Unstable manifold from $u = 0$

A. J. Roberts, University of Adelaide
http://www.maths.adelaide.edu.au/anthony.roberts

10:04am, June 16, 2014

The specified dynamical system

$\dot{u}_1 = u_2$

$\dot{u}_2 = \varepsilon^2(-u_1^2\alpha + u_1\alpha) + \varepsilon(1/2D_{t,-2c\epsilon}(u_1)u_1^2 - 1/2D_{t,-2c\epsilon}(u_1)u_1 - 1/2u_1^2c - 1/4u_1^2) - u_2c + 1/2u_1c + 1/4u_1$

Centre subspace basis vectors

$\vec{e}_1 = \left\{\{1, 1/2\}, e^{(-iti}/2)\right\}$

$\vec{z}_1 = \left\{\{(c+1/2)/(c+1), 1/(c+1)\}, e^{(-iti}/2)\right\}$

The centre manifold

$u_1 = e^{-iti}s_1^2\varepsilon(-2\cosh(c\epsilon) - 2\sinh(c\epsilon) - 2c - 1)/(2c+3) + e^{(-iti}/2)s_1 + e^{(-3iti}/2)s_1^3\varepsilon(1/2\cosh(c\epsilon) + 1/2\sinh(c\epsilon))/(c+2)$

$u_2 = e^{-iti}s_1^2\varepsilon(-2\cosh(c\epsilon) - 2\sinh(c\epsilon) - 2c - 1)/(2c+3) + 1/2\,e^{(-iti}/2)s_1 + e^{(-3iti}/2)s_1^3\varepsilon(3/4\cosh(c\epsilon) + 3/4\sinh(c\epsilon))/(c+2)$

Centre manifold ODEs

$\dot{s}_1 = (s_1 \varepsilon^2 \alpha)/(c+1)$