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Single Transducer Continuous Doppler Ultrasonic Sensors

SAYANTAN DAS, Texas A&M University- SA, JAVAD R GATABI, AKYOR LLC — Doppler ultrasonic sensors are widely employed for displacement and vibration measurements and imaging applications. Continuous Doppler ultrasonic measurement, compared to the pulsed Doppler technique, has the advantage of measurement-continuity and shorter minimum achievable range. Conventional continuous Doppler ultrasonic systems require the use of two transducers, one as a transmitter of the wave, and the other as a receiver. The proper alignment of continuous-wave ultrasonic transducers has always been a challenging process in precision measurements. On the other hand, continuous-wave ultrasonic systems have a significant temperature dependency. In this research we introduce a novel single transducer continuous Doppler ultrasonic measurement system. In this novel technique, the ultrasonic transducer works as a transmitter and a receiver at the same time. A reference series impedance and a compensation circuit has been designed to allow for distinguishing the transmitted signal from the received wave. Both theoretically and experimentally we prove that the displacement measurement by the fabricated sensor has less temperature dependence.

Sayantana Das
Texas A&M University- SA

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