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Currently, there are about 40 to 60 million Americans suffering from Dry Eye Syndrome (DES); this serious public health problem will worsen with the explosive aging population created by baby boomers, where DES has a high incidence. However, the therapeutics for DES are elusive because our understanding of DES is so elementary, especially the correlation between symptoms and the diagnosis. Unfortunately, a quantitative diagnosis, which is the prerequisite to advance the management of DES, is yet to be realized. We are seeking the next breakthrough in DES management by providing a quantitative diagnosis, with the combination of optical coherence tomography (OCT) imaging and statistical decision theory.

In this paper, we present the mathematical model of a Spectral Domain OCT system coupled with task-based image quality assessment such as tear film thickness estimation. Specifically, we investigate a maximum-likelihood estimator for the quantification of the tear film thickness.

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