**Solving optimal control problems by variational approach based on the Adomian's Decomposition Method**

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**Abstract:**

In this work the Adomian's Decomposition Method (ADM) is used to solve optimal control problems. The Lagrange multiplier method is adopted to derive the necessary conditions of optimality as a set of first-order differential equations. Then, by doing some algebraic manipulations, these equations are converted to a one ordinary differential equation, which can be easily solved, iteratively, using Adomian's Decomposition Method to deduce the optimal control law. The proposed design approach is illustrated by several examples.

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**I. Introduction**

Optimal control occupies an important place in control theory and is a challenging field [1], [2], [3]. It consists in finding a control policy that steers the system from an initial state to a final one and minimizes a given performance index. Nowadays, optimal control is encountered in many industrial applications, which makes it an active research area [4]. In addition, the significant advances in computing power available have enabled researchers to address optimal control of complex problems [5].

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