

Consider the problem of finding the extremum of the functional

$$J(x) = \int_0^1 F[t, x(t), \dot{x}(t)] dt.$$

The necessary condition for $x(t)$ to extremize $J(x)$ is that it should satisfy the Euler-Lagrange equation

$$\frac{\partial F}{\partial x} - \frac{d}{dt} \left(\frac{\partial F}{\partial \dot{x}} \right) = 0,$$

with appropriate boundary conditions. However, the above differential equation can be integrated easily only for simple cases. Thus numerical and direct methods have been developed to solve variational problems. Here, we consider a direct method using orthogonal functions.