ACOUSTICS2008/1253
Autofocus of synthetic aperture sonar data using the phase adjustment by contrast enhancement algorithm

Hayden Callow, Torstein Olsmo Sæbø and Roy Hansen
Norwegian Defence Research Establishment, P O Box 25, NO-2027 Kjeller, Norway

Imagery from synthetic aperture systems often suffers from imperfect image formation due uncertainties in the collection geometry or environmental parameters. Autofocus techniques aim to estimate and subsequently eliminate the effect of these uncertainties—automatically adjusting focus parameters to obtain a "better" image. Typically, autofocus algorithms will optimise for reduced Doppler phase gradients or improved image contrast.

The Phase Adjustment by Contrast Enhancement (PACE) algorithm belongs to the second class and was first proposed for use in synthetic aperture radar (SAR) autofocus. The algorithm is somewhat unusual for a contrast optimisation in that it avoids lengthy computation through directly solving the equations for optimum contrast. This advance allows for rapid autofocus without the need for complicated iterative optimisers.

We compare results from using the PACE algorithm on local region of strip-map synthetic aperture sonar (SAS) data collected with the HUGIN AUV and compare against a benchmark Phase Gradient Autofocus (PGA) algorithm. We also demonstrate the effect of using the algorithm in circular SAS imagery, something not currently possible with standard PGA-based autofocus.