Physical Mathematics Seminar

Gunwale bobbing and the quantum canoe

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ABSTRACT:

It is now well established, both experimentally and theoretically, that droplets bouncing in a liquid bath can be made to 'walk' at constant horizontal velocity, and in so doing exhibit a wealth of analogous quantum phenomena. A life-size application of this phenomena takes the form of a person, or many people, jumping up and down on a canoe to achieve forward motion through the surfing of their own wave field, a sport known to those who have found themselves up the lake without a paddle as gunwale bobbing. After an initial transient, the canoe achieves a cruising velocity which satisfies a balance between the thrust generated from pushing downwards into the surface gradients of the wave-field and the resistance due to a combination of skin, form and wave drag. By superposing the linear wave theories of Havelock (1919) for steady cruising and Helmholtz for a bouncing source we demonstrate that such a balance can be sustained, and calculate the optimal parameter values to achieve maximum canoe velocity. A comparison is made to accelerometer data taken from an enthusiastic Gunwale bobber, and various perspectives are discussed, including possible analogies with quantum systems.

TUESDAY, FEBRUARY 28, 2023
2:30 PM – 3:30 PM
Building 2, Room 449

https://math.mit.edu/sites/pms/

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