The Synthesis Problem of a Chaotic Signal Computer System for Secure Data Transmission

State Marine Technical University (SMTU)
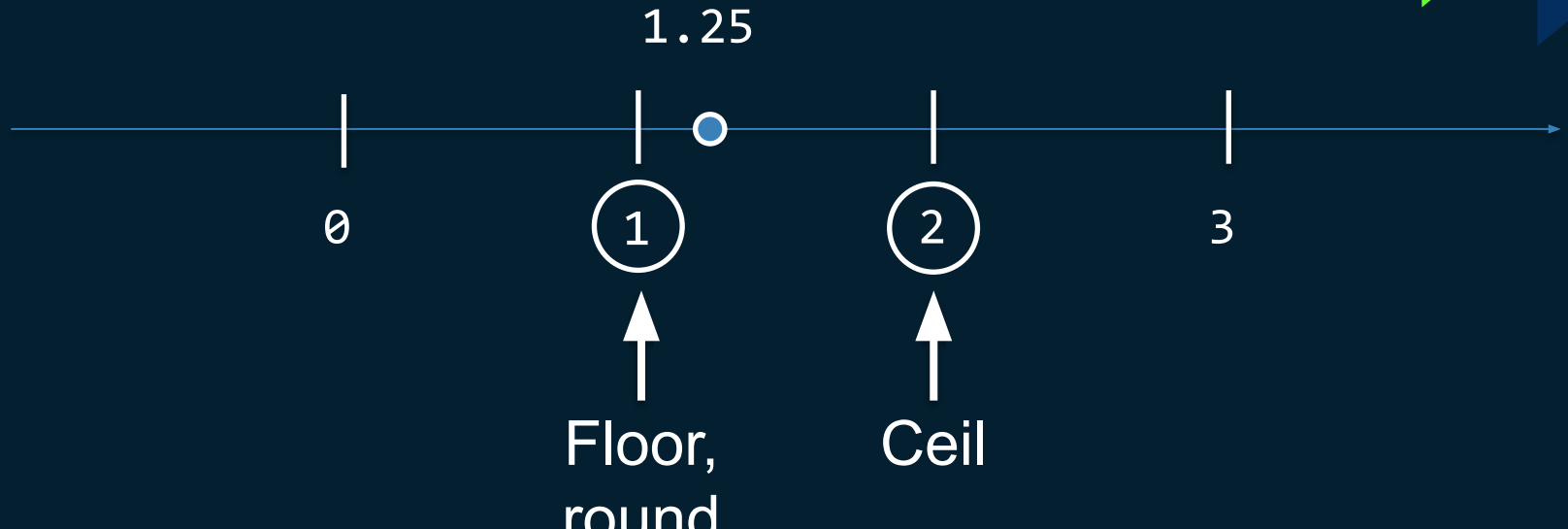
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Cyber
Security

Methods

- floor (rounding down to the nearest integer)
- ceil (rounding up to the nearest integer)
- round (rounding to the nearest integer)

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1.25
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Floor, round

Ceil

Chua's model

$$\begin{cases} \dot{x} = \alpha(y - x - g(x)) \\ \dot{y} = x - y + z \\ \dot{z} = -\beta y \end{cases},$$

where α and β are real numbers, and $g(x)$ is a scalar function of the single variable x:

$$g(x) = m_1 x + \frac{1}{2}(m_0 - m_1)(|x + 1| - |x - 1|).$$

Parameters:

$\alpha = 15.6$
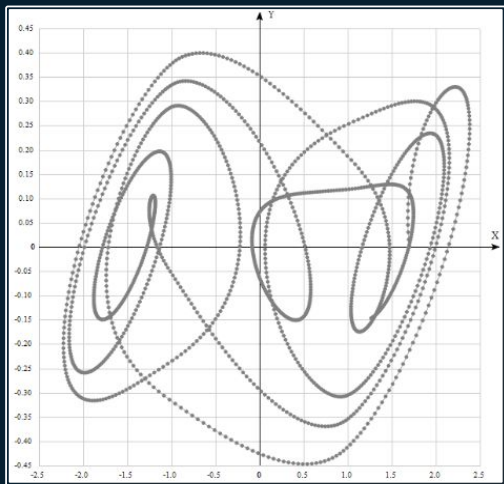$\beta = 28$
$m_0 = -1.143$
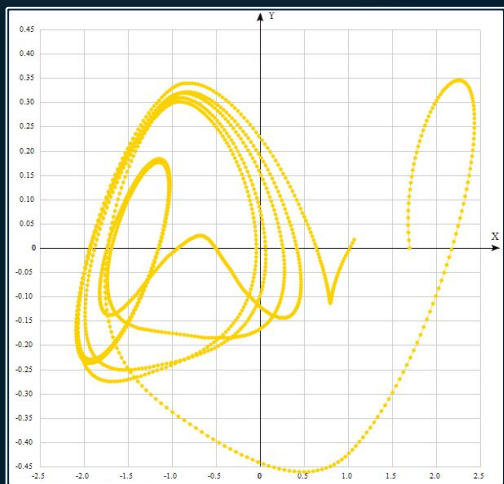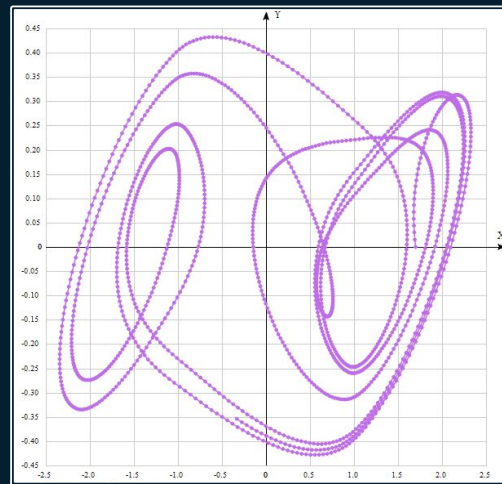$m_1 = -0.714$

Initial values:

$x_0 = 1.7$
$y_0 = 0$
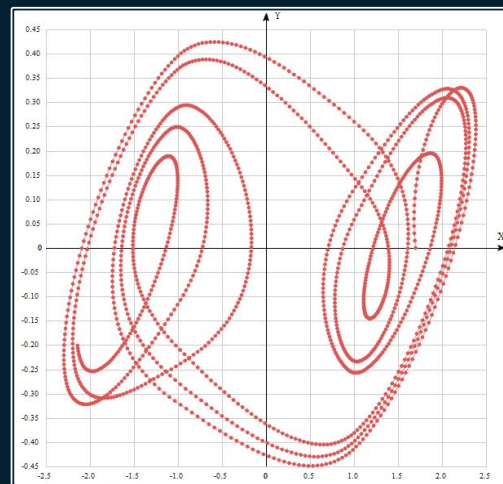$z_0 = 0$

Integration step:

$h = 0.009$

Without rounding

With using function "floor"

With using function "ceil"

With using function "round"

Rössler's model

$$\begin{cases} \dot{x} = -y - z \\ \dot{y} = x + ay \\ \dot{z} = b + z(x - c) \end{cases},$$

where a, b and c are constants.

Parameters:

$a = 0.2$
$b = 0.2$
$c = 2.6$

Initial values:
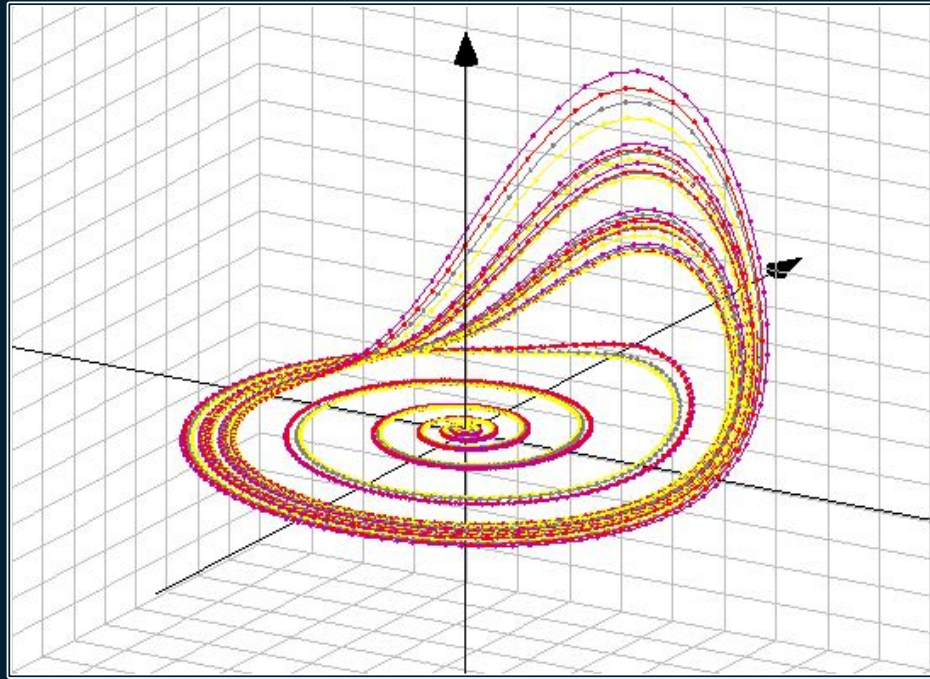
$x_0 = 0$
$y_0 = 0$
$z_0 = 0$
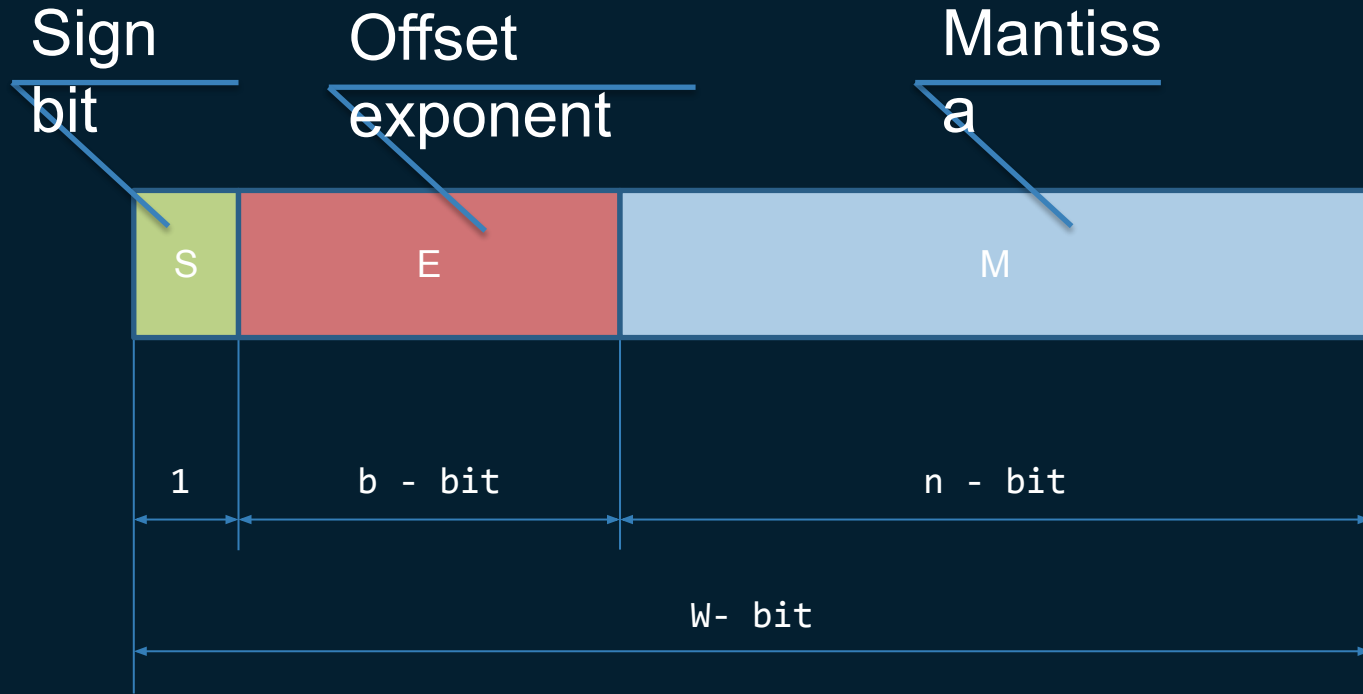
Integration step:

$h = 0.05$

Grey – without rounding

Yellow – with using function "ceil"

Purple – with using function "floor"

Red – with using function "round"

Statistic of distribution of variables

statistics

statistics

The conclusion

Thank you for your attention!