SIGN-CHANGING SOLUTIONS OF SECOND ORDER DIRICHLET PROBLEM WITH IMPULSE EFFECTS

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Abstract. We consider the second order boundary value problems with impulse effects
\[
\begin{align*}
\frac{d^2 u(t)}{dt^2} + \lambda a(t)f(u(t)) &= 0, \quad t \in (0,1) \setminus \{t_1, t_2, \ldots, t_m\}, \\
\Delta u(t_k) &= \alpha_k u(t_k), \quad k = 1, 2, \ldots, m, \\
u(0) = u(1) &= 0,
\end{align*}
\]
where \(\lambda > 0\) is a parameter, \(\alpha_k > -1\), and \(0 < t_1 < t_2 < \cdots < t_m < 1\) are given constants, \(\Delta u(t_k) = u(t_k^+) - u(t_k^-)\) (respectively \(u(t_k^+)\)) denote the right limit (respectively left limit) of \(u(t)\) at \(t = t_k\); \(a : [0,1] \rightarrow [0,\infty)\) is continuous and \(a(x) \neq 0\) on any subinterval of \([0,1]\); \(f : R \rightarrow R\) is continuous, and there exist two constants \(s_2 < 0 < s_1\) such that \(f(s) = 0, \quad s \in [\beta s_2, \alpha s_2] \cup \{0\} \cup [\alpha s_1, \beta s_1]\) and \(f(s) > 0\) for \(s \in R \setminus \{[\beta s_2, \alpha s_2] \cup \{0\} \cup [\alpha s_1, \beta s_1]\}\) for some constants \(\alpha\) and \(\beta\), the limits \(f_0 = \lim_{|s| \rightarrow 0} f(s), \quad f_\infty = \lim_{|s| \rightarrow \infty} f(s)\) exist. We show the existence of sign-changing solutions via global bifurcation techniques.

Keywords. Dirichlet problem; sign-changing solution; multiplicity; impulsive effects; bifurcation.

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References


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