ABSTRACT

Measurement of optical absorption ($\mu_a$) and scattering ($\mu_s$) properties provide information of medical importance:
- Blood oxygenation level
- Photosensitve drug concentrations
- Early signs of cancer
- Spectrally based Diffuse Reflectance Spectroscopy has been shown to do this, however it requires that all possible absorbers in the sample be known.

RESULTS

- The RRDR derived absorption and scattering spectra of an unknown resin based phantom for each method is on the right.
- The mean extracted vs. mean expected optical properties for each phantom in a control set of the liquid phantom set is plotted, where the legend corresponds to which set of RRDR’s spectra was used:
  - Black line is 1-1 expected vs. extracted.
  - Gray lines show 10% error.
- The teal diamonds show what happened when a liquid phantom was used as reference.

- Absorption spectra from RRDR methods were used as the absorber shape input to the SRDR method.
- Using a liquid phantom as reference, the SRDR method predicted the following absorption and scattering spectra, seen on the right, for the corresponding RRDR methods.
- When tested in the same way as RRDR derived properties, the percent errors between expected and extracted can be seen in the table on the right.

- Built second liquid phantom set using milk and drops of blue, green, yellow and red food dyes.
- Then used the solid phantom as reference, with both the RRDR-derived and SRDR-derived properties, to fit each phantom in the set using the SRDR-model.
- The derived number of drops from each model along with the control can be seen in the bar graphs to the right.

METHODS

- Diffuse Reflectance Spectroscopy (DRS) measures diffuse light remitted from a surface after it has undergone multiple scattering events inside the sample.
- Requires the use of a reference measurement with known optical properties for calibration.
- Spectrally Resolved DRS (SRDR), demonstrated on right, uses the reflectance spectrum of any sample as reference.
- The Radially Resolved method is not capable of producing accurate optical properties.
- By combining both methods, the optical properties of any unknown scattering sample can be collected.

CONCLUSION

- The Radially Resolved method is not capable of producing accurate optical properties.
- However, it does produce the spectral shape of absorption.
- The Spectrally Resolved method requires the spectral shape of absorption, which can be taken from any sample using RRDR.
- By combining both methods, the optical properties of any unknown scattering sample can be collected.

REFERENCES


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