MPM Computational Cycle

Step 1: Interpolate material-point data to the mesh

Step 2: Solve equations of motion in an updated Lagrangian frame on the mesh

Step 3: Update the material-points based on the mesh

Step 4: Redefine the background mesh if desired

Features of MPM

- Dual description of the continuum: Lagrangian (material points) and computational mesh. The unconnected material points represent the geometry rather than the mesh. Allows large deformations, even fracture.

- The convective phase of the algorithm is performed by Lagrangian material points which carry position, mass, velocity... Properties transported without error. Multiple materials easily represented.

- The interaction between material points is solved using a finite element discretization on a mesh (cost is linear in the number of material points)

Features of MPM

- Information is transferred between the material points and the mesh by interpolation (only changes are interpolated, keeping numerical dissipation relatively small)

- Material points move in a continuous velocity field providing a natural no-slip contact algorithm