COMPUTER-AIDED ROBOT-ENHANCED SURGERY (CARES): RAMAN SPECTRA FLUORESCENCE BACKGROUND SUBTRACTION

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Abstract

To identify whether or not any kind of tissue is malignant, a biopsy must be administered. Biopsies are cumbersome and can take a considerable amount of time to generate results. Raman Spectroscopy will be able to differentiate between cancerous and non-cancerous tissue in a much shorter time, at the surgical location. Eventually, small "spectroscopic scopes" will be attached to the end of surgical instruments to emit certain wavelengths of light on the tissue of interest. The "scope" will then detect what was absorbed and reflected and process this information to obtain spectra plotted on a 2-dimensional graph. The key idea of Raman Spectroscopy is that the spectra of non-cancerous tissue differs from that of cancerous tissue. In many spectra there exists a phenomenon called fluorescence. Fluorescence is an un-wanted inherent by-product of the Raman Spectroscopy process and most often occurs in material that contains water, i.e., human tissue. Fluorescence tends to increase at higher Raman shift (cm-1), you can see in the spectra an overall positive slope. The peaks of interest in the spectra seem to ride a "backbone" of fluorescence. Background fluorescence subtraction is a huge problem in the realm of Raman Spectroscopy. A proficient algorithm or automated method to subtract this background does not exist. Currently, manual methods do exist to subtract the fluorescence background. One of the methods is to load the spectra into a program called GRAMS/AI (7.02) and manually pick points on the spectra as to generate a curve that will represent the background fluorescence and subtract the two. However, with the scope of the whole idea being speedy cancer detection we need an automated method.

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