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A stepped plate transducer as ultrasonic range sensor

Yub Je, Jong-Kyu Park, Dong Hoon Yi, Haksue Lee and Wonkyu Moon
Postech, San 31, Hyoja-Dong, Namgu, 790-784 Pohang, Republic of Korea

A new type of highly directional ultrasonic transducer is designed and tested as an ultrasonic range sensor by using the parametric acoustic arrays. To get intensive primary waves, a modified stepped plate transducer is proposed. Gallego-juarez et al.(1978) first proposed stepped plate transducer for high power radiation at one frequency. The steps with the height of half-wavelength of sound in air compensate discrete phase difference on the vibrating plate. However, two collimated beams are required for the parametric acoustic array. The position and height of the steps are modified to compensate the flexural vibration for two frequencies in this transducer. The transducer diameter is 50mm. The optimal primary frequencies are designed as 80kHz and 120kHz to generate difference frequency of 40kHz efficiently. The proposed transducer has the HPBW of 5° that is much higher directivity than general ultrasonic range sensor(Generally 20° on same size). The maximum SPL is 130dB at primary frequencies and 95dB at difference frequency on 75Vpk input. These experimental results show that the proposed transducer can successfully improve the spatial resolution of ultrasonic sensor. [Research is partly supported by MIC/IITA Intelligent Robot Sensor and partly supported by DAPA and ADD UD070054AD]