

# Simulation, animation and program support for a high performance pneumatic force actuator system

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## Abstract

Program support, simulation and the animation of dual action pneumatic actuators controlled with proportional spool valves are developed. Various factors are involved, such as time delay in the pneumatic lines, leakage between chambers, air compressibility in cylinder chambers as well as non-linear flow through the valve. Taking into account the complexity of the model, and the fact that it is described by partial different equations, it is important to develop the program support based on numerical methods for solving this kind of problems. Simulation and program support in Maple and Matlab programming languages are conducted, and the efficiency of the results is shown from the engineering point of view.

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**Keywords:** Pneumatic actuator; Simulation; Animation; Program support

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## 1. Introduction

Detailed mathematical model of dual action pneumatic actuator system, controlled by proportional spool valves, is shown in paper [13], and the effects of non-linear flow through the valve, leakage between chambers, time delay, attenuation and other effects are carefully considered.

These pneumatic systems have a lot of advantages if we compare them with the same hydraulic types; they are suitable for clean environments, and much safer. In accordance with project and space conditions, valves are positioned at relatively large distance from pneumatic cylinder [2].

Considering real pneumatic systems, it is crucial to describe them with time delay, non-linearities, with attempt of not creating only academic model [5]. Despite these problems, the development of fast algorithms and using numerical methods for solving partial different equations, as well as enhanced simulation and animation techniques have become necessary [1]. Various practical stability approaches, for solving complex partial equations, have used similar algorithms [6].

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