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Experimental Study on Tissue Characterization using S Calculation

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Scientists have theoretically shown that there is a relationship between the size and shape of the scatterers (s) and the bandwidth of the power spectrum (2σ) obtained from ultrasound echoes (RF echoes). The purpose of this work is to conduct an experimental study to analyze how this s calculations can be utilized in tissue identification. A heterogeneous tissue structure (bovine kidney) and a comparatively homogeneous tissue structure (bovine liver) were investigated. Five kidney and liver samples were taken into analysis and data were taken at 80 positions each. Average values turned out to be in the range of 1-2, which complies with the literature. The experimental error was calculated as 0.342.

Further, average and variance of the s values were calculated, and considering the results of error calculation, it is evident that "average values of s" cannot be used to differentiate two tissues. However, when the "variance of s" of these two tissue samples was considered, it can be observed that the variance of s can be used as an identifier of two tissue samples. Homogeneity of the scatter size and shapes cause a higher variance in bandwidth, which leads to higher variance in s. Hence, s variance can be identified as a successful tissue identifier.

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