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Oscillation theorems for second-order nonlinear differential equations with impulsive effects

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Abstract

By using classical variational principle and averaging technique, several oscillation criteria are established for nonlinear second-order equation of the form in which an impulsive effect

$$\left[r(t)\Phi\left(x(t)\right)\varphi\left(x'(t)\right)\right]' + a(t)\varphi\left(x(t)\right) = 0,$$

where $r \in C\left(\left[t_0,\infty\right);\left[0,\infty\right)\right), a \in C\left(\left[t_0,\infty\right);\mathbb{R}\right), \Phi \in C\left(\mathbb{R};\mathbb{R}\right)$ and $\varphi : \mathbb{R} \to \mathbb{R}$ is defined by $\varphi(s) = |s|^{p-2}s$ with $p > 1$ is a fixed real number. This equation can be regarded as an equation of motion in which the moving speed of a mass point may oscillate due to the influence of impulsive effect even if the mass point does not oscillate in the model removing the impulsive effect. It is also shown that the obtained results extend some previous criteria.

Key Words: Oscillation problem, Impulse, Averaging technique, Riccati transformation.

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