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10. Partial Differential Equations

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Global existence of a classical solution to $\Box u - \mu u + au^m = 0$

We consider the following boundary value problem of the non-linear wave equation (B. V.)

$$\begin{cases} u_{tt}(t,x)\Delta u(t,x) - \mu u(t,x) + au^m(t,x) = 0, (t,x) \in [0,\infty) \times \Omega & (1.1) \\ u(t,x)|_{\partial\Omega} = 0 & (1.2) \end{cases}$$

where a is a real number, $m = 2,3, \ldots$ and $\Omega \subset R^n$ is a bounded domain with a smooth boundary $\partial\Omega$. We will show that for a constant $\mu > 0$, one can obtain a time global solution for (1.1) and (1.2) with exponential decay property under some additional condition on μ and m.