Common pattern in sound simulation methods:
- Follow the pattern also for granular materials?
- Previous work in sound simulation of granular materials: limited case scenarios only (footsteps, musical instruments, piles)

Visual simulation → Results → Sound simulation

Sound of granular materials
- We have identified sounds from two types of collisions:
  - Particle vs. surrounding objects – ringing noise of the large surrounding object prevails, acceleration noise is not significant
  - Particle vs. particle – ringing noise is outside the hearing range, acceleration noise is the only significant sound source

Sound of collisions
- Each collision produces two types of sound:
  - Ringing noise from surface vibrations
  - Acceleration noise from acceleration force
- Large objects: ringing noise masks their acceleration noise
- Small objects: ringing noise is outside human hearing range

Result
- Sound simulation method for granular materials
- Physically based
- Handles general case scenarios that involve granular material
- Testing implementation to confirm the validity of the approach

Visual simulation → Collision data → Particle vs. surrounding objects → Ringing noise using modal analysis

Particle vs. particle → Acceleration noise

Random collision data
- Not all visual simulation methods provide collision data
- Localized probabilistic approach towards generating collision data is proposed and tested

Visual simulation → Collision probability density approximation → Density sampling → Random collision data

Image: Ihmsen et al. 2013