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The effect of particle shape on rockfall events

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Rockfall events are a gravity-driven mass movements with limited volume but high energy and mobility. They are a significant hazard in mountainous regions and along engineered slopes with substantial potential for destruction (e.g. [1]). Mitigation of rockfall damage requires accurate prediction of potential rockfall trajectories and motion behavior. While various simulation methods have been proposed over the years, the common approach in discrete element simulations is to use round particles, see e.g. [2]. However, as real particles in rockfall events are rarely round but often angular and sharp-edged, round particle methods cannot accurately describe rockfall events. The dynamics of rigid bodies are heavily affected by the shape of the bodies as a competition of sliding, rolling, and even bouncing. Only recently have simulations begun to consider polygonal or polyhedral particles, e.g. [3], but they are still limited to a coarse selection of particle shapes. Up to now, no systematic study on the effect of particle shape in rockfall events has been performed.

With this research, we want to address this shortcoming by investigating the dependency of the motion behavior and runout distance of polygonal particles on the corner number and elongation for different initial orientations and slope angles using a two-dimensional discrete element method based on [4].

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