Emergent quantization of trajectories in a square box

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Goal of the experiment :

A walking droplet is placed in a square box, at the onset of Faraday thresold.

The trajectory of the droplet is mapped.
In the long time limit, does a self-interference pattern appear ? what's its shape ?
How does it relate to the square cavity surface wave eigen-modes ?

cf. experiment by Bush et al. : in a circular corral
http://dotwave.org/wavelike-statistics-from-pilot-wave-dynamics-in-a-circular-corral/

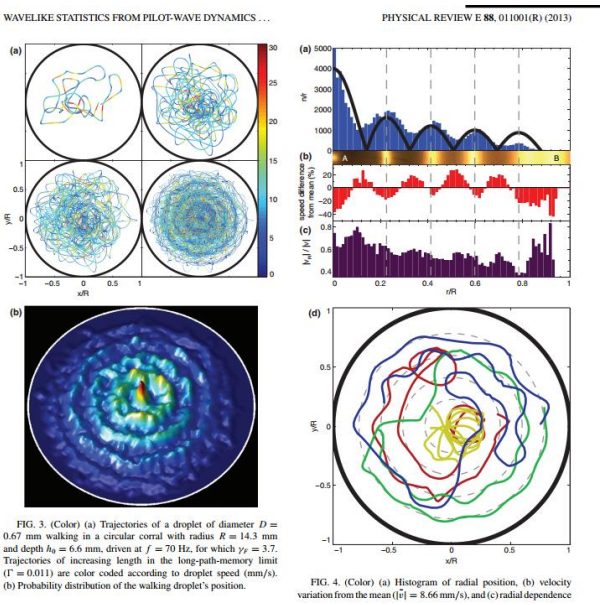


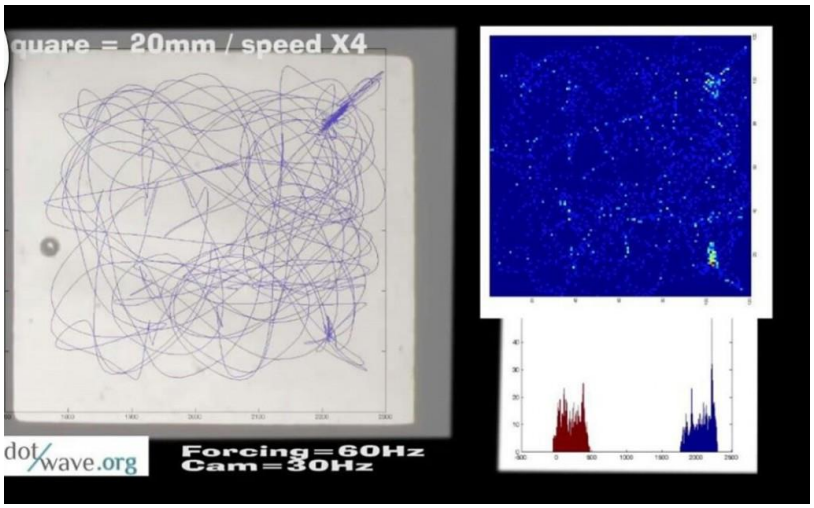
FIG. 3. (Color) (a) Trajectories of a droplet of diameter $D = 0.67$ mm walking in a circular corral with radius $R = 14.3$ mm and depth $h_0 = 6.6$ mm, driven at $f = 70$ Hz, for which $\gamma_F = 3.7$. Trajectories of increasing length in the long-path-memory limit ($\Gamma = 0.011$) are color coded according to droplet speed (mm/s). (b) Probability distribution of the walking droplet's position.

FIG. 4. (Color) (a) Histogram of radial position, (b) velocity variation from the mean ($|\vec{v}| = 8.66$ mm/s), and (c) radial dependence

In short, we try to reproduce the experiment of Bush et al, but in a square box.

This movie presents the goal and means of the experiment :

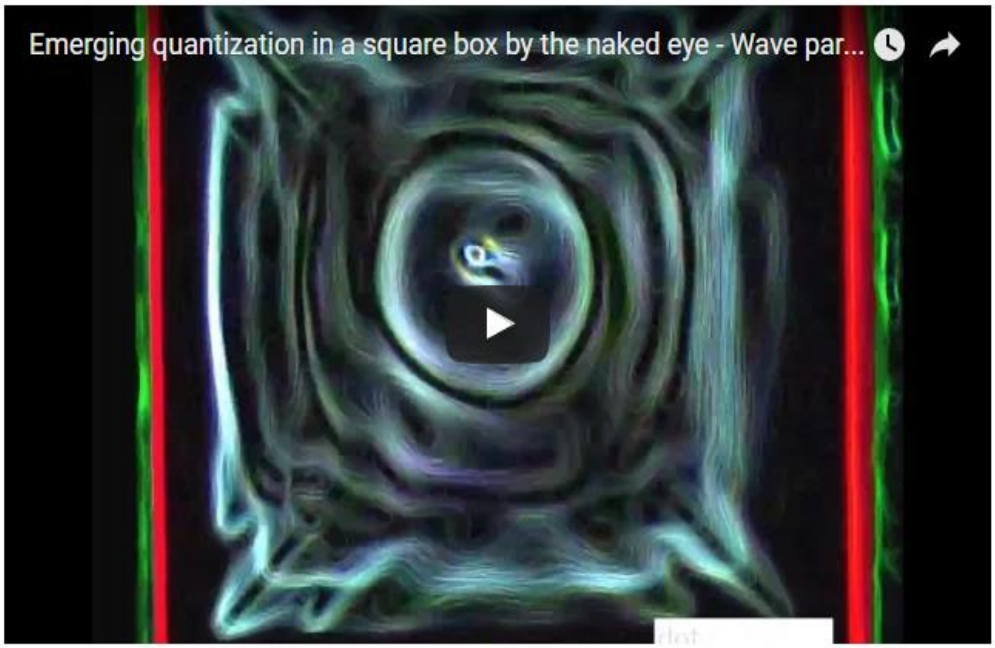
https://www.youtube.com/watch?v=nVtnKbCXqKg



First result :

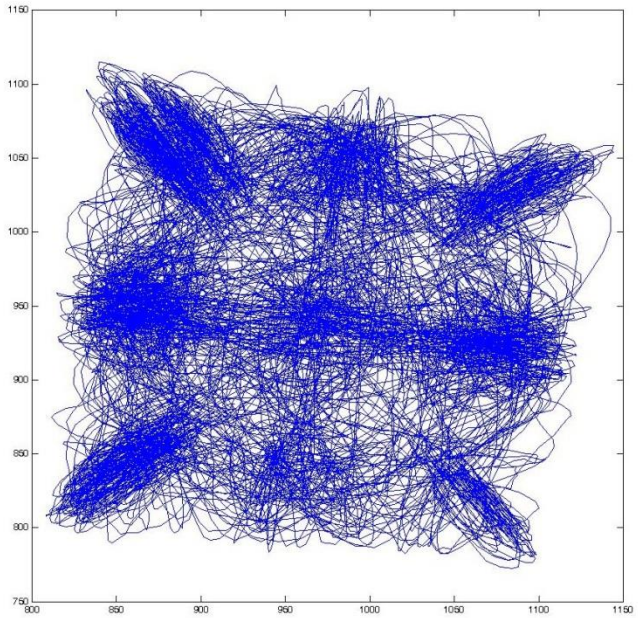
A walking droplet in a square cavity shows random motion, but with time, its trajectory is building a statistic reminiscent of the resonant mode of the cavity.

This can be seen by the naked eye in this movie excerpt :



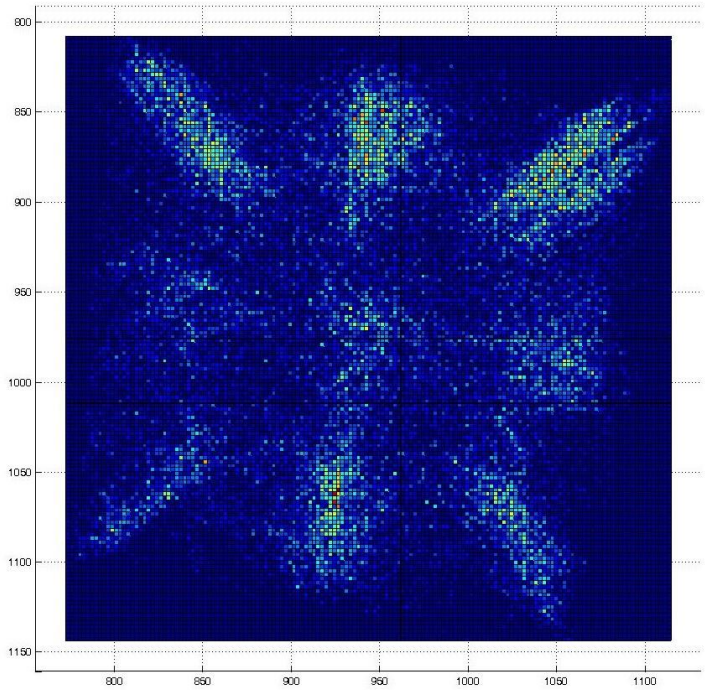
https://www.youtube.com/watch?v=lYnHZqU7Hkk

This is then confirmed with **optical tracking measurment** of the trajectory :



Trajectory of the walking droplet

The **position distribution** (~probability density) is then computed :



Probabilty density