

# **SPECKLE MACHANISM IN HOLOGRAPHIC OPTICAL COHERECE IMAGING**

Haibo Lin

Dr. Ping Yu, Dissertation Supervisor

## **ABSTRACT**

This thesis gives a systematical study of speckles based on holographic optical coherence imaging (OCI) system. The first studies on speckle statistics in holographic OCI are provided. The new speckle statistics consider the combination of holographic speckle and photorefractive effects, and is used to optimize the holographic diffraction efficiency and coherent image contrast for biomedical imaging applications. With a moving grating technique, speckle noises in holographic OCI are successfully suppressed based on a speckle averaging in the CCD camera. Also, the system longitudinal resolution degradation depends on the mean free path (concentration) of the suspensions. Besides, holographic optical imaging using two-wave mixing is explored with acceptable image quality due to higher diffraction efficiency than that of conventional four-wave mixing in the photorefractive materials.