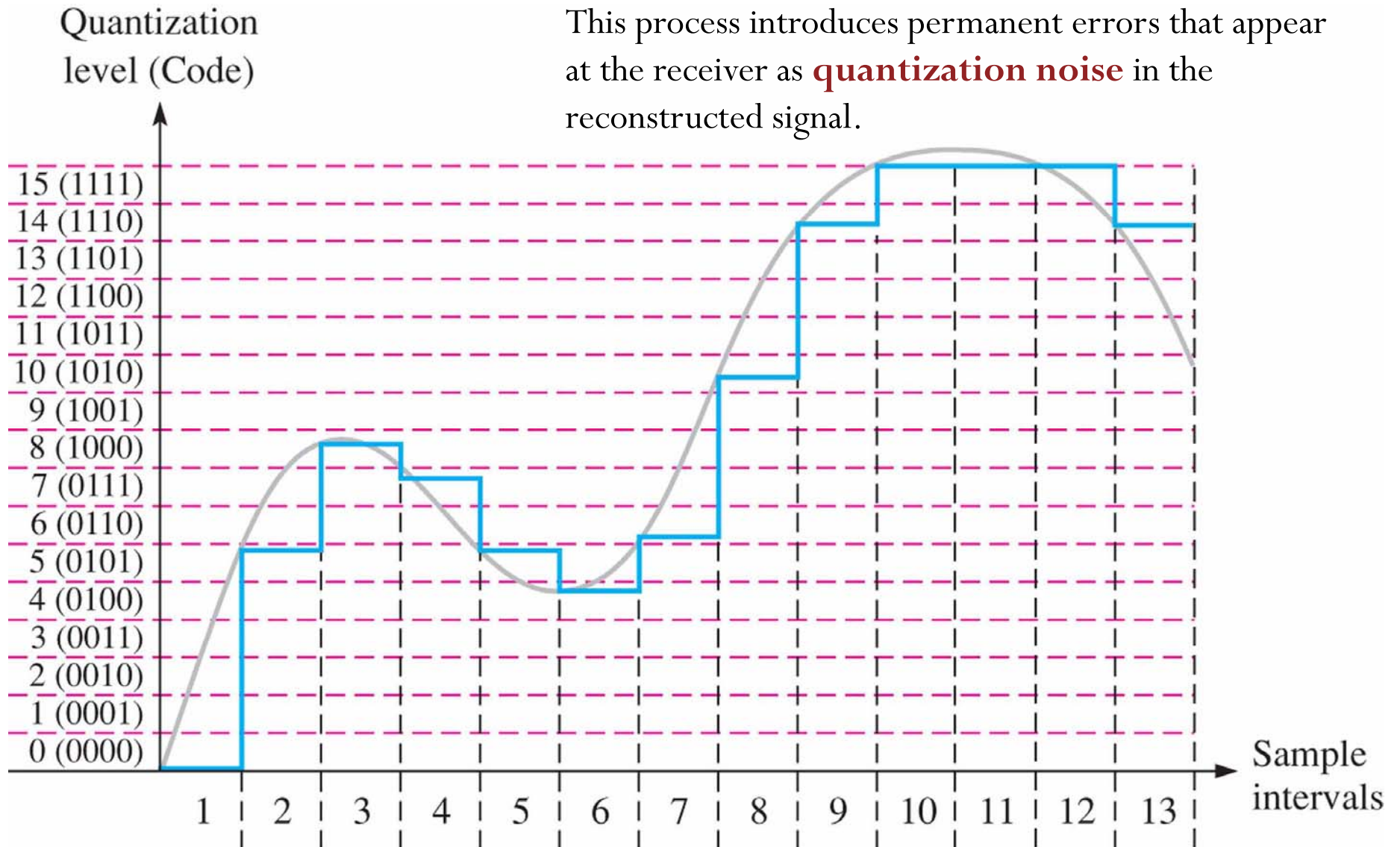
Digitization (analog to digital)

Quantization

Quantizer rounds off the sample values to the nearest discrete value in a set of q **quantum levels**.

This process introduces permanent errors that appear at the receiver as **quantization noise** in the reconstructed signal.

Quantization level (Code)

15 (1111)
14 (1110)
13 (1101)
12 (1100)
11 (1011)
10 (1010)
9 (1001)
8 (1000)
7 (0111)
6 (0110)
5 (0101)
4 (0100)
3 (0011)
2 (0010)
1 (0001)
0 (0000)

Sample intervals

1 2 3 4 5 6 7 8 9 10 11 12 13

Quantization in 2D Image