

Singular nonlinear problem for ordinary differential equation of the second order

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The paper deals with the singular nonlinear problem

$$\begin{aligned}u''(t) + f(t, u(t), u'(t)) &= 0, \\ u(0) &= 0, \quad u'(T) = \psi(u(T)),\end{aligned}$$

where $f \in Car((0, T) \times D)$, $D = (0, \infty) \times \mathbb{R}$. We prove the existence of a positive solution on $(0, T]$ to this problem under the assumption that the function $f(t, x, y)$ is nonnegative and can have time singularities at $t = 0$, $t = T$ and space singularity at $x = 0$. The proof is based on the Schauder fixed point theorem and on the method of a priori estimates.