

Robust Wide-Band Synthetic Aperture Sonar Processing on an AUV Platform

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Abstract: Synthetic Aperture Sonar is a key enabling technology in the use of Autonomous Underwater Vehicles for underwater reconnaissance and survey missions. In comparison to conventional fixed aperture sonar, SAS offers the potential of range independent azimuth resolution and increased signal to noise. In order to achieve this potential, robust signal processing is required to accurately estimate the arrival time of each ping that is to be used in the synthesis of an aperture, and the orientation and position of the platform over the aperture synthesis period.

This paper presents the performance of the Wide-band Displaced Phase Centre (WDPC) algorithm, a Stripmap Phase Estimation Algorithm (SPEA) and a Beam Space Estimation Algorithm (BSEA) in the

processing of Wide-Band Synthetic Aperture Sonar data. The data was obtained using the QinetiQ Gambit AUV in shallow water trials around the Portland harbour area of Weymouth, in the UK. These algorithms all perform very well under certain conditions. A robust solution is obtained by combining the algorithms into a multi-stage processing suite.

The paper will first outline the sonar, which has been developed by QinetiQ specifically to address the requirements of SAS. The system operates over the 100 to 200KHz frequency band. The principles of the algorithms will then be briefly outlined. Finally, the impact of the inclusion or exclusion of various processing stages will be illustrated on data sets that contain a variety of targets at different ranges.