The Chaotic Pendulum II

Implementation & Assessment

Rubin H Landau

Sally Haerer, Producer-Director

Based on *A Survey of Computational Physics* by Landau, Páez, & Bordeianu

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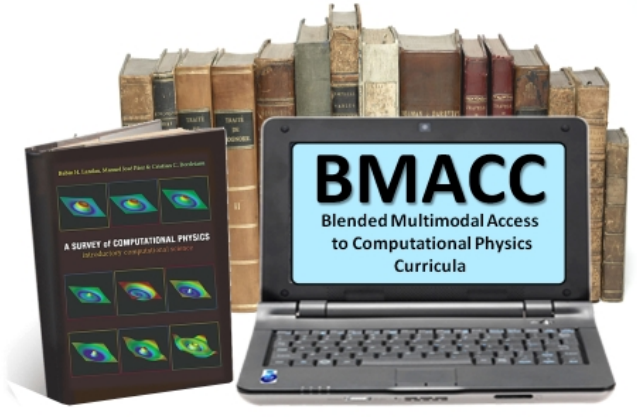
Course: **Computational Physics II**



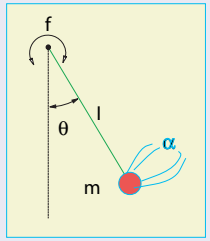
Implementation: Let's Get Down to Work

Good Time for a Break!

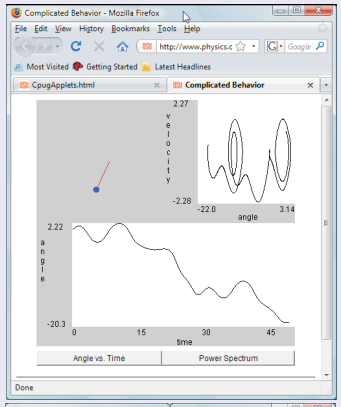
Examples of What You Should See

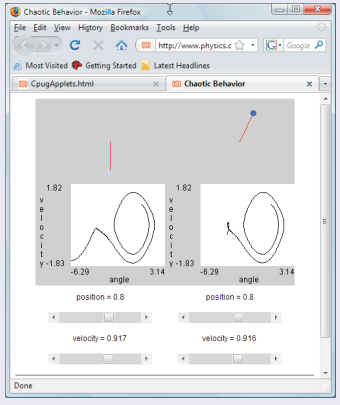
Applets of Pendulums in Phase Space (Hans Kowallik)

- Do with your program (text path)
- Reproduce standard features
- Beware: 4-D parameter space



- Complicated Behavior Applet
- Chaos Comparison Applet

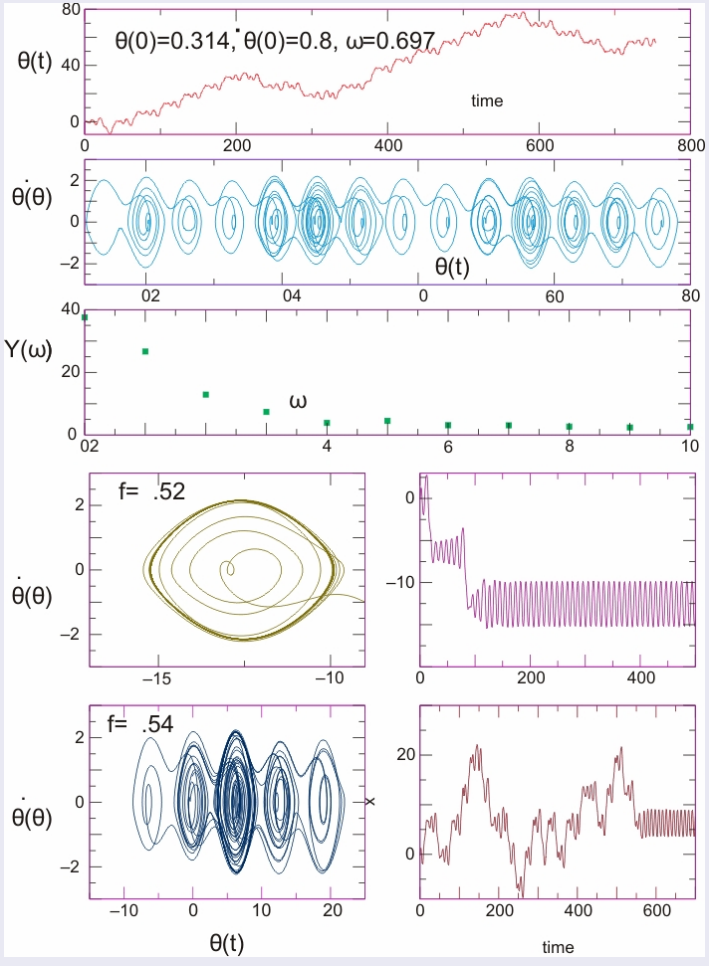




Assessment in Phase Space

Start with Free Pendulum As Your Lab

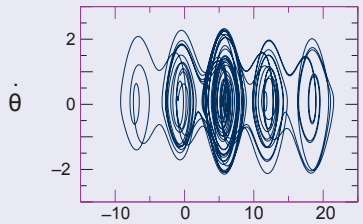
- Add friction: spirals
- Small τ_{ext} ($\sim$ellipse)
- $\omega \simeq \omega_0$, beats
- NL resonance (ϕ matters)
- ID transients, 1, 2, 3 cycle
- ID running solutions
- Explore chaos (small *h*)
- ID hypersensitive details
- OK not reproduce us

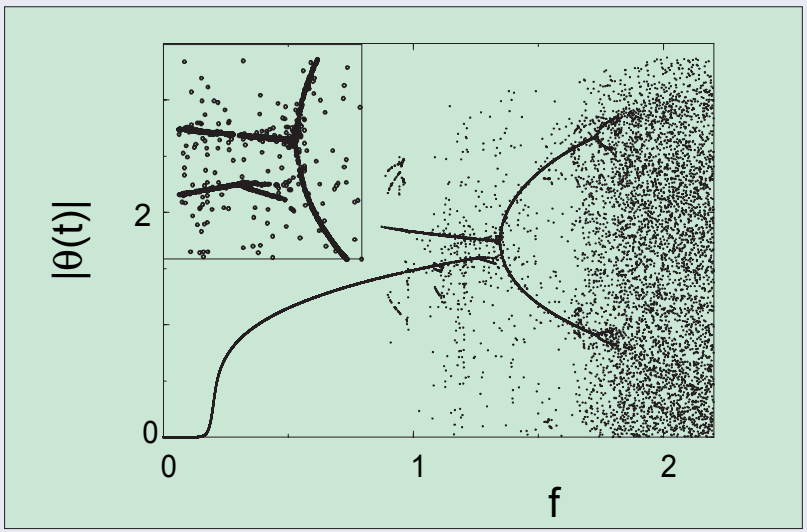


Bifurcations of Chaotic Pendulum

How & When Do ω_is Occur?

- Saw bugs bifurcate
- Saw pendulum jump ω_i
- $\Rightarrow \omega_i$ sequential
- Linear: ω_i simultaneous
- For 150 t_i plot $(|\dot{\theta}(t_i)|, f)$
- Samples instantaneous $\dot{\theta} = d\theta/dt$
- Dominant ω_i = attractors





That's All Folks

See Double Pendulum for Alternate problem.