Parameters Estimation of Ultrasonics Echoes using the Cuckoo Search and Adaptive Cuckoo Search Algorithms

Farid CHIBANE, Abdessalem BENAMMAR, Redouane DRAI

Abstract: In this study we present a novel approach to estimate ultrasonic echo pattern using the two algorithms: Cuckoo Search (CS) and Adaptive Cuckoo Search (ACS). We model ultrasonic backscattered echoes in terms of superimposed Gaussian echoes corrupted by noise. Each Gaussian echo in the model is a nonlinear function of a set of parameters: echo bandwidth, arrival time, center frequency, amplitude and phase. The estimation of parameters is formulated as a nonlinear optimisation problem. Simulations are carried out to assess the performance of the proposed algorithms. Finally the algorithms were applied on experimental data for thickness measurement. The CS algorithm converges to best solution with less time than ACS. However, ACS algorithm outperforms CS.

Keywords: Cuckoo search algorithm, echo parameter estimation, Ultrasonic signal, thickness measurement