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Helical propulsion in granular media ALEJANDRO IBARRA, BAPTISTE DARBOIS TEXIER , FRANSISCO MELO, Physics department, University of Santiago — It is known that the forces experienced by a slender body moving into a granular media present similar trends that the ones undergone in a viscous fluid at low Reynolds numbers. Thus, the solutions employed by the living kingdom in order to move in fluids in such conditions are expected to operate in granular media at a larger scale. The present work investigates the case of the helical propulsion into a granular material. The horizontal velocity of a rotating helix has been studied depending on its geometry, its rotation speed and the properties of the granular material. Our observations are proved to be consistent with a simple modelisation of the problem based on the anisotropical friction force experienced by the helix. The previous theoretical analysis also provides the optimal geometry of the helix in order to maximize the locomotion speed. Finally, our results were used to build an autonomous robot able to progress in non-cohesive materials such as sand. The optimal design of such a robot in term of energy consumption and moving speed will be discussed.

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