Classification of reflected signals from cavitated tooth surfaces using an artificial intelligence technique incorporating a fiber optic displacement sensor

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Abstract
An enhanced dental cavity diameter measurement mechanism using an intensity-modulated fiber optic displacement sensor (FODS) scanning and imaging system, fuzzy logic as well as a single-layer perceptron (SLP) neural network, is presented. The SLP network was employed for the classification of the reflected signals, which were obtained from the surfaces of teeth samples and captured using FODS. Two features were used for the classification of the reflected signals with one of them being the output of a fuzzy logic. The test results showed that the combined fuzzy logic and SLP network methodology contributed to a 100% classification accuracy of the network. The high-classification accuracy significantly demonstrates the suitability of the proposed features and classification using SLP networks for classifying the reflected signals from teeth surfaces, enabling the sensor to accurately measure small diameters of tooth cavity of up to 0.6 mm. The method remains simple enough to allow its easy integration in existing dental restoration support systems. (C) 2014 Society of Photo-Optical Instrumentation Engineers (SPIE)

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