Multi-point boundary value problems: non-resonance with respect to the Fučík spectrum

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We study the solvability of the four-point boundary value problem

$$\begin{cases} u'' + \alpha u^+ - \beta u^- + g(u) = f, \quad x \in (0,1), \\ u'(0) = u'(\xi),\ u(1) = u(\eta), \end{cases}$$

with sublinear nonlinear term $g(u)$. We consider the non-resonance case, i.e. the case when $(\alpha, \beta) \notin \Sigma(L)$, where $\Sigma(L)$ is the Fučík spectrum of the corresponding linear differential operator. We show the existence of a solution for any right-hand side f for (α, β) in regions of type I, and the nonexistence for a particular f for (α, β) in regions of type II.