Fiber Optic Probe-Based Raman Imaging Using Positional Tracking

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Raman spectroscopy canprovide label-free spectroscopic fingerprint information, which makesit a highly valuable tool for biomedicaldiagnostics [1].For example, imaging of tissue samplescan providevisual information about the distribution of molecular components of the sample and can be used to detect, diagnose, and delineate tumor and normal tissues [2, 3]. Fiber-based Raman spectroscopy has been shown to provide superb identification ex vivo an in vivo of tumor grades. For in vivo applications it would be very advantageous to provide imaging information, this, however, is not straightforward using a fiber-probe [4].

Because most implementations of Raman spectroscopy provide only information from the focus spot, Raman images are created by mechanical sample or beam scanning approaches. This makes the scanning setup rigid and not easily movable, and restricts imaging applications directly at the patient. Here, we present a newly developed Raman-probe based imaging method, using traditional fiber-optical probes computational image processing [5]. Combining the simultaneous measurement of position information with spectroscopic Raman information, allows acquiring Raman imagesin a short time from large tissue samples. The proposed approached allows the access to any surface and the acquisition of Raman images from those surfaces. The chemical information canalsobe overlaid during the acquisition with the brightfield imaging information on a computer screen to create an augmented reality image of the biochemical distribution on a sample surface.This method allowsto easily distinguish borders of different biomolecular composition and can be extended to clinical applications of tumor border delineation and so improve tumor removal.

References

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