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(Research Article)
The effect of energy and interpolation combination on the accuracy of indoor localization based on the speech signal time difference of the arrival

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Abstract

Real time source localization is a difficult method and includes challenges such as computational complexity, noise, reflection and sensor layout architecture. The time difference of the arrival signal method is used because of its simplicity and low computational complexity and if the energy ratio of the signal is combined with the time difference of arrival the results will be somewhat improved. In this paper, a method for estimating the location of the speech source in a three-dimensional space is proposed to calculate the delay in the time difference of the arrival signals and noise resistance and reflection to sharpen the peak of the signal correlation. This method, while using the appropriate arrangement of sensors and applying phase spectrum smoothness while amplifying power along with cubic spline interpolation, to have high speed solution of nonlinear equation devices, improved Chan and weighted least squares two-stage algorithms with the ratio of sensor energy to signal, thus the basis sensor has benefitted. The mean error of the direct distance of the estimated coordinates from the true position of all measurements in the selected arrangement of the array in the Chan and weighted least squares two-stage combined with energy is 10.94 and 10.185 cm, respectively. The test results on real and simulation data show that the interpolation of cross-correlation and the combination of the energy ratio with the time difference of the arrival signal of the proposed method is efficacious.

Keywords: Sound source localization, Time difference of arrival signal, Weighted least squares algorithm, Signal energy ratio, Interpolation.

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