

The conference is supported by the National Laboratory for Health Security project RRF-2.3.1-21-2022-00006

Semicycles and correlated asymptotics of oscillatory solutions to second-order delay differential equations

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We obtain several new comparison results on the distance between zeros and local extrema of solutions for the second order delay differential equation

$$x''(t) + p(t)x(t - \tau(t)) = 0,\ t \geq s$$

where $\tau : \mathbb{R} \to [0, +\infty)$, $p : \mathbb{R} \to \mathbb{R}$ are Lebesgue measurable and uniformly essentially bounded, including the case of a sign-changing coefficient. We are thus able to calculate upper bounds on the semicycle length, which guarantee that an oscillatory solution is bounded or even tends to zero. Using the estimates of the distance between zeros and extrema, we investigate the classification of solutions in the case $p(t) \leq 0, t \in \mathbb{R}$. Joint work with Elena Braverman and Alexander Domoshnitsky.