

## Design, Optimize the Damping System for Optical Scanning Equipment

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**Abstract :** In recent years, artificial intelligence and the Internet of Things have experienced significant advancements. Collecting image data and real-time analysis and processing of tasks have become increasingly popular in various aspects of life. Optical scanning devices are widely used to observe and analyze different environments, whether fixed outdoors, mounted on mobile devices, or used in unmanned aerial vehicles. As a result, the interaction between the physical environment and these devices has become more critical in terms of safety. Two commonly used methods for addressing these challenges are active and passive approaches. Each method has its advantages and disadvantages, but combining both methods can lead to higher efficiency. One solution is to utilize direct-drive motors for position control and real-time feedback within the operational range to determine appropriate control parameters with high precision. If the maximum motor torque is smaller than the inertial torque and the rotor reaches the operational limit, the spring system absorbs the impact force. Numerous experiments have been conducted to demonstrate the effectiveness of device protection during operation.

**Keywords :** optical device, collision safety, collision absorption, precise mechanics

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