This study discusses a lunar/planetary spacecraft landing mechanism using energy conversion. A part of the authors has already proposed Base-Extension Separation landing Mechanism (BESM) and its effectiveness was confirmed in one-dimensional simulations and experiments. This study shows two-dimensional response analysis using BESM. The effectiveness of BESM for falling to slopes is verified.

### Background

**Explorations of the lunar attract attention**

To realize soft landing on severe regions for example slopes or steps.

**Previous methods and their problems**

- Airbag Pit
- Honeycomb Crash
- Sky Crane

**Base-Extension Separation landing Mechanism (BESM)**

Components of BESM

1. Falling
2. Landing
3. Spring is stretched and velocity of the base is reduced.
4. When the springs reach stroke length, locking-devise is unlocked.
5. Extension is launched. Base lands softly.

**BESM can realize**

- Low rebound
- Reuse
- Passive landing

**Simulation results**

![Simulation results graph](image)

- BESM can prevent from tipping for falling to 30° slope.
- BESM can prevent from tipping under all conditions.
- Acceleration becomes high under small ground angle conditions.
- Energy reduction becomes large under large ground angle conditions.

**Models for simulation**

- Model for the base
- Model for the gear

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<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
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**References**


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