**Development of a multimodal optical imaging system for improved disease diagnosis**

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Optical imaging techniques, such as microscopy and endoscopy, have been widely used for medical inspections of lesions that can be accessed optically. Changes in tissue morphology and biochemistry due to disease progression lead to alterations in tissue optical properties, such as scattering and absorption, which can enable the discrimination of abnormal tissue. However, early disease diagnosis remains challenging due to subtle differences in optical properties between healthy and abnormal tissue. To address this issue, we propose a multimodal optical system that combines structured illumination and hyperspectral imaging techniques. Structured illumination allows the measurement of quantitative optical properties, such as the reduced scattering coefficient and absorption coefficient, by illuminating a specific pattern (e.g., sinusoidal patterns) onto the target. We have developed an adaptive pattern synthesis method using a digital-micromirror device for accurate structured illumination, which improves the accuracy of the structured illumination method. Additionally, we exploited a liquid-crystal tunable filter placed in front of an imaging sensor for hyperspectral imaging of tissue. Hyperspectral imaging captures both spatial and spectral information, providing rich information for accurate sample classification, which is challenging using conventional color imaging methods. The developed multimodal imaging system captures reduced scattering coefficients and absorption coefficients over multiple wavelengths. We tested the proposed system on gastric tissues obtained from patients and found that lesions could be discriminated from healthy tissue based on the measured optical properties. Thus, the proposed system has the potential to become an early diagnostic tool for diseases in clinical settings.