

# Multispectral 2D Imaging for Oxygen Saturation in Tumor Detection

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Tumors exhibit greater vascularization and lower blood oxygenation. Suspicious tumors may be detected by measuring the changes in oxygen saturation (SO<sub>2</sub>), noninvasively. In this project, we explore a method to perform 2D SO<sub>2</sub> mapping of superficial human tissue. Oxygenated and deoxygenated hemoglobin exhibit distinctive reflection patterns of light in response to both red and near-infrared (NIR) wavelengths. Using a multispectral imaging technique, SO<sub>2</sub> mapping of a region of interest (ROI) can be performed. Light from red and NIR LEDs is sequentially projected on tissue while short videos are automatically recorded. Frames are then isolated and processed at each illumination wavelength. LEDs are placed at a specific angle relative to the surface of the tissue so that the camera only captures reflected light that interacts with the targeted tissue. The frames are then analyzed with an algorithm that was designed to extract and process the light intensities frame by frame. Each frame is split into 10X10 pixels areas. The average intensity of each area is collected over time. Matching pixel coordinates are then used to produce SO<sub>2</sub> maps. Both the device and the algorithm are validated by liquid phantoms that mimic the optical properties of oxygenated and deoxygenated tissues. Consequently, our product, utilizing 2D SO<sub>2</sub> imaging technology, is capable of producing high-resolution images of SO<sub>2</sub> mapping from targeted tissues based on the difference in vascularization.

