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Adaptive signal processing work at the Naval Ocean Systems Center (NOSC) dates back to the late 1960s. It began as an IR/IED project by John McCool, who made use of an adaptive algorithm that had been developed by Professor Bernard Widrow of Stanford University. In 1972, a team lead by McCool built the first hardware implementation of the algorithm that could process in real-time at acoustic bandwidths. Early tests with the two units that were built were extremely successful, and attracted much attention. Sponsors from different commands provided funding to develop hardware for submarine, surface ship, airborne, and other systems. In addition, an effort was initiated to analyze performance and behavior of the algorithm. Most of the hardware development and analysis efforts were active through the 1970s, and a few into the 1980s. One of the original programs continues to this date.

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ADAPTIVE SIGNAL PROCESSING AT NOSC

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ABSTRACT

Adaptive signal processing work at the Naval Ocean Systems Center (NOSC) dates back to the late 1960s. It began as an IR/IED project by John McCool, who made use of an adaptive algorithm that had been developed by Professor Bernard Widrow of Stanford University. In 1972, a team lead by McCool built the first hardware implementation of the algorithm that could process in real-time at acoustic bandwidths. Early tests with the two units that were built were extremely successful, and attracted much attention. Sponsors from different commands provided funding to develop hardware for submarine, surface ship, airborne, and other systems. In addition, an effort was initiated to analyze performance and behavior of the algorithm. Most of the hardware development and analysis efforts were active through the 1970s, and a few into the 1980s. One of the original programs continues to this date.

The Submarine Sonar Adaptive Processor (SSAP) program, which began in 1974 under the sponsorship of OP-092 (then OP-009), has gone through several phases of development. Two single-channel processors built to NOSC specifications were procured in 1976, followed by ten more in 1978. These processors were used to support a number of submarine sea tests and deployments. The success of these units led to the development and procurement, in 1981, of eighteen upgraded two-channel units called SSAP II. Most of the eighteen became part of the pooled equipment program. Following that, sponsorship by the Naval Sea Systems Command (NAVSEA) was attained to procure a version of the SSAP II for permanent installation in the submarine fleet. Production of 65 SSAP IIA units was begun in 1986 for installation aboard SSNs. Just prior to the SSAP IIA production, a large 52-channel processor called the Towed Array Noise Canceller (TANC), built from the SSAP circuit board set, was developed for a project at the Naval Underwater Systems Center (NUSC) New London. Development of a new device called the Enhanced Signal Processor (ESP) is currently underway at NOSC. It will incorporate a number of new adaptive and non-adaptive signal processing algorithms, plus new display techniques.

The Adaptive Line Canceller and Enhancer (ALICE) program began under Navy Science Assistance Program (NSAP) sponsorship in 1974. In 1976 the surface warfare community of NAVSEA assumed sponsorship and acquired a single channel processor identical to the original SSAP units. That unit supported a number of successful sea tests that led to the development of a much larger ALICE Advanced Development Model (ADM). A portion of the ADM was modified by NUSC New London and became a permanent part of the AN/SQR-18A. Yet another portion became a permanent part of the AN/SQR-17 under the direction of NOSC.

Numerous other small projects and tests encompassing a variety of acoustic and non-acoustic applications were supported by NOSC through the 1970s and 1980s. One began recently that may lead to another fleet transition: the development of an adaptive processor to be used with the VERDIN processor.

In addition to hardware development, NOSC personnel involved with various aspects of adaptive processing have published nearly 60 technical reports and 20 journal articles, and have delivered more than 40 papers at symposiums and DoD workshops.

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