

Multi-variable Control of High Speed Optical Disk Drives

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Master Thesis Project

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1. INTRODUCTION

In an optical disk drive it is important that the laser beam emitted from the optical pickup is focused and tracked at information track quickly and precisely, if not the retrieving speed will be dramatically down or the CD-player will not be able to retrieve the stored data. The fine tracking position and the focus of laser beam are controlled by two electromagnetic servo systems, namely focusing control loop and tracking control loop. Ideally, these two control loops act orthogonally and therefore are independent. However, the coupling dynamics have been observed for many high-speed disk drives.

and tracking position needs to be developed by taking the coupling dynamic into consideration.

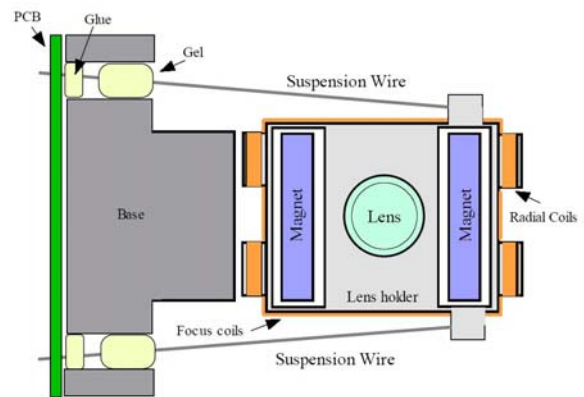


Fig.2 Schematic Structure of the Optical Pickup

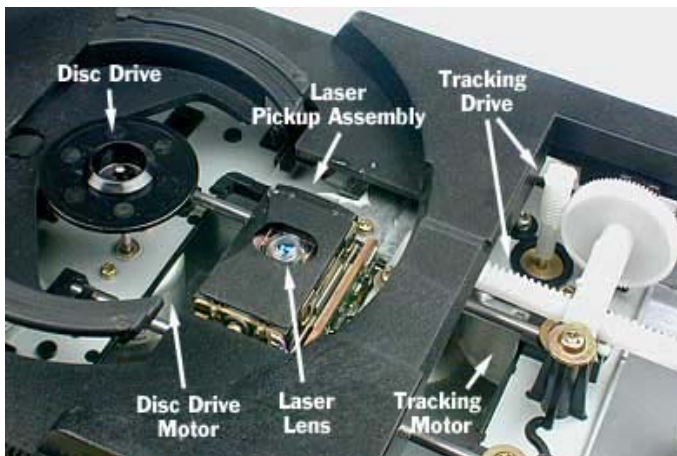


Fig.1 Main Components in an Optical Dick Drive

2. OBJECTIVES

First of all, the coupling mechanism(s) and modeling need to be investigated. Afterwards, a multi-variable controller to control both the focus

3. STRATEGY

The coupling dynamics are investigated by combining the theoretical modeling (Lagrange method) and system identification technique. The robust H_{∞} control method is employed for developing the MIMO controller.

4. RESULTS

- The misalignment of mass center with centroid is not the only dominant reason for coupling, some other coupling mechanisms, such as stiffness coupling of the suspension wires, electro-magnet coupling and some nonlinearities in the system also play critical rule in the coupling dynamic.
- A H_{∞} controller has been developed and showed satisfactory performance under the nonlinear simulation environment.