

Wave sorcery: Scientists bend water to control floating objects like magic

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Neetika Walter



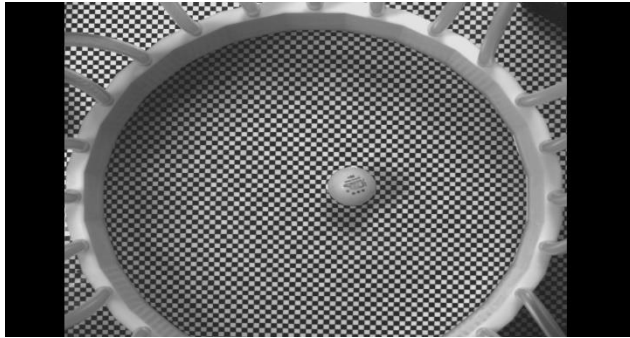
A hexagon-shaped plastic structure was used to generate waves that merged to form complex patterns on the water surface in a tank for an experiment co-led by Nanyang Technological University, Singapore.

Henan University

Waves and water are inseparable—but what if you could manipulate the waves to move floating objects?

A team of international scientists, co-led by Singapore's Nanyang Technological University (NTU), have just discovered a method to bend water waves, enabling them to trap and meticulously move floating objects.

The technique involves generating and merging waves to create complex surface patterns, such as twisting loops and swirling vortices.



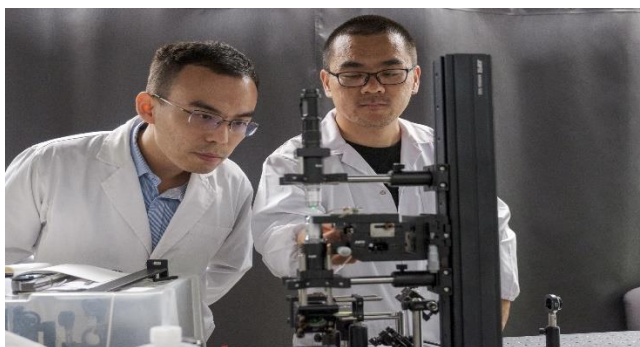
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Methodology behind the new tech

The team first conducted computer simulations before experimenting in a water tank using 3D-printed plastic structures to generate waves. One setup featured a ring connected to 24 tubes linked to speakers emitting low-pitched sounds, creating ripples on the water's surface.

They tested floating polyethylene foam balls (4.8mm to 12.7mm in diameter) and a 40mm ping pong ball, observing their movement in response to the waves. By adjusting wave magnitude and frequency and changing whether some waves moved in step with others, the researchers created complex wave patterns that trapped the balls, holding them in one place or guiding them along precise circular and spiral paths with minimal deviation (2-4mm).

Unlike ordinary ripples, these wave patterns remain stable even when disrupted by minor external waves.



“We’ve shown that water waves can be used to precisely move floating objects as small as rice grains,” said Assistant Professor Shen Yijie, one of the co-leads of the research.

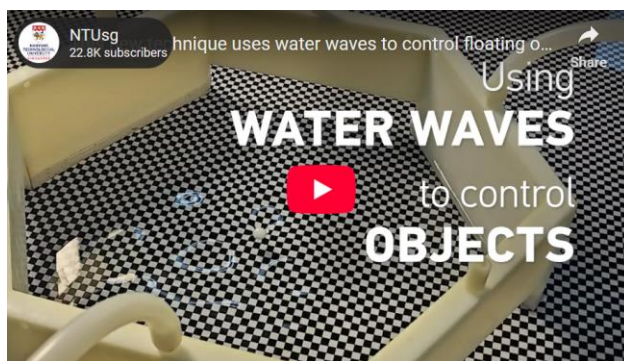
“Future research could study even smaller waves such as those on the scale of cells that are hundreds of times smaller, as well as much larger sea waves that are a thousand times bigger.”

The news research is inspired by Shen’s previous work on light waves that demonstrated how structured light waves could trap and move tiny particles.

Huge potential impact

The team now plans to work on establishing whether the water patterns can be created underwater, and not just on the surface, to move submerged objects.

They also intend to scale down the water-wave technique to the micrometer level to study if the water patterns on the surface can be used, like tweezers, to move cells and similarly sized particles precisely. This could allow the particles to be brought close together for experiments without using equipment to touch them.



The technique could also be scaled up to explore whether this method could guide boats along specific paths or to designated locations while factoring in disruptions from natural sea waves. Since the water patterns are highly stable, future studies may also explore their potential for data storage, similar to how computers store information.

Moreover, water waves could be studied as a more accessible proxy to research some quantum phenomena seen in light waves and electrons.

The breakthrough, published in the scientific journal *Nature* on February 5, opens the possibility of using water waves in new ways.

<https://interestingengineering.com/science/scientists-bend-water-waves>