# Physically-Based Simulation
# Material Point Method (MPM)

## The A-Team
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# The Pingu World

# One Sim to rule them all?

- Rigid
- Elastic
- Plastic
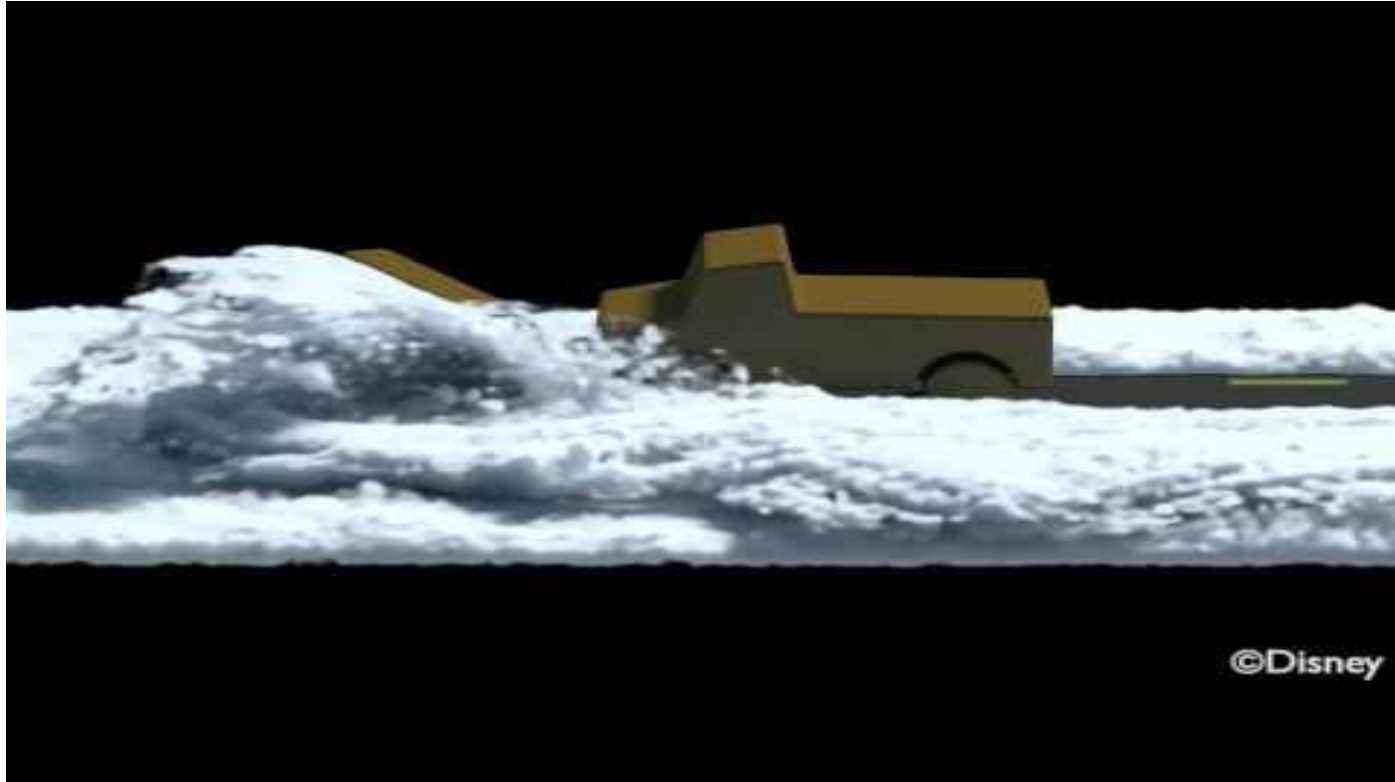- Fluid
- Springy
- Fluffy
- Mushy
- Spongy
- Fishy
- Seals

# One Sim to rule them all?

- Rigid
- Elastic
- Plastic
- Fluid
- Springy
- Fluffy
- Mushy
- Spongy
- Fishy
- Seals

- Objects changing state



FACE MELTING !!!

# Material Point Method (MPM)



Stomakhin A. et al. 2013. A material point method for snow simulation. ACM Trans. Graph. 32(4).

# [1] Disney's Frozen



PREVIOUS APPROACH

[2] Chenfanfu J. et al. 2016. The material point method for simulating continuum materials. In ACM SIGGRAPH 2016 Courses (SIGGRAPH '16).

# Minimal

- Basic MPM Implementation

    - Working for <u>a</u> type of Material (probably some deformable solid)

    - Explicit time integration

- Gaining insights into the method's

    - up- and downsides

    - shortcomings and limitations

- Learning about practical aspects, implications and pitfalls of implementing MPM

# Desired

- Different Material models

- Wide range of material properties

    - fairly stiff

    - almost fluid

Target

# Overambitious

- Decent computational efficiency

- Nice rendering

- Implicit time integration

# Milestones & Timeline

(1) by 27/11

- P2G & G2P transfer

- Grid & grid-based operations

- Material Model

- Collisions & Boundaries

- Input & discretization

- Output & rendering

(2) by 18/12

- Testing, determine limitations

- More material models

- Optimization

- Better rendering

- Implicit time integration

- Compile results