Controlling the system with hyperbolic attractor

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Model predator and prey of hyperbolic attractor

$$\dot r_1 = 2[1-r_2+\tfrac{1}{2}r_1-\tfrac{1}{50}(1-r_1)^2]r_1,\ \dot r_2 = 2(r_1-1)r_2,$$
$$z_1 = x_1 + iy_1, z_2 = x_2 + iy_2,$$
$$r_1 = x_1^2 + y_1^2,\ r_2 = x_2^2 + y_2^2.$$

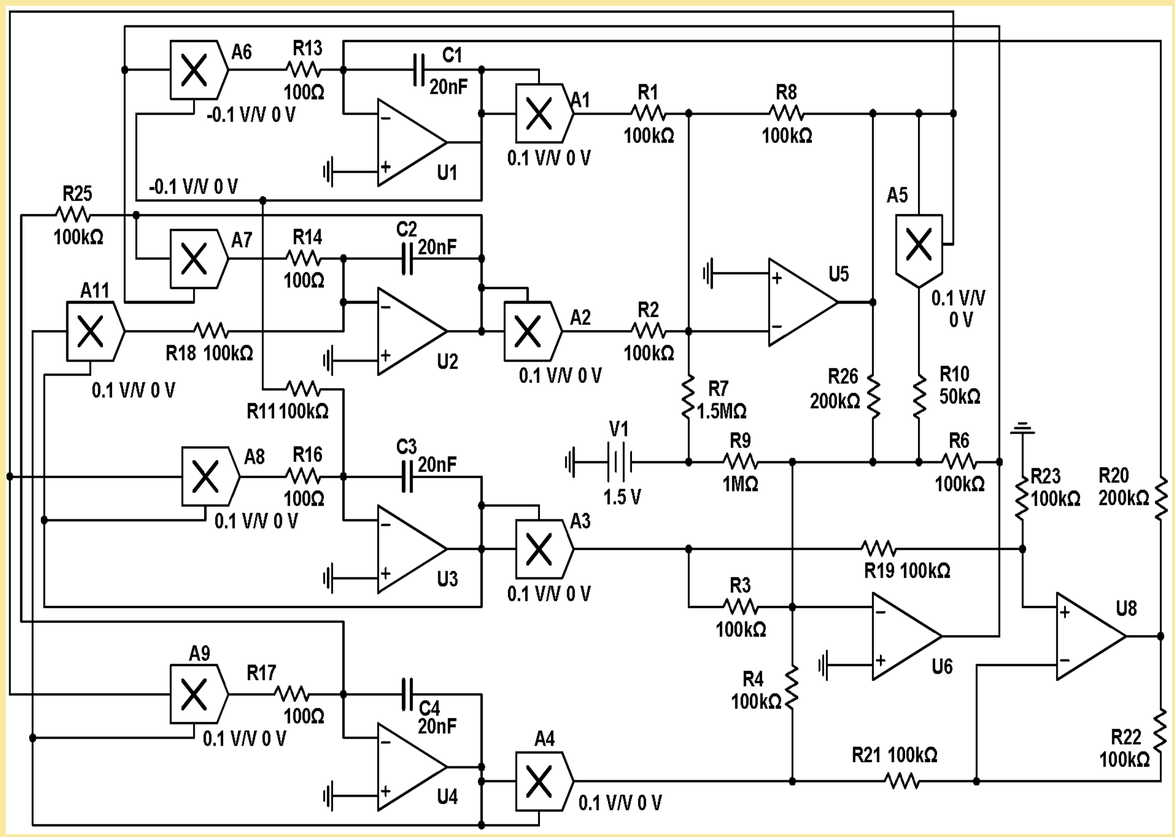
System of equations that has hyperbolic attractor

$$\dot x_1 = (1-a_2+\tfrac{1}{2}a_1-\tfrac{1}{50}(1-a_1)^2)x_1 - \tfrac{1}{2}\varepsilon_1(x_2^2-y_2^2),$$
$$\dot y_1 = (1-a_2+\tfrac{1}{2}a_1-\tfrac{1}{50}(1-a_1)^2)y_1 - \varepsilon_1 x_2 y_2,$$
$$\dot x_2 = (a_1-1)x_2 - \varepsilon_2 x_1,$$
$$\dot y_2 = (a_1-1)y_2 - \varepsilon_2 y_1,$$
$$a_1 = x_1^2 + y_1^2, a_2 = x_2^2 + y_2^2, \varepsilon_1 = 0.01, \varepsilon_2 = 0.1.$$

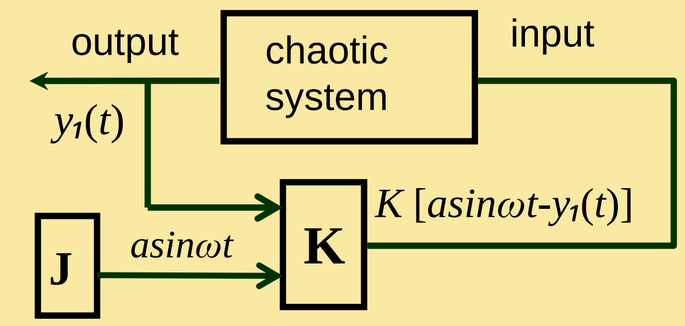
System of equations under control

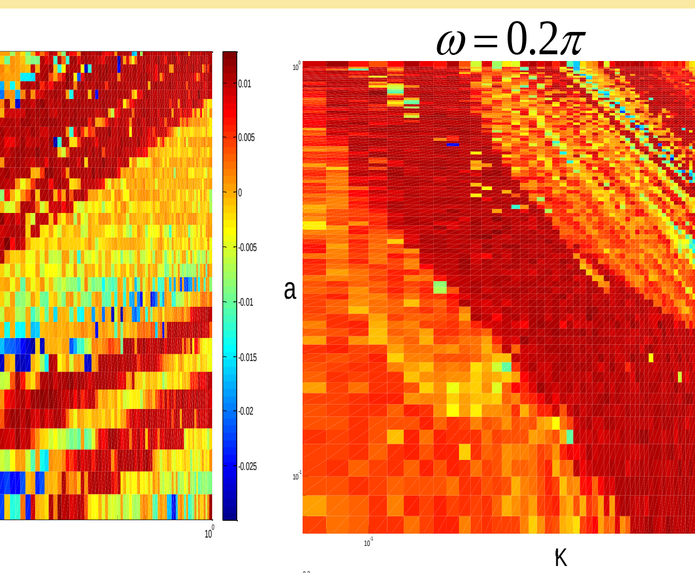
$$\dot x_1 = (1-a_2+\tfrac{1}{2}a_1-\tfrac{1}{50}(1-a_1)^2)x_1 + \varepsilon_1(x_2^2-y_2^2),$$
$$\dot y_1 = (1-a_2+\tfrac{1}{2}a_1-\tfrac{1}{50}(1-a_1)^2)y_1 - \varepsilon_1 x_2 y_2 + D_{1,2},$$
$$\dot x_2 = (a_1-1)x_2 - \varepsilon_2 x_1,$$
$$\dot y_2 = (a_1-1)y_2 - \varepsilon_2 y_1,$$
$$a_1 = x_1^2 + y_1^2, a_2 = x_2^2 + y_2^2, D_{1,2} = K(a\sin\omega t - y_1, \omega\cos\omega t).$$

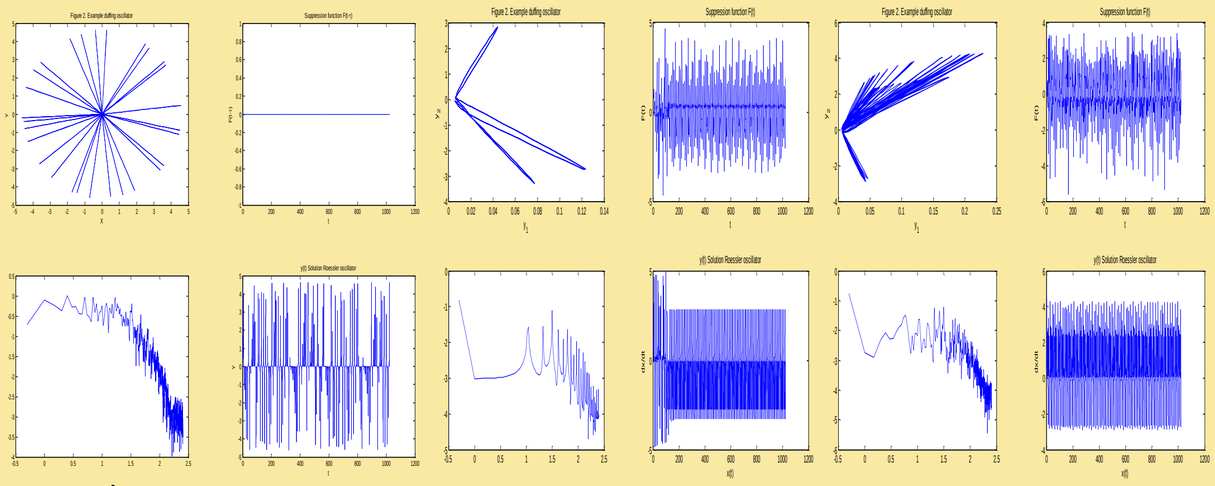
Radio electronic model of hyperbolic attractor



Methods of controls of chaotic system

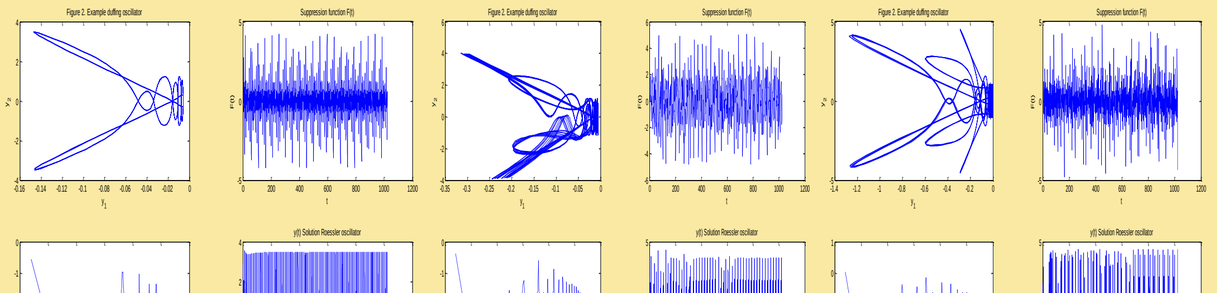




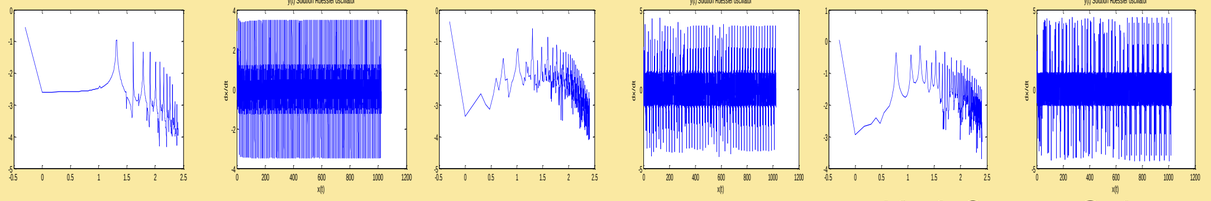


y_1 / x_1 K=0

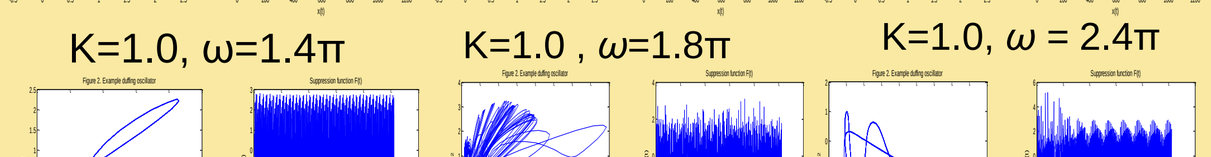
K=1.0, *a* =0.52, ω=0.2π



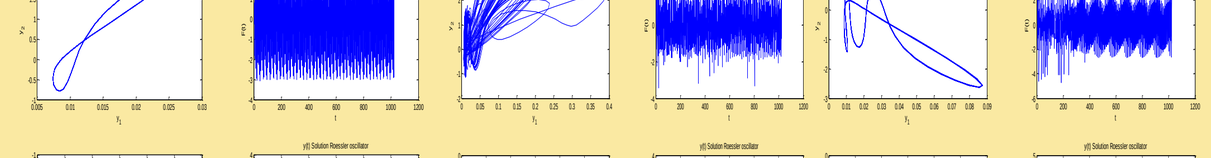
K=1.0, *a* =0.60, ω=0.2π



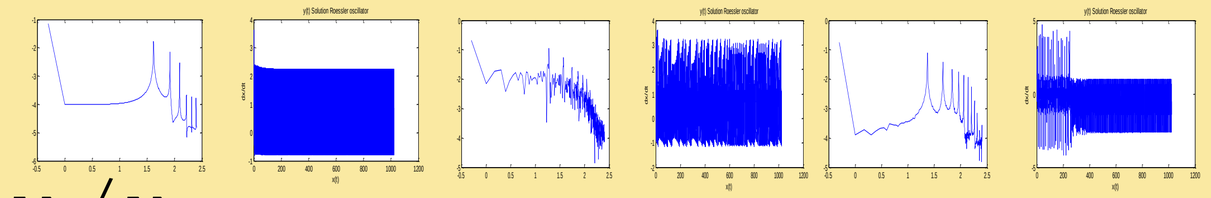
K=1.0, ω=1.4π



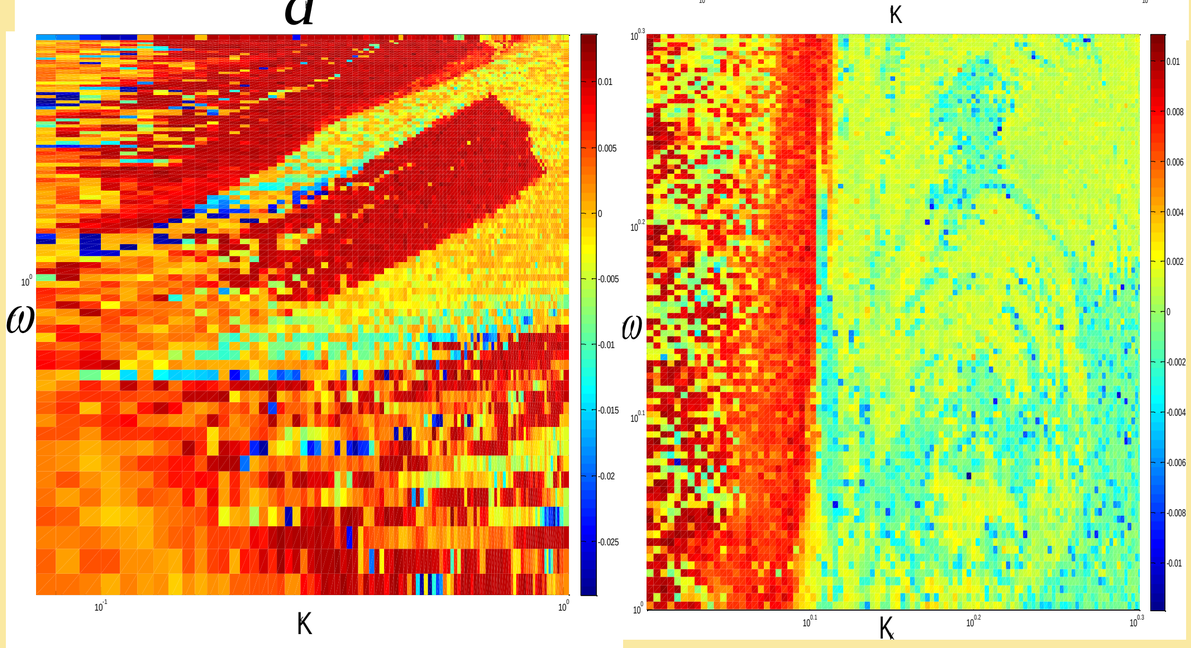
K=1.0 , *ω*=1.8π



K=1.0, *ω* = 2.4π



y_1 / x_1K=1.0, ω=0.8π



K=1.0, ω=1.1π

K=1.0, ω=1.3π

References:

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