The second order nonlinear periodic problem at resonance with impulses

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In this contribution, based on the joint paper with P. Drábek [1], we consider the second order nonlinear equations with periodic boundary conditions and with impulses in the derivative at fixed times. The impulses depend on the actual value of the solution in a nonlinear way. We concentrate on the resonance problems and provide sufficient condition for the existence of a solution in terms of the forcing term, restoring force and the impulse functions. Our condition not only generalizes the classical Landesman-Lazer condition but also implies the existence results for problems with vanishing or oscillating nonlinearities. To prove our result Saddle Point Theorem due to P. Rabinowitz [2] is applied. The practical importance of models the solutions of which include instantaneous impulses depending on the position that result in jump discontinuities in velocity, but with no change in position, was stressed in different fields of applied research.

References

[1] P. Drábek, M. Langerová, *On the second order periodic problem at resonance with impulses*, J. Math. Anal. Appl. **428** (2015), 1339–1353.

[2] P.H. Rabinowitz, Minimax Methods in Critical Point Theory with Applications to Differential Equations, Amer. Math. Soc., Providence, RI, 1986.