Sukhendu Sharma, Echo synthesis for decoy application, M. Tech. Thesis, Department of Electrical Engineering , Indian Institute of Technology Bombay, 2005.

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*Abstract -*During an electronic warfare in sea, a torpedo is fired from a ship (or submarine) to attack and destroy its enemy vessel. Once a torpedo is identified by the sonar of the vessel, the vessel launches a small expendable electronic device, called decoy, to protect itself and employs an escape maneuver. The aim of the project is to develop a technique for synthesizing and transmitting a signal by the decoy that can be interpreted by the torpedo sonar receiver as the reflection of its own transmitted signal from the target vessel. The echo synthesis should take care of various modulation schemes employed in the torpedo sonar and should have delay, Doppler shift, and echo elongation corresponding to the distance, speed, and size of the moving target vessel. The approach adopted in this project is that, first the decoy detects the incoming signal pulse transmitted by the torpedo, and then retransmits the received signal by introducing in it the appropriate features without analyzing the input signal. The complete algorithm of echo synthesis has been implemented using MATLAB, and tested with different types of signals in additive white noise. The approach of echo synthesis by considering the entire signal pulse received by the decoy requires large computation and storage capabilities of the hardware to implement the algorithms. Hence, a second approach has been investigated in which the echo synthesis is carried out by using overlap-add processing of the input sequence. Finally, the individual modules of the echo synthesis process, for the overlap-add processing, have been implemented in real-time for a DSP hardware based on ADSP-21160 processor. Key words - Torpedo, Decoy, Echo synthesis, overlap-add, Echo extensions