

Innovation

SBIR Topic Number:
FA06-208

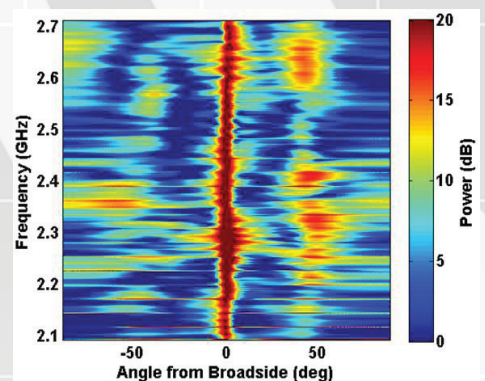
SBIR Title:
Adaptive Signal Processing to Counter Jamming

Contract Number:
FA8718-07-C-0053

SBIR Company Name:
NAVSYS Corporation,
Colorado Springs, CO

Technical Project Office:
AFRL Sensors Directorate,
Wright-Patterson AFB, OH

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR/STTR technology that met topic requirements and has outstanding potential for Air Force and DoD.



Left: Duke University experimental testing. Right: Hardware-in-the-loop counter jamming results.

Adaptive Signal Processing to Counter Jamming

- There is an increasing need to counteract interferences in wideband environments due to improving technologies that enable the employment of systems with wider bandwidth
- NAVSYS successfully demonstrated a wideband derivative-based updating (DBU) adaptive beamforming (ABF) algorithm implemented on field-programmable gate array (FPGA) hardware that matches robust simulated results that can be adapted to suit various radar configurations and timings
- With this algorithm, true wideband performance is achieved, as interference sources are modeled over the entire frequency span
- Using this hardware, wideband radars can perform adaptive beamforming interference mitigation in real-time, eliminating the need and latency associated with implementing the adaptive beamforming via post-processing software
- The NAVSYS algorithm has the potential to deliver high-performance, real-time radio frequency (RF) interference mitigation for a variety of multi-channel radar and communications sensors such as portable urban radar and data-communication links, hardware beamforming for real-time acoustic sonar, beamforming for space surveillance network (SSN) phased arrays, and data communication link sidelobe canceller for jamming/interference mitigation

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Air Force Requirement

There is an increasing need to counteract interference in wideband environments due to continually improving technologies that enable the employment of systems with wider bandwidths. Currently, most systems utilize narrowband adaptive algorithms, which are based on narrowband assumptions, that when used with a wideband system results in performance degradation.

The main goal of the program was to develop wideband adaptive algorithms, as well as strategies and techniques, that attenuate interferences with varying bandwidths and center frequencies while preserving the desired signal. A scenario of interest is to assume that there is a wideband system with M array elements, with a bandwidth to center frequency ratio greater than 0.2, and N interference sources with various bandwidths and center frequencies spread throughout the system's operating bandwidth.

SBIR Technology

NAVSYS successfully demonstrated a wideband derivative-based updating (DBU) adaptive beamforming (ABF) algorithm implemented on field-programmable gate array (FPGA) hardware that matches robust simulated results that can be adapted to suit various radar configurations and timings. With this hardware, wideband radars can perform adaptive beamforming interference mitigation in real-time. This eliminates the need and latency associated with implementing the adaptive beamforming via post-processing software.



Annapolis Micro Wildstar FPGA card

The newly developed hardware offers a low-cost, high-performance solution that can be used with experimental radars and radars currently under development. With this algorithm, true wideband performance is achieved, as interference sources are modeled over the entire frequency span.

Potential Application

With its new hardware implementation, the NAVSYS algorithm has the potential to deliver high-performance, real-time radio frequency (RF) interference mitigation for a variety of multi-channel radar and communications sensors such as portable urban radar and data-communication links, hardware beamforming for real-time acoustic sonar, beamforming for space surveillance network (SSN) phased arrays, and data-communication link sidelobe cancellation for jamming/interference mitigation.

Commercial applicability is manifested in the potential to adapt these new technologies for both atmospheric and space private sector support and capabilities.

Company Impact

The wideband adaptive beamforming algorithm and hardware implementation developed in this SBIR program has extended NAVSYS' technology to both commercial and military electronic mitigation systems.

Founded in 1986 by Dr. Alison Brown, the company is a growing firm that provides high quality technical products and services in Global Positioning System hardware design, systems engineering, systems analysis, and software design. NAVSYS has a standing commitment to provide high quality products and services to both governmental and commercial customers.



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