Credits: NASA/Goddard/University of Arizona

Studying Asteroid Impacts Using the pkdgrav Simulation Software

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What is PKDGRAV?

- PKDGRAV is a software that generates rubble piles out of soft spheres that are used to model planetary bodies.
- This software can be used to study asteroid impacts

Credit: NASA/JPL

Motivation Behind Using pkdgrav

Being a simulation that accurately models planetary bodies and their impacts, pkdgrav can be used in multiple ways.

DART

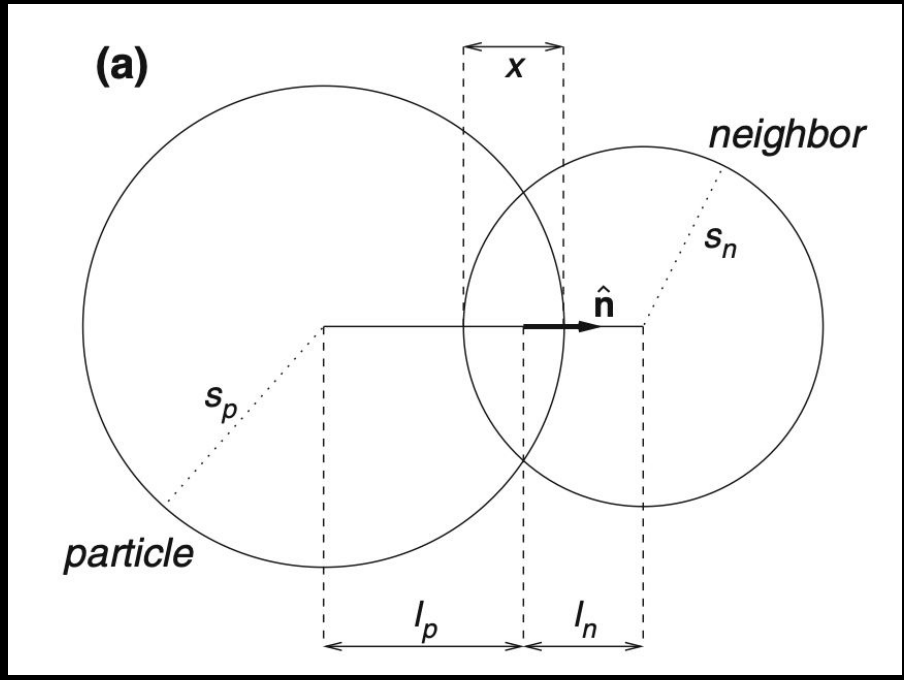
Credits: NASA/Johns Hopkins Applied Physics Lab

Osiris-Rex

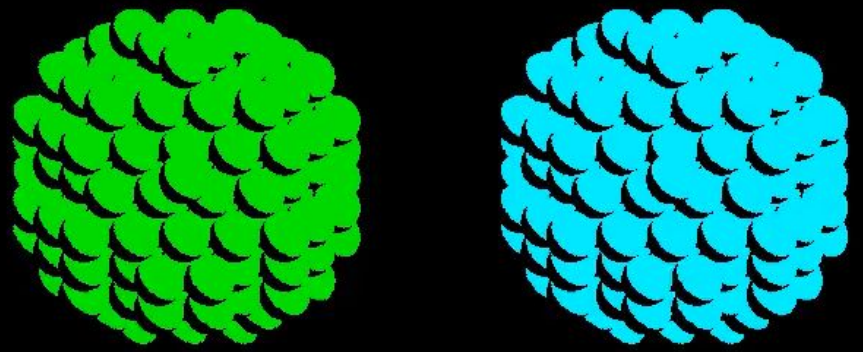
Image Credit: NASA/Goddard/University of Arizona

PKDGRAV Outline

- The soft spheres generated by the software model small particles that are held together by contact forces.
- The software considers the effect of all the existing contact forces to makes the simulation accurate.



Schwartz et al. 2012

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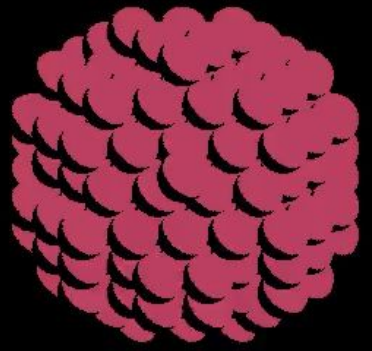

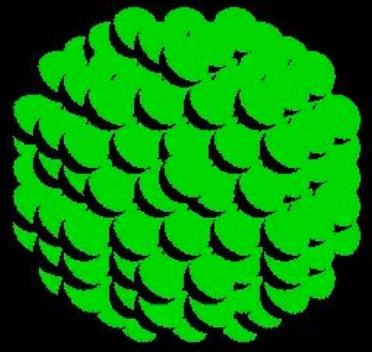


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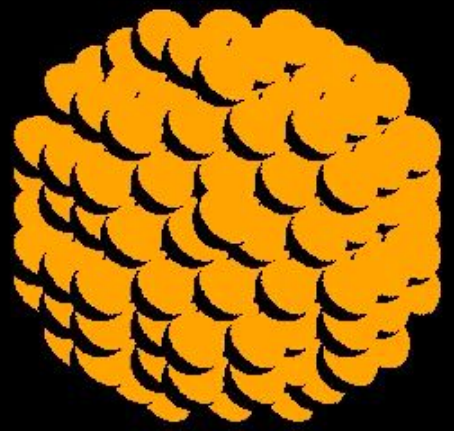

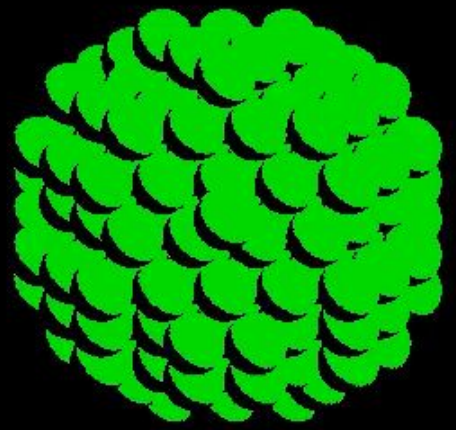

Next Steps

To use pkdgrav to make a data set that can be used in the machine learning algorithm described in the following two papers

- Cambioni et al. “Realistic On-the-fly Outcomes of Planetary Collisions: Machine Learning Applied to Simulations of Giant Impacts.” The Astrophysical Journal, 875(1) 40, 14 pp. 2019.
- Emsenhuber et al. “Realistic On-the-fly Outcomes of Planetary Collisions. II. Bringing Machine Learning to N-body Simulations.” The Astrophysical journal, 891(1) 6, 15pp. 2020.

Thank You!