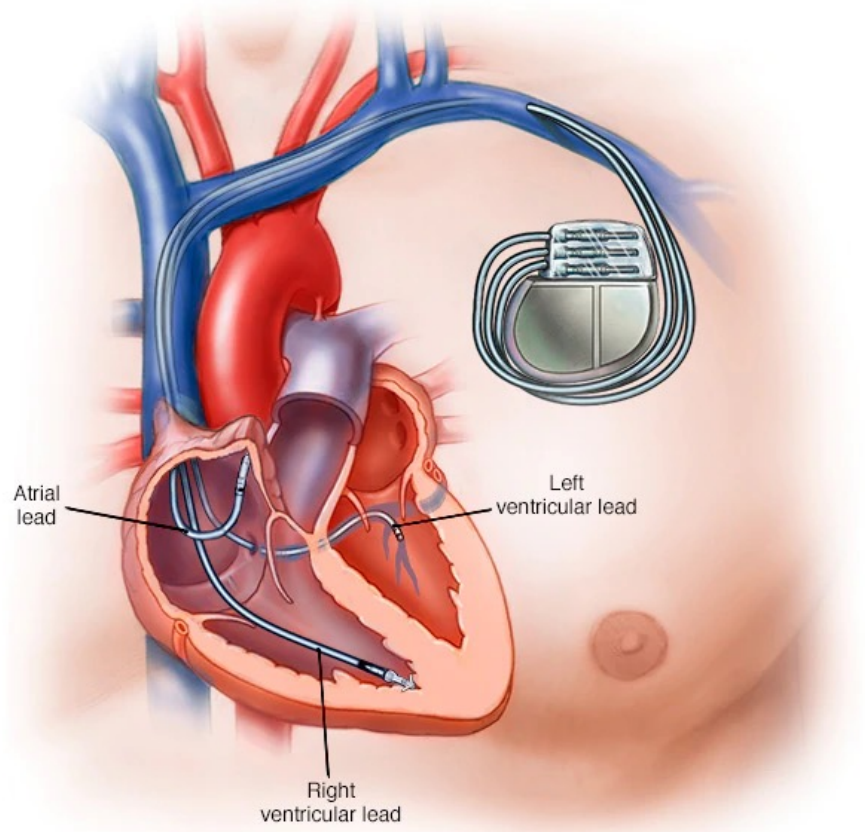
Análise Numérica num Dispositivo Coletor de Energia Assimétrico Não Linear

Roberto Luo[1]
João Pedro Norenberg[2]
Americo Cunha Jr[1]

[1]Universidade do Estado do Rio de Janeiro
[2]Universidade Estadual Paulista



© MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH. ALL RIGHTS RESERVED.

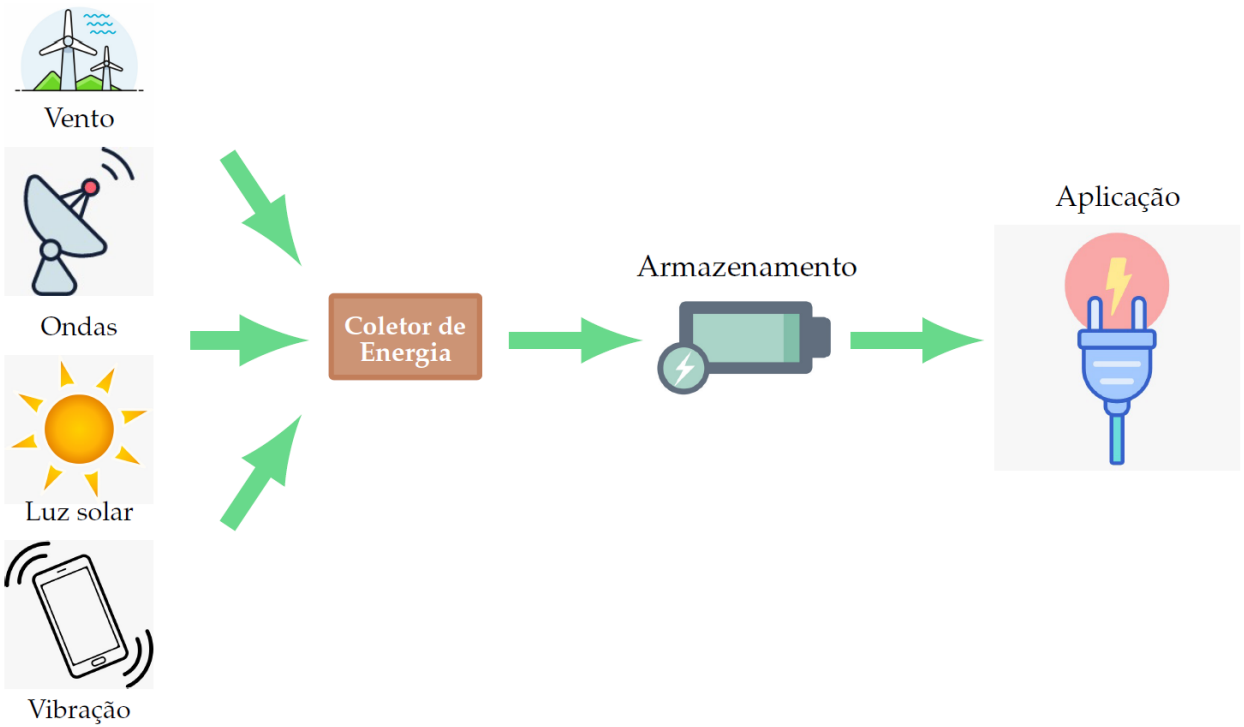
Fonte: https://www.mayoclinic.org/tests-procedures/pacemaker/about/pac-20384689

- Introdução
- Sistema Dinâmico
- Ferramentas Computacionais
- Resultados Numéricos
- Considerações Finais

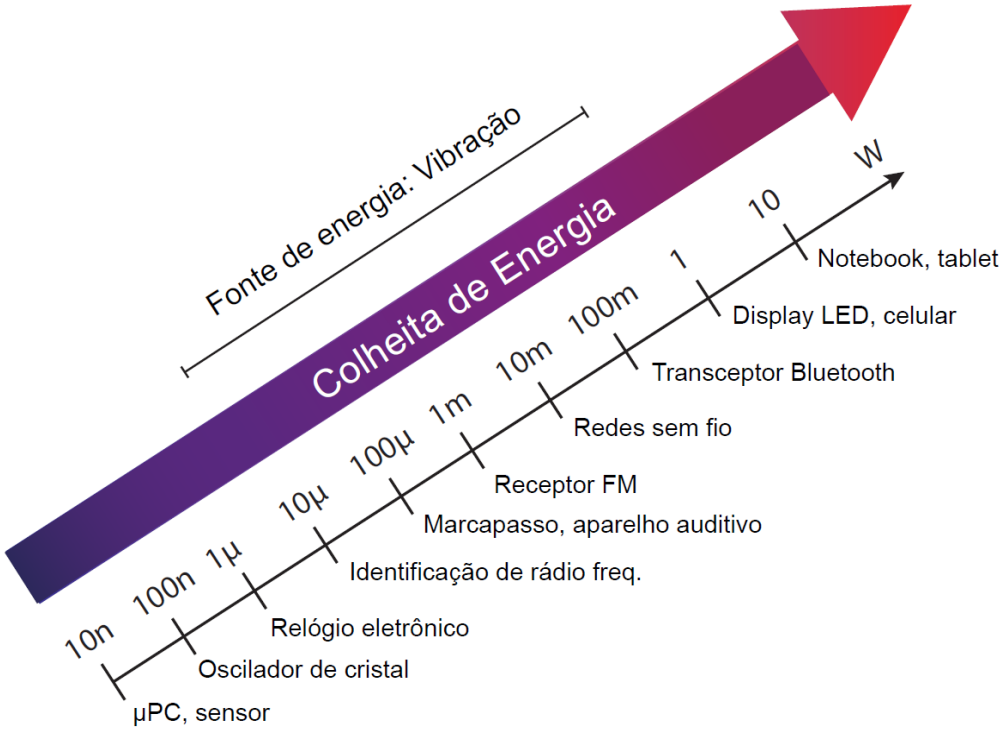


Introdução

Conceito de Colheita de Energia



Escala de Energia por Vibração



Fonte: https://passive-components.eu/energy-harvesting-is-not-fiction-anymore-2/

Objetivos da Pesquisa

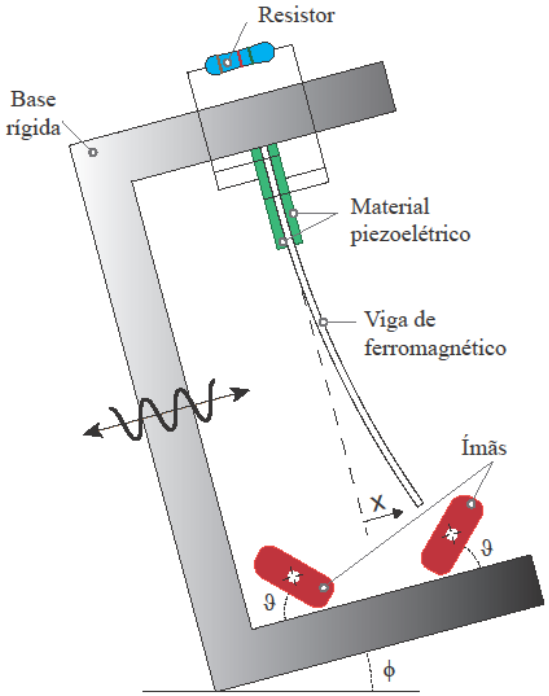
Investigar o comportamento da dinâmica do dispositivo coletor de energia assimétrico não linear por meio das:

- Bacias de atração
- Teste 0-1 para caos
- E sobre uma faixa de amplitude de forçamento

Sistema Dinâmico



Dispositivo Coletor de Energia Não Linear



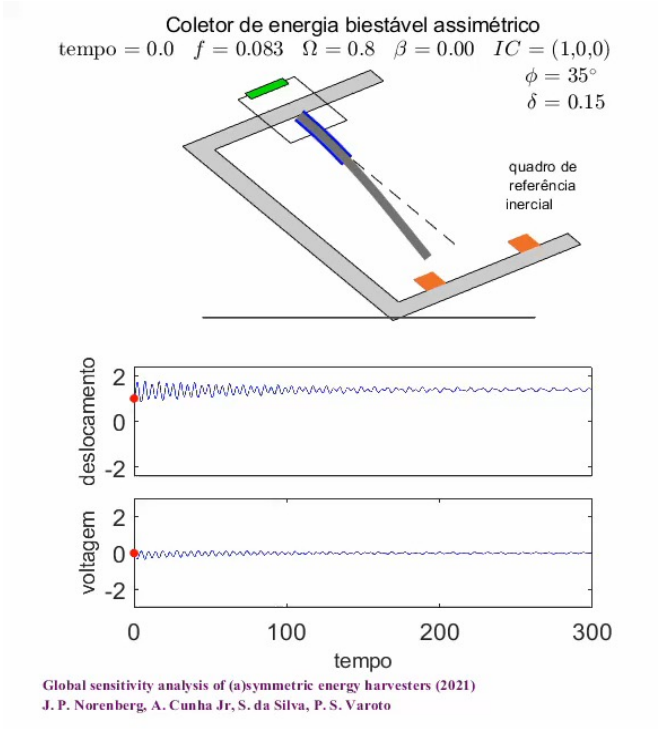
$$\ddot{x} + 2\xi\dot{x} - 0{,}5x(1 + 2\delta x - x^2) - \chi v - p\sin\phi = f\cos\Omega t$$

$$\dot{v} + \lambda v + \kappa\dot{x} = 0$$

$$x(0) = x_0, \dot{x}(0) = \dot{x}_0, v(0) = v_0$$

Norenberg, J. P., Cunha. Jr, A., Silva, S. and Varoto, P. S. Global sensitivity analysis of (a)symmetric energy harvesters, Preprint, arXiv:2107.04647, 2021.

Animação do Dispositivo



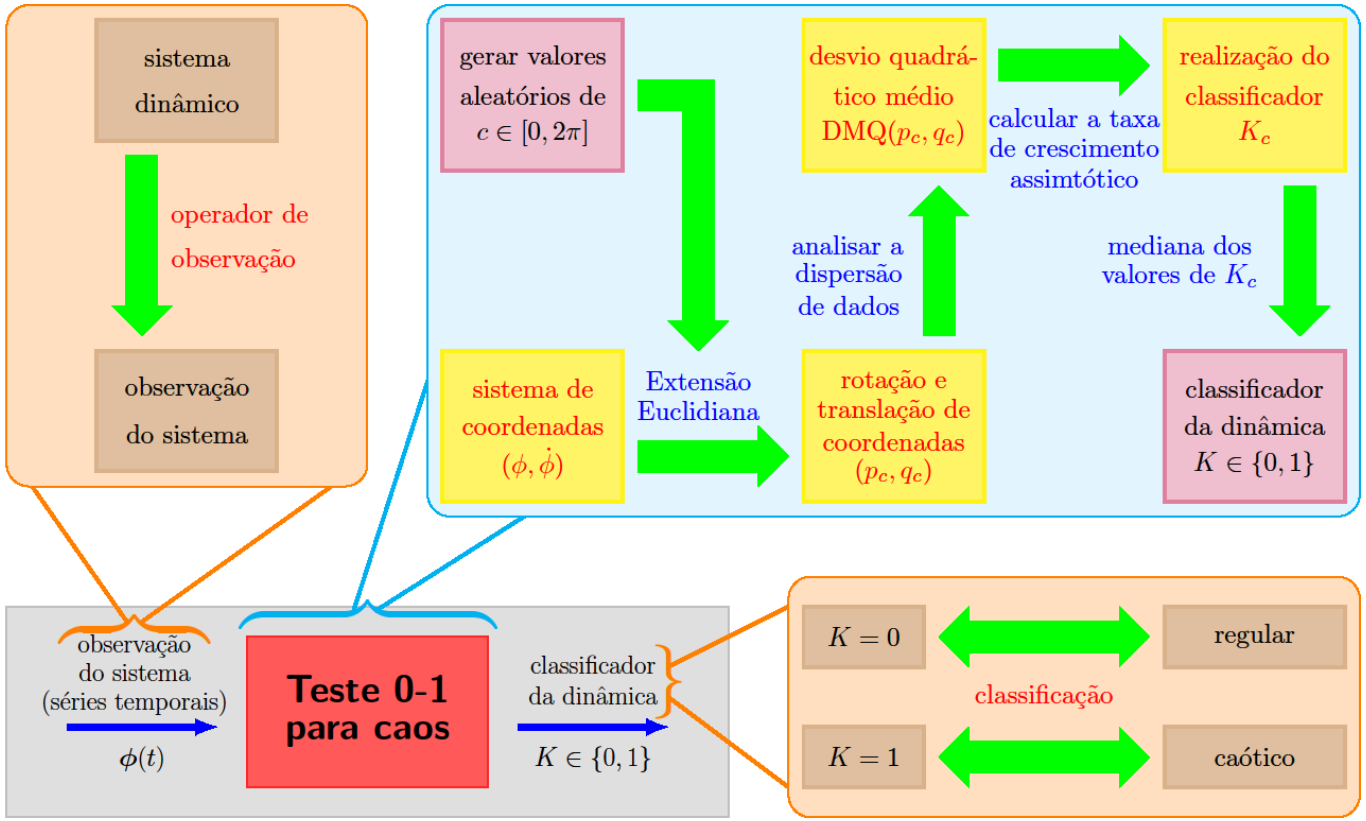
Ferramentas Computacionais







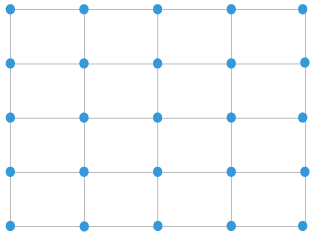
Teste 0-1 para Caos



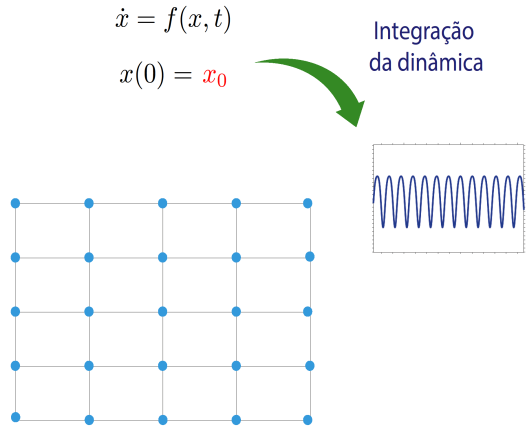
Bacias de Atração

$$\dot{x} = f(x,t)$$

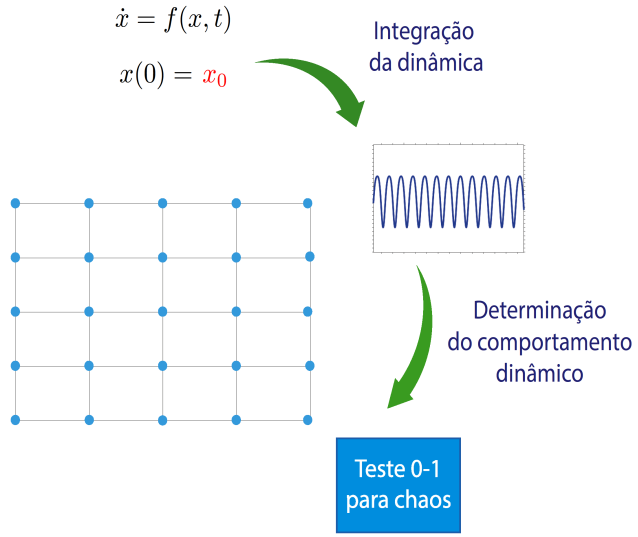
$$x(0) = x_0$$



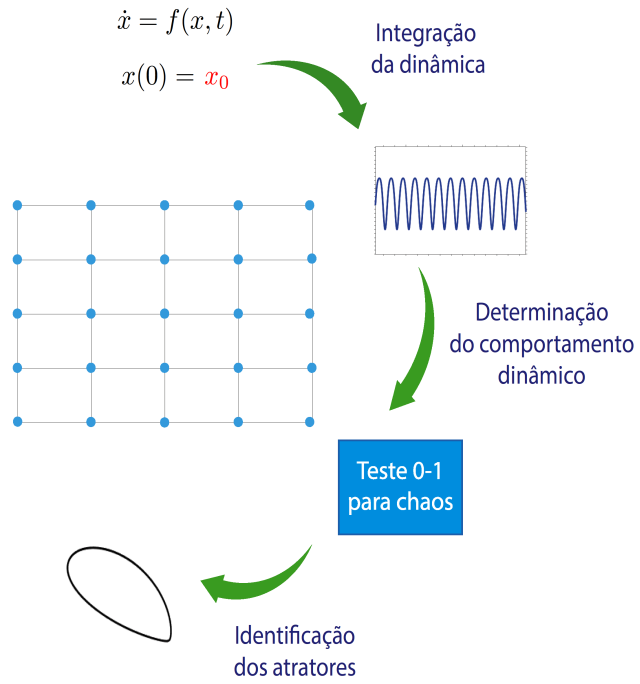
Bacias de Atração



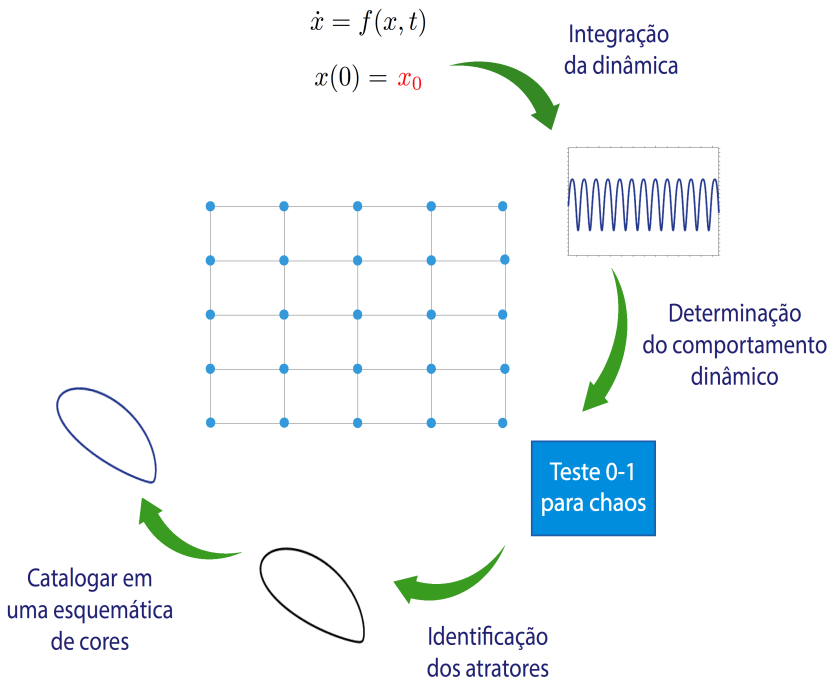
Bacias de Atração



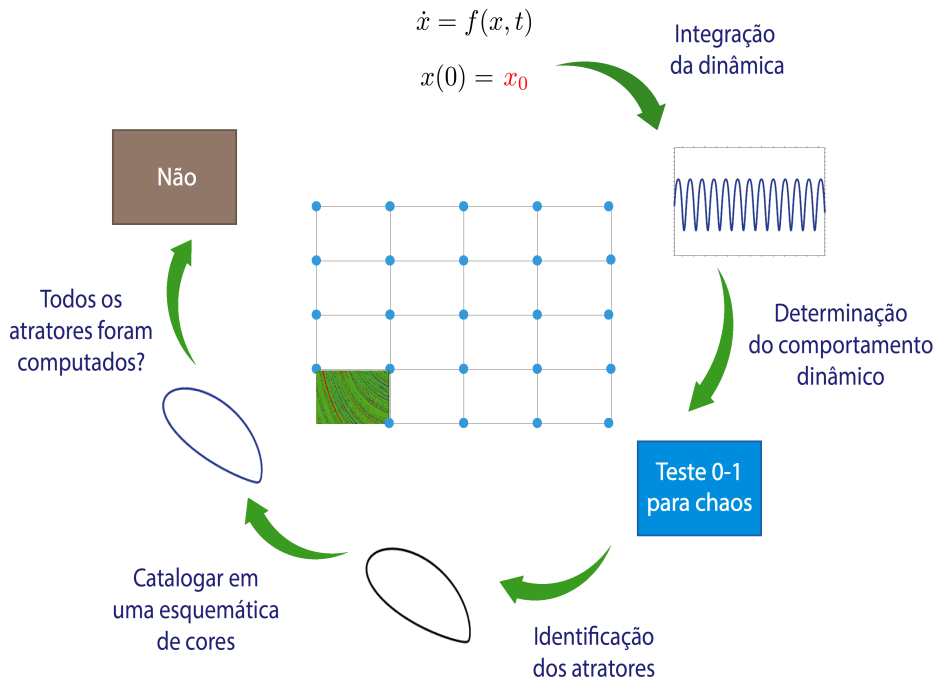
Bacias de Atração



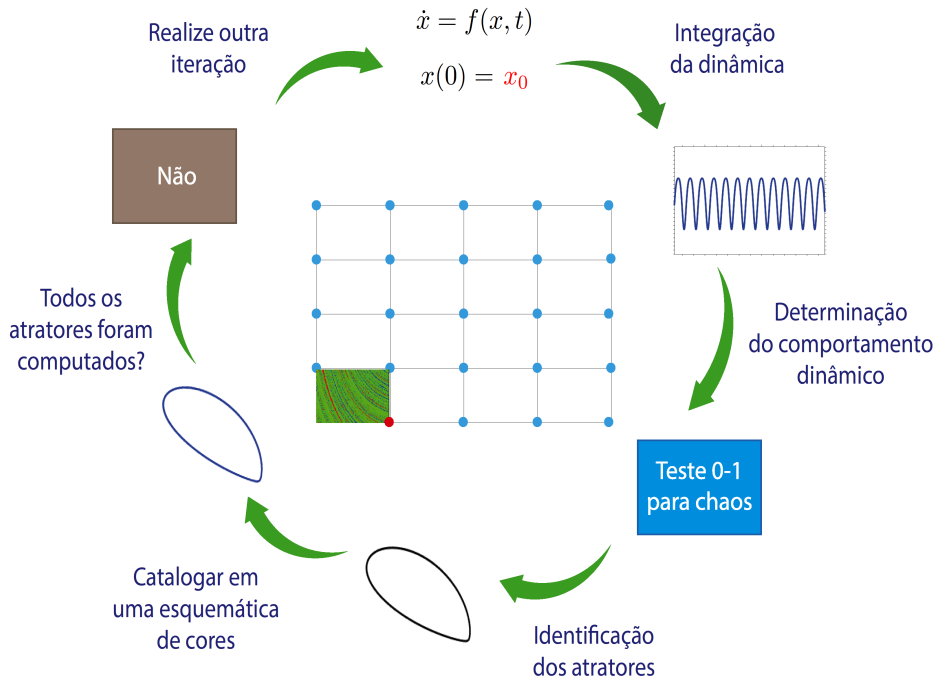
Bacias de Atração



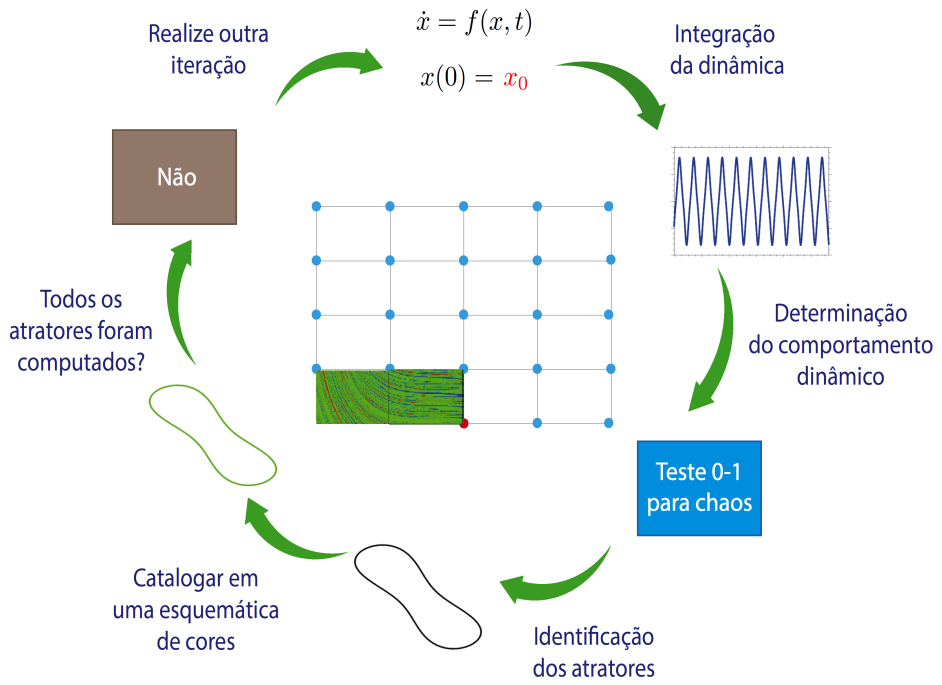
Bacias de Atração



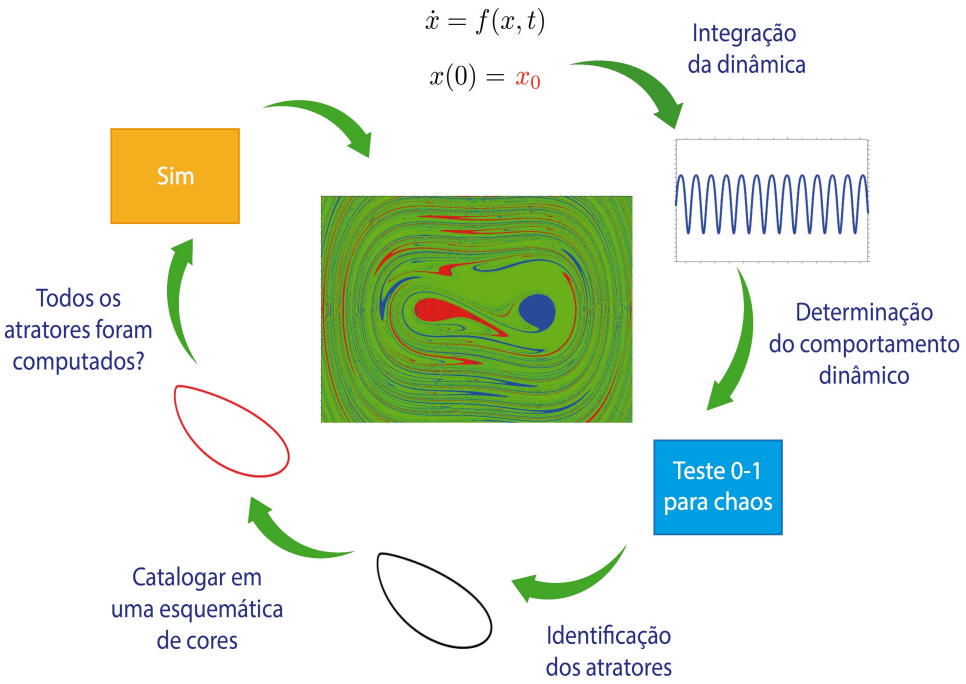
Bacias de Atração



Bacias de Atração

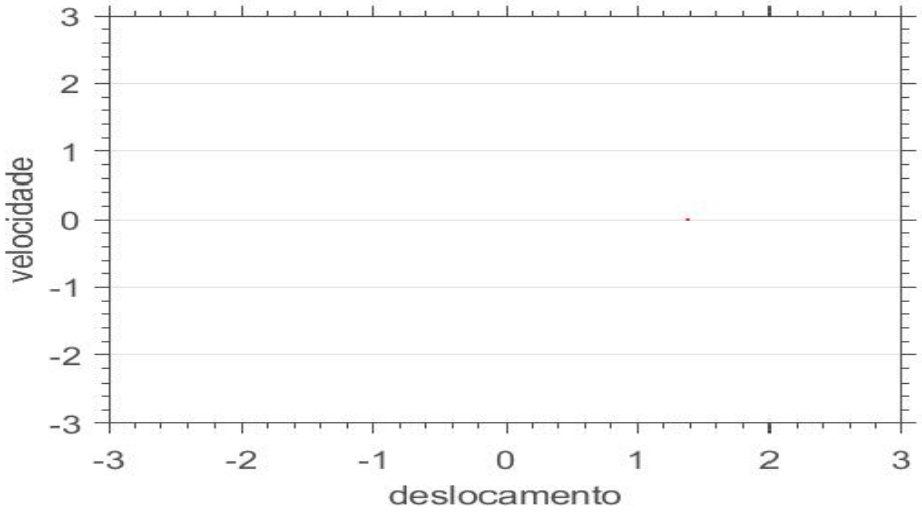


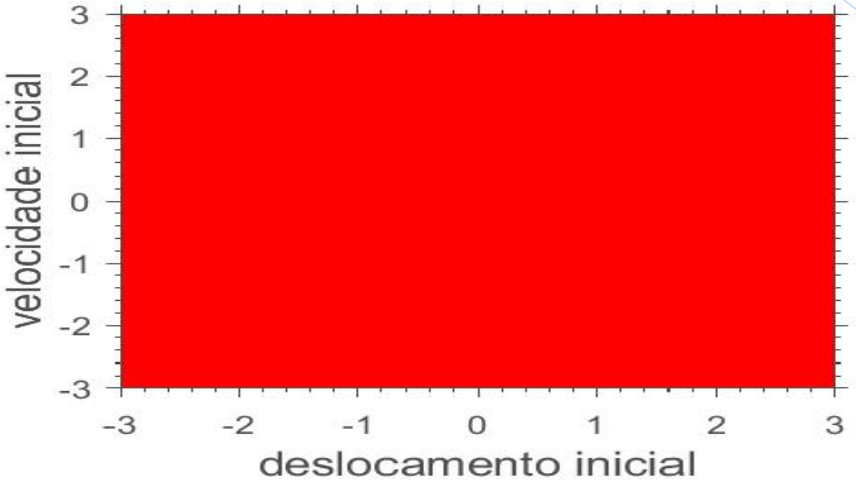
Bacias de Atração



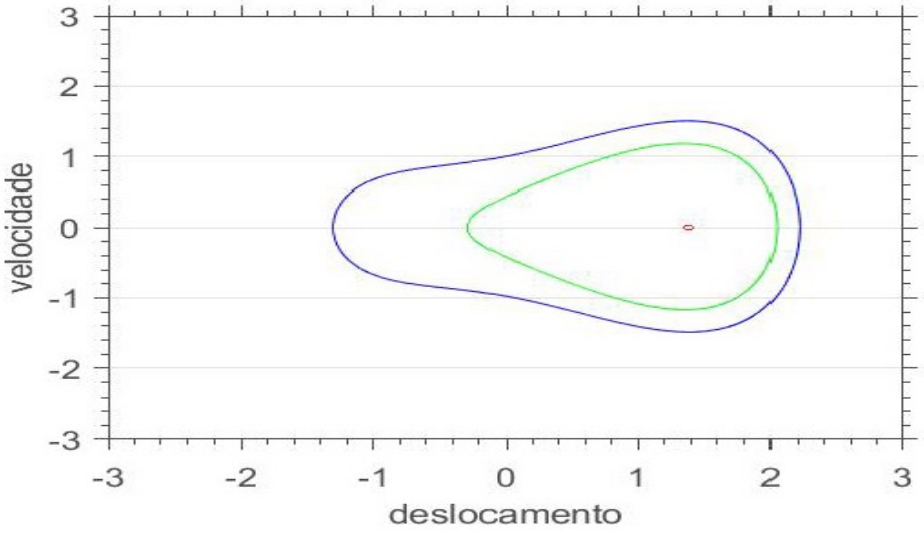
Resultados Numéricos

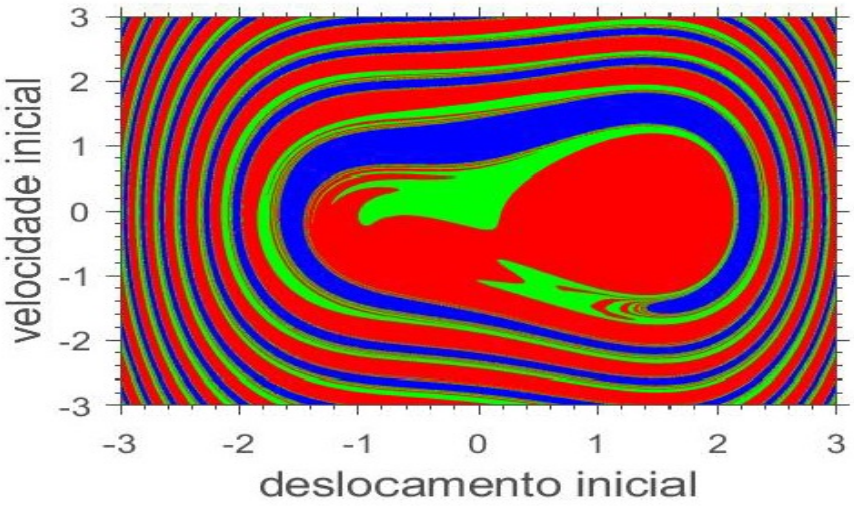
Amplitude de Forçamento: 0,019



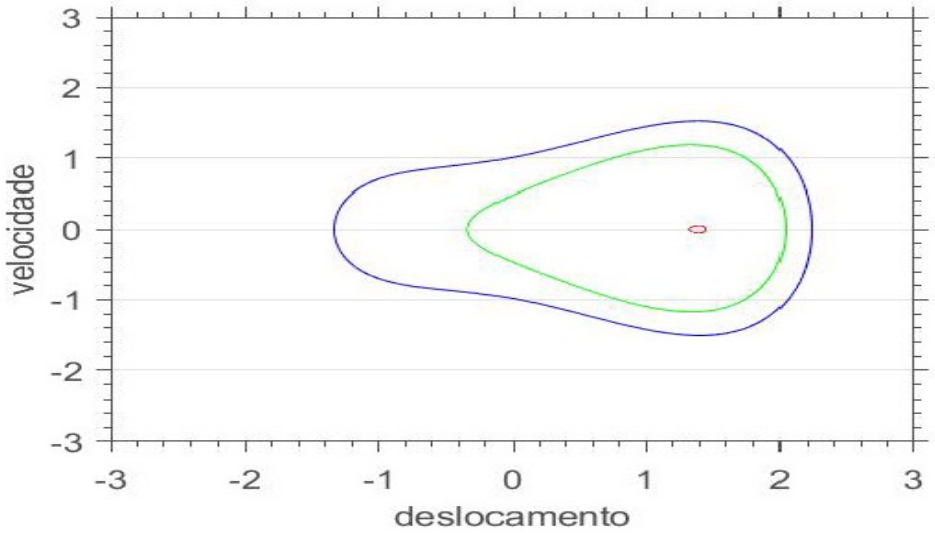


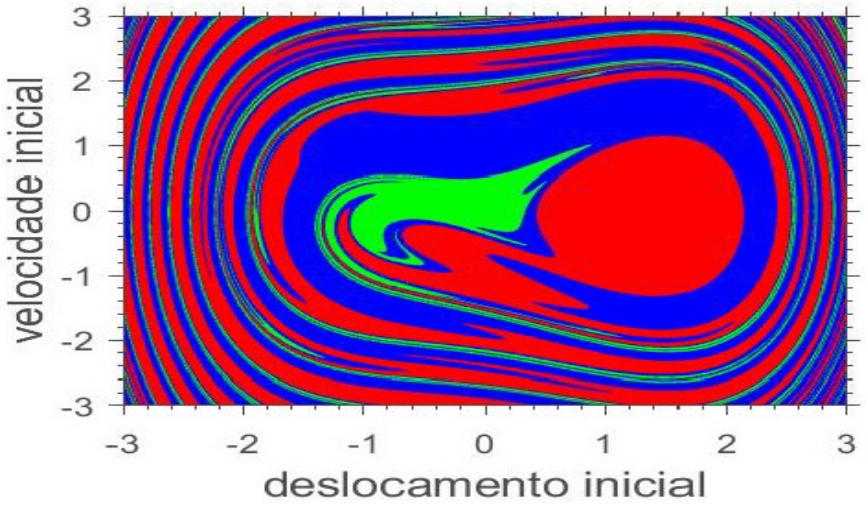
Amplitude de Forçamento: 0,051



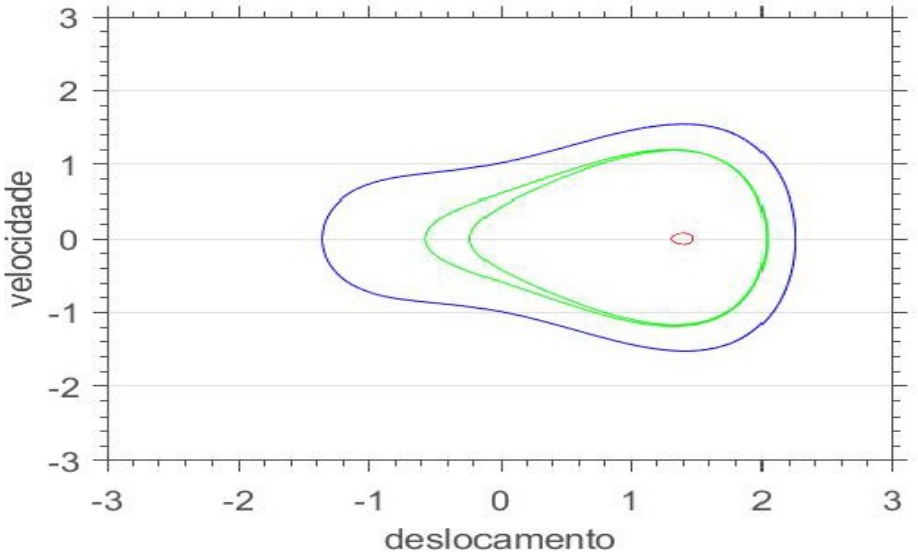


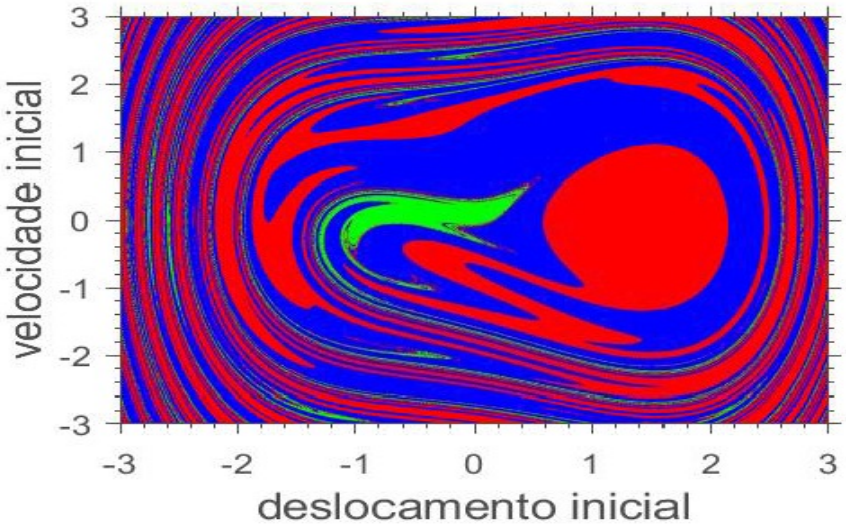
Amplitude de Forçamento: 0,083



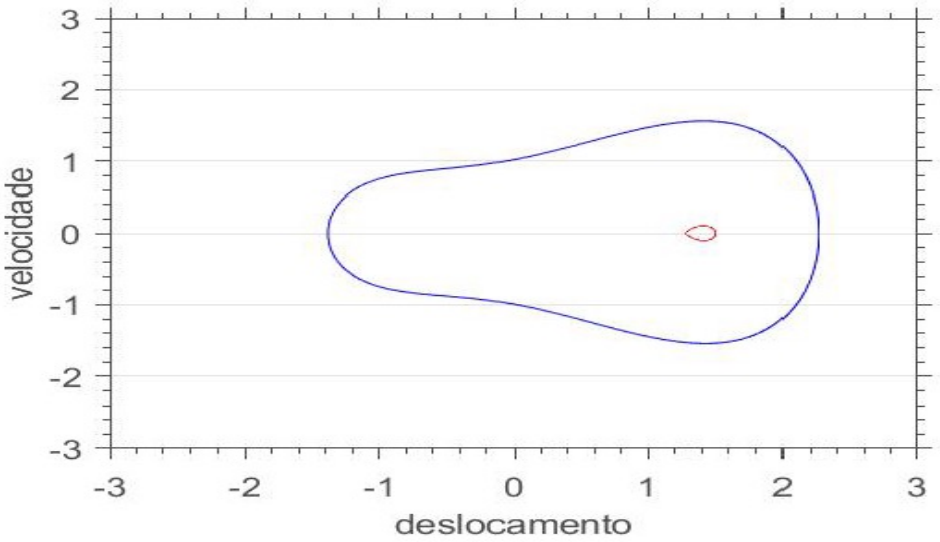


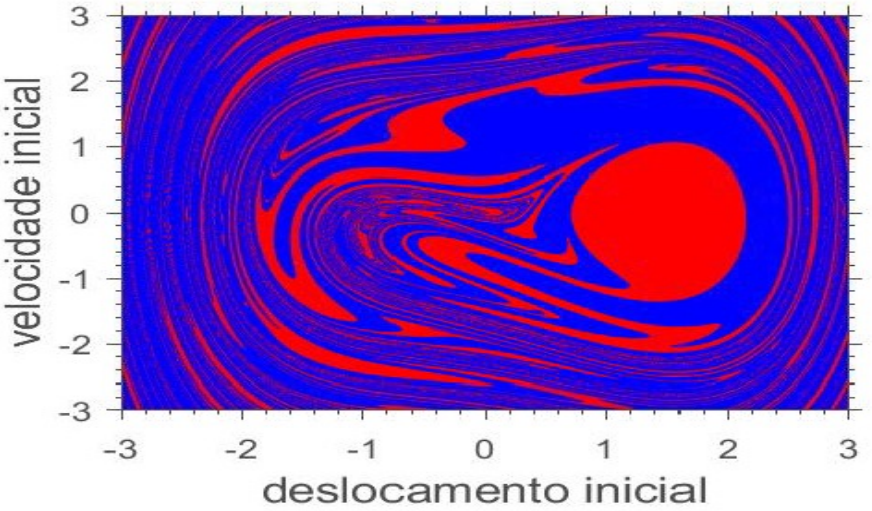
Amplitude de Forçamento: 0,115



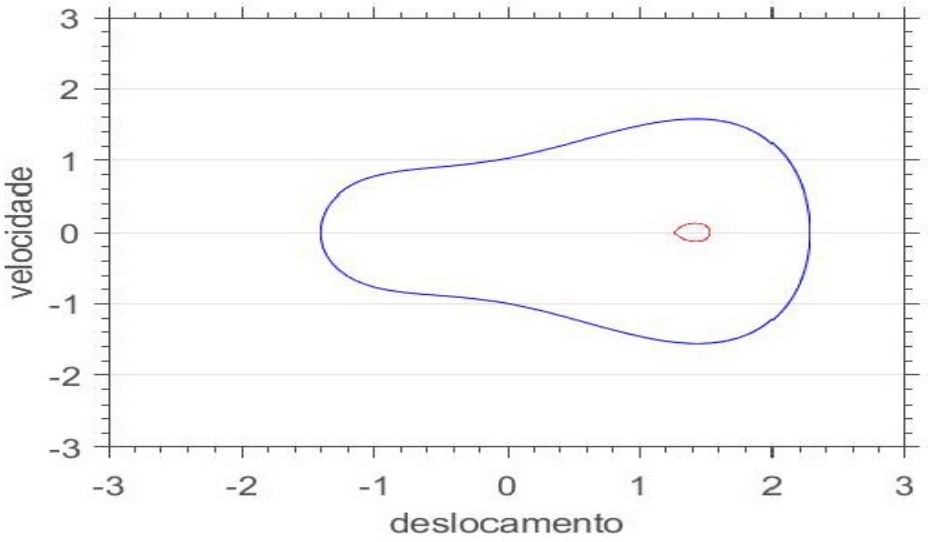


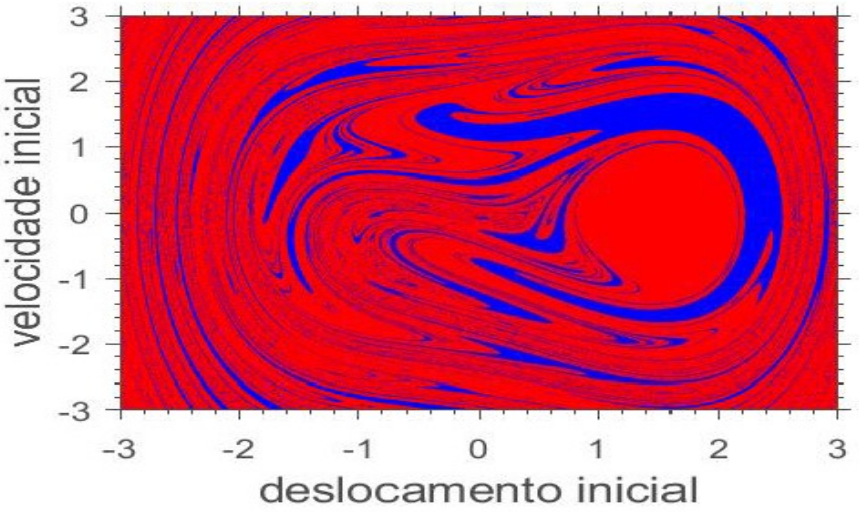
Amplitude de Forçamento: 0,147



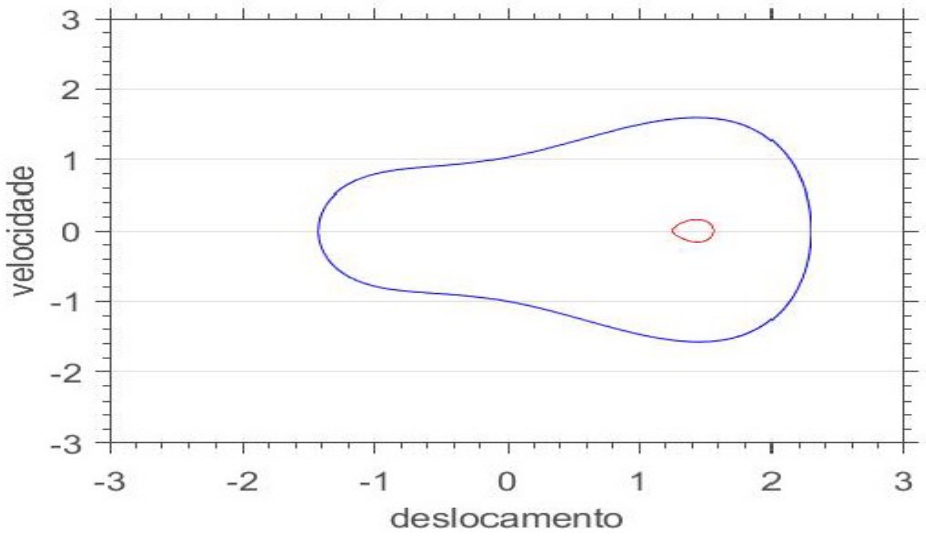


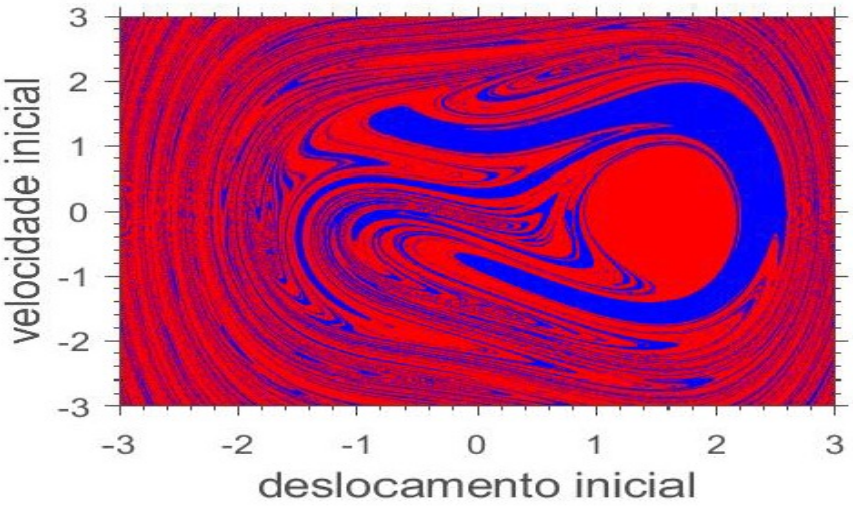
Amplitude de Forçamento: 0,179



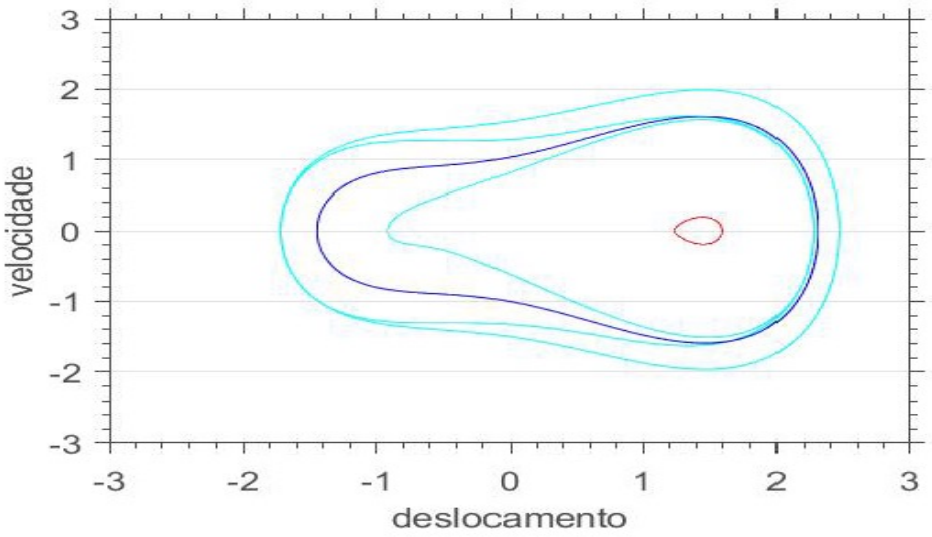


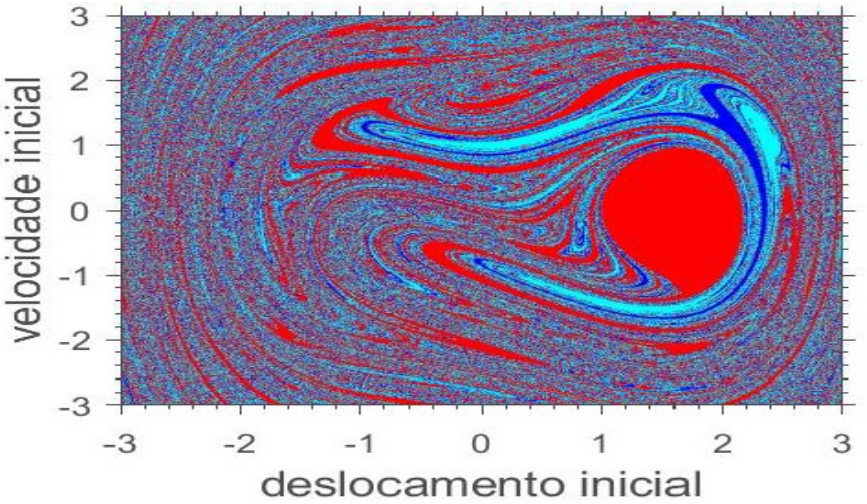
Amplitude de Forçamento: 0,211



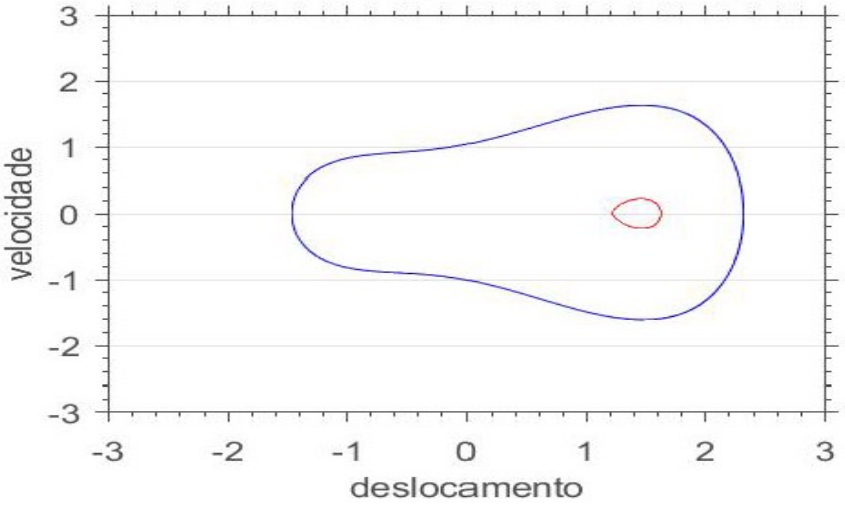


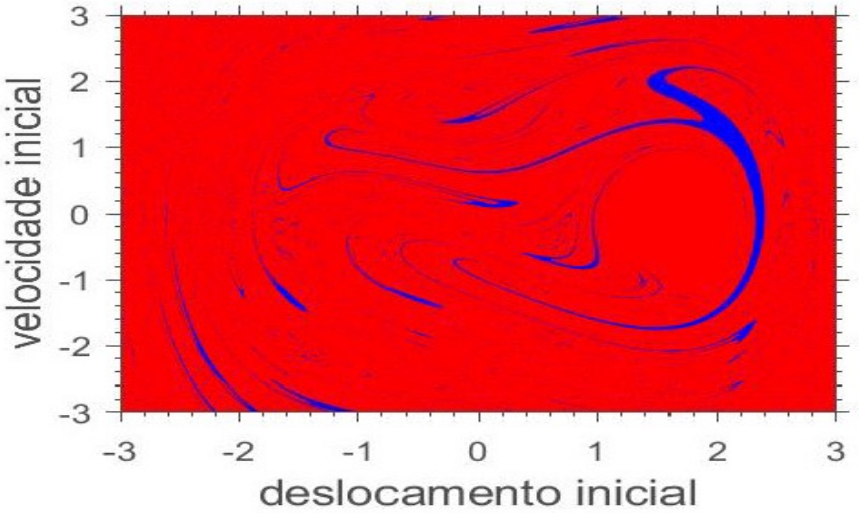
Amplitude de Forçamento: 0,243





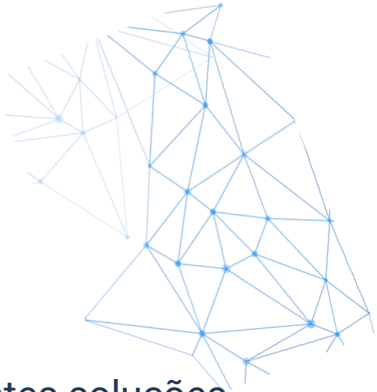
Amplitude de Forçamento: 0,275





Considerações Finais

Considerações Finais



Conclusões:

- A dinâmica do sistema é sensível as condições iniciais, podendo apresentar diferentes soluções
- Na faixa de alta amplitude de excitação o sistema apresenta maiores condições de ter órbita de baixa de energia
- Nem todas as configurações analisadas apresentaram bacias fractais

STONEHENGE

Contents lists available at ScienceDirect

Software Impacts

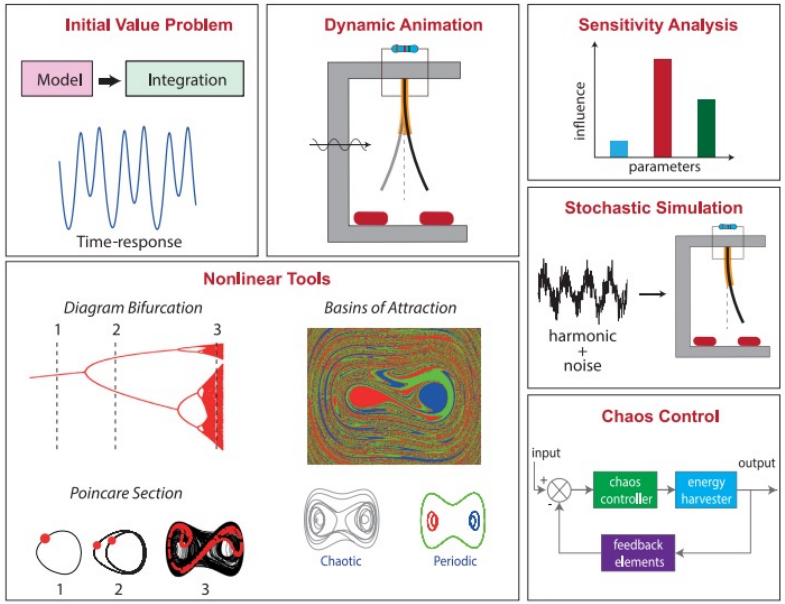
journal homepage: www.journals.elsevier.com/software-impacts

Original software publication

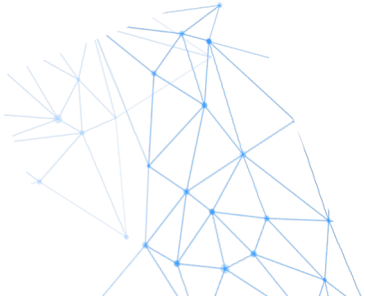
STONEHENGE — Suite for nonlinear analysis of energy harvesting systems

João Pedro Norenberg [a], João Victor Peterson [b], Vinicius Gonçalves Lopes [b], Roberto Luo [b], Leonardo de la Roca [b], Marcelo Pereira [b], José Geraldo Telles Ribeiro [b], Americo Cunha Jr [b,*]

[a] São Paulo State University – UNESP, Ilha Solteira - SP, Brazil
[b] Rio de Janeiro State University – UERJ, Rio de Janeiro - RJ, Brazil



Agradecimentos







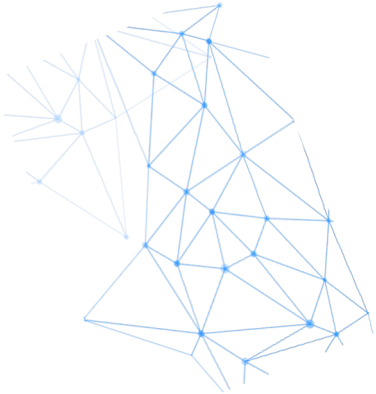












Obrigado pela atenção!

cai.roberto@graduacao.uerj.br