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# The necessary condition for optimal control of dynamical systems

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**Abstract:**

**In this work, we have studied and analyzed the following non-linear dynamical systems:**

$$\begin{cases} \dot{x}(t) = f(t, x(t), u(t)) \\ x(0) = x_0 \\ x(1) = x_1 \end{cases}$$

**Augmented with the following cost functional**

$$J(x(t), u(t)) = \int_0^1 g(t, x(t), u(t)) dt \rightarrow \inf$$

**And we found the necessary conditions for optimal control, by using Lagrange principle.**