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ELECTRICAL AND COMPUTER ENGINEERING
TEAM: 1917
SPONSOR: Undersea Warfighting
Development Center
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Undersea Navigation and Precision Timing



The Undersea Warfighting Development Center (UWDC), a division of the United States Navy based in Groton, CT, is interested in the research and development of innovative technologies to further increase their submarine abilities. We were tasked with finding new solutions related to precision navigation and timing. Specifically, our goal was to discover and potentially test devices which would allow for submarine tracking in areas deprived of a stable GPS signal.



Our foundational research revealed that conventional, modern means of radio communication would be ineffective underwater due to the high conductive properties of salt water. A simple solution for this issue would see a submarine surface briefly to reveal a radio antenna, but such would make the craft vulnerable. We then turned to acoustics.



Acoustic waves (sound waves) travel very well through sea water relative to radio waves. Therefore, the standard for communication to and from submarines has long been in the form of acoustic waves generated by a transducer and recorded by a device called a hydrophone. Despite large signal attenuation (loss of signal strength) over moderate distances and multi-path propagation, hydrophones are the current technology employed, so we looked for ways to test them.



We were graciously loaned hydrophones from the laboratory of Dr. Shengli Zhou, and we performed diagnostic tests and applied triangulation algorithms in an effort to track the source of a local sound signal. In this way, we simulated communication between submarines.

Due to the highly confidential nature of the United States Navy's submarine technology, we were unable to obtain a basis for the current research being performed at the UWDC in Groton, so we turned to academic literature and compiled them in our capstone, a research paper on current underwater communication methods. Please see our poster for more information.