

239f Landmine Detection in Granular Beds: Behavior of Cumulative Surface Kinetic Energy

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We present the preliminary results towards a useful detection method effective for distinguishing buried objects in granular media. A non-linear particle dynamics based simulational study of the propagation of δ function mechanical impulses in idealized three-dimensional hexagonal close packed lattices of monosized Hertz spheres is considered. Our first step towards this goal involves characterizing the impulse backscattering of the granular bed with (i) restitution, (ii) effect of different impulse areas and (iii) effect of random-massed particles. After the granular bed has been characterized, the obstacle (landmine) is introduced into the granular bed. Initial results indicate that the size of the obstacle to be detected is dependent on the ratio of the area of the impulse to the area of the obstacle. This avenue is explored to determine the ratio mentioned above. The characterization of the backscattered impulse is done for the bed (without the obstacle) to form a reference when an obstacle is present. The change in the behavior of the backscattered impulse contains critical information (size and shape of the object) to be reflected off buried objects, such as land mines. This leads to the most important question: How small an obstacle can be detected for how small an impulse? In this work, these questions are answered.