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Existence of periodic solutions to differential equations with pulse action in a neighborhood of composite singular points. (Ukrainian. English summary)

Dopov. Nats. Akad. Nauk Ukr., Mat. Pryr. Tekh. Nauky 2000, No.8, 29-32 (2000). [ISSN 1025-6415]

The authors study the phenomenon of appearance of discontinuous periodic solutions in nonlinear second-order differential equations under the action of impulses. The following equations with composite equilibrium are considered

$$(a)\quad \ddot{x} - \frac{2\dot{x}^2}{x} + x^5 = 0; \qquad (b)\quad \ddot{x} - \frac{2\dot{x} + 6x^3}{x}\dot{x} - x^5.$$

A phase point $(x(t), \dot{x}(t))$ undergoes pulse influence each time it intersects the line $x = x_*$, where x_* is a given number. The corresponding action is defined by the mapping

$$(x, \dot{x})|_{x=x_*} \mapsto (x, \dot{x} + I(\dot{x}))|_{x=x_*}$$

where $I(y)$ is a continuous function. The existence of discontinuous periodic solutions is reduced to the existence of periodic points to a one-dimensional Poincaré mapping of the line $x = x_*$ into itself.

It should be noted that the phase portrait of the second equation seems to contain a bug.

See also the paper of *A. M. Samojlenko, V. G. Samojlenko* and *V. V. Sobchuk* [Ukr. Math. J. 51, No. 6, 926-933 (1999); translation from Ukr. Mat. Zh. 51, No. 6, 827-834 (1999; Zbl 0941.34030)].

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34C25 Periodic solutions of ODE

34C05 Qualitative theory of some special solutions of ODE

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