

Simultaneous noninvasive stabilization  
of infinitely many, large and rapid  
Duffing oscillations,  
by delayed feedback control

Bernold Fiedler

Institute of Mathematics  
Free University of Berlin

**Abstract**

For many decades it has been known that stable periodic solutions in scalar first order delay equations with monotone feedback are necessarily *slowly* oscillating. Occasionally, and in contrast to the first order case, it has been remarked how scalar second order delay equations may well exhibit stable *rapid* oscillations.

At the previous Tangier CSNDD2018, Richard Rand suggested how the delayed Duffing oscillator might exhibit an infinity of stable rapidly oscillating solutions, with amplitudes tending to infinity and periods tending to zero. We pursue the mathematical basis for this remarkable phenomenon, which also arises in the desirable context of linear delayed noninvasive feedback control of the standard Duffing oscillator.

Results are based on joint work with Lopez-Nieto, Rand, Sah, Schneider, Shayak, and de Wolff.