Executive Summary Report of the Minor Research Project

Comparing diseased and normal human breast tissue fluorescence spectra in visible regime through Statistical tools viz. ANOVA and Tucky-Cramer post hoc test

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by

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Breast and Cervical cancers are commonly occurring cancer types amongst women. Both of these are eminently treatable provided detected at an early stage. Amongst many approaches, the ones based on optical methods are emerging as potentially reliable tools for cancer detection.

The developments in the optical spectroscopy instrumentation have given new dimensions to optics for biological studies. Now-a-days lasers are used in the biological and medical sciences with spectroscopy to diagnose disease.

Optical spectroscopy in the ultraviolet to visible wavelength range can be used to measure tissue properties reflecting the intrinsic physiological and structural properties of tissue. Fluorescence emission can differ significantly in normal, benign and cancerous tissues due to the differences in concentration of absorbers and scatterers and also the scatterer sizes. In this work statistical analysis of normal and diseased tissue fluorescence is done by the Wavelet transform, ANOVA, Tucky-Cramer post hoc test and receiver operating characteristics (ROC) graph.

The systematic separation of variations at different wavelength scales from the broad spectral features pinpoints several quantifiable parameters to distinguish cancer and normal tissues. These distinguishable features are related with the biochemical and morphological changes. The spectral profile of diseased and the non-diseased tissues behave very differently, t-test, ANOVA, ROC with wavelet transform also able to capture the differences. The need for the early identification and constant monitoring of breast cancer for a large population can make combination of both methods eminently suitable since the same can be automated.

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Papers published during this minor research projects are as follows:

1. Differentiating polarized fluorescence spectral of normal and cancerous breast tissues using ANOVA, *Quest Int. Multidisciplinary Research Jr.*, 2015; **4(3)**; 133-137.

2. Characterizations of polarized fluorescence spectra of human breast cancer using ROC Curve, *Global Academic Research Jr.*, 2015; **3(4)**; 34-39.