Using Octave to prepare figures for LaTeX papers

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Abstract
This is an example of how to prepare figures for LaTeX papers using Octave software. We use both PSTeX and EPS pictures.

The source files can be downloaded from http://www.math.tamu.edu/~comech/tools/octave-latex

1 Phase portraits of differential equations
Here we use Octave’s built-in ODE solver lsode to solve a system of differential equations and plot the solution on the phase plane.

Damped Oscillation

\begin{align*}
\dot{u} &= v \\
\dot{v} &= u - u^3 - 0.2v
\end{align*}
2 Orbital stability of solitary waves

Definition. $\phi(x)e^{-i\omega t}$ is orbitally stable if $\forall \varepsilon > 0 \ \exists \delta > 0$ so that

if $\left\| \psi(0) - \phi \right\| < \delta$ then $\sup_{t \geq 0} \inf_{s \in \mathbb{R}} \left\| \psi(t) - \phi e^{is} \right\| < \varepsilon$

At $t = 0$, start near the orbit...
Orbital stability results: plot charge vs. $\omega$...

- Instability results:
  M. Vakhitov & A. Kolokolov [1973] (linear instability)

- Orbital stability results:
3 Long-time asymptotics for nonlinear Klein-Gordon

We consider the finite energy solutions to the Klein-Gordon equation:

\[ \ddot{u} = \Delta u - m^2 u + \beta(|u|^2)u, \quad u|_{t=0} = u_0, \quad \dot{u}|_{t=0} = v_0. \]

Octave is used to solve the equation numerically (finite interval, absorbing boundary conditions). Below are the snapshots at \( t = 1, 10, 100, \) and 1000.