Project ODE 42

The Fitzhugh-Nagumo model (see article for details)

The Fitzhugh-Nagumo (FHN) model is a reduced model of the Hodgkin-Huxley (HH) model for nerve cell dynamics. The model consists of a system of two differential equations, one for modeling the variation of the membrane potential dV / dt and the other for the resting variable dW / dt. The model is as follows:

$$\frac{dV}{dt} = V - \frac{V^3}{3} + I - W$$

$$\frac{dW}{dt} = b(V + a - cW)$$

where a, b, c are model constants that have been fixed a = 0.7, b = 0.08, c = 0.8.

I represents the current needed to unleash the potential for action. The Fitzhugh-Nagumo model is a nonlinear model of two equations in two unknowns V(t) and W(t).

Numerically solve the differential model with the numerical resolution methods for ODEs: the explicit Euler method, Implicit Euler, Heun, Runge-Kutta (ode45 and ode23).

Compare the results obtained with each resolution method and perform an analysis of the dynamics of the system by varying the parameter I and parameter c.