Sonar Inspired by Dolphins: New Kind of Underwater Device Can Detect Objects Through Bubble Clouds

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Scientists at the University of Southampton have developed a new kind of underwater sonar device that can detect objects through bubble clouds that would effectively blind standard sonar.

Just as ultrasound is used in medical imaging, conventional sonar ‘sees’ with sound. It uses differences between emitted sound pulses and their echoes to detect and identify targets. These include submerged structures such as reefs and wrecks, and objects, including submarines and fish shoals.

However, standard sonar does not cope well with bubble clouds resulting from breaking waves or other causes, which scatter sound and clutter the sonar image.

Professor Timothy Leighton of the University of Southampton's Institute of Soundand Vibration Research (ISVR), who led the research, explained:

"Cold War sonar was developed mainly for use in deep water where bubbles are not much of a problem, but many of today's applications involve shallow waters. Better detection and classification of targets in bubbly waters are key goals of shallow-water sonar."

Leighton and his colleagues have developed a new sonar concept called twin inverted pulse sonar (TWIPS). TWIPS exploits the way that bubbles pulsate in sound fields, which affects the characteristics of sonar echoes.

"To catch prey, some dolphins make bubble nets in which the best man-made sonar would not work. It occurred to me that either dolphins were blinding their sonar when making such nets, or else they have a better sonar system. There were no recordings of the type of sonar that dolphins use in bubble nets, so instead of producing a bio-inspired sonar by copying dolphin signals, I sat down and worked out what pulse I would use if I were a dolphin," said Leighton.

As its name suggests, TWIPS uses trains of twinned pairs of sound pulses. The first pulse of each pair has a waveform that is an inverted replica of that of its twin. The first pulse is emitted a fraction of a second before its inverted twin.

Tags: bubble, Cloud, dolphin

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