Partnerships for Innovation in Acoustic and Ultrasound Technologies for Medical and Industrial Applications

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Project Summary

The lead institution is Villanova University, with Dr. Moeness Amin serving as the Principal Investigator. Bucknell University is main subawardee, with Dr. Richard Kozick acting as the subawardee project director.

Villanova University will lead an NSF partnership in acoustics and ultrasound technologies. The partnership includes Bucknell University, Gwynedd-Mercy College (GMC), Ben Franklin Technology Partners (BFTP), Siemens, Boeing, and Naval Sea Systems Command (NAVSEA). The proposed partnership centers around acoustic and ultrasound education, research, and development with emphases on medical and industrial applications. It builds on the cross-disciplinary use of acoustic technologies in medical, electrical, mechanical, and civil engineering practices. The partnership recognizes the growing acoustic and ultrasound local, and national job markets, spanning the healthcare, automotive, and aerospace sectors with aplications ranging from medical diagnostic and therapeutic needs to predictive maintenance of machinery and products, and extending to acoustic source tracking and localizations.

The partnership has been carefully formed to provide common goals and objectives, and to equally serve and benefit all constituencies. Villanova University has a long track record of innovative signal processing techniques for detection, separation, and classification of indoor animate and inanimate objects. Bucknell University has valuable expertise in acoustic signal processing and sound propagation, and has been conducting cutting edge research on acoustic source tracking. The School of Allied Health Professions at GMC offers programs in Bioscience Technologies and Radiologic Science and has a study and training track in Sonography for diagnostic applications. BFTP of Southeastern Pennsylvania will provide commercialization opportunities and will seed the involvement of small businesses in the partnership. NAVSEA will use its unique Acoustic Complex facilities to assist the academic partners in innovative acoustic research. Villanova University and Bucknell University will develop and share multidisciplinary undergraduate and graduate courses and student projects in acoustics. The private sector of the partnership is represented by Siemens and Boeing, who will furnish guidance and access to valuable data needed by the Partnership.

The intellectual merit of this proposal comes from applying core and emerging research in acoustic signal processing, aiming at increasing acoustic system

performance and enhancing ultrasound imaging. This is achieved through advances in signature analyses and feature extractions. Novel fusion modalities based on multiple and distributed sensors are examined for further system performance improvements.

The broader impacts of the proposed activities will serve to improve acoustic and ultrasound data analyses and imaging. The enhancements in medical ultrasound imaging have clear societal impact, as they will increase diagnostic capabilities and quality of life while reducing medical costs, both of which are notable goals. In the predictive maintenance field, if more information can be acquired describing the state and properties of existing machinery, better decisions can be made with regards to failure prediction, and safety issues with obvious financial benefit. BAE Systems, Lockheed Martin, and PECO Energy also support the proposed partnership and attest to its value and offerings to advance their businesses and markets.