

ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON
RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE

April 23-24-25, 2026 | Marrakech, Morocco



Applications of Linear Matrix Differential Equations

Communication Info

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Keywords:

- (1) Linear matrix differential equations;
- (2) Second-order matrix equations;
- (3) Mass-spring systems

Abstract

In this work, we propose a novel approach for deriving explicit solutions to mass-spring systems composed of two or three coupled masses. The method is based on the theory of generalized second-order linear matrix differential equations and exploits structural properties of matrix operators associated with such systems. In particular, we build on a recent contribution developed in [5], which addresses second-order matrix differential equations of Apostol-Kolodner type. Within this framework, we establish explicit solution representations for coupled mass-spring models and discuss several aspects of the general theoretical setting. To demonstrate the effectiveness and robustness of the proposed approach, we analyze significant special cases and present illustrative numerical examples.

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