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The flight of Alsomitra macrocarpa

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Alsomitra macrocarpa, also known as Javan cucumber, is a gliding seed that does not need gusts or a slight breeze to fly distances of up to hundreds of meters. It presents a non-uniform mass distribution that allows for an inherently stable flight coupled with one of the lowest terminal velocities between those of plant seeds [1]. We used depth cameras, which allow capturing the seed path without using markers, to record the different flight paths of 15 seeds. The majority of the seeds (11) presented a helical path, while the remaining seeds (4) moved in a straight oscillatory path not previously described [2]. This behaviour couples the horizontal motion of a tumbling wing and the oscillation of a fluttering wing. Low order dynamical models [3, 4], which include a non-uniform mass distribution, were employed to study these motions. In the Javan cucumber, it is related to the Inverse-Zimmerman planar form and the location of the seed containing pericarp, which acts as a concentrated mass. This work sheds light on this particular flight behaviour that allows the Javan cucumber to disperse, without being carried by the wind, and it may inform the design of more efficient, bio-inspired drones.

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