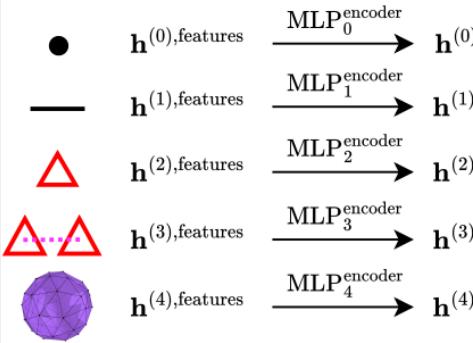


A. Enhancing mesh faces with intra-object data

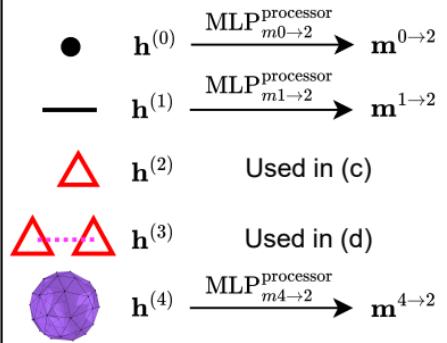
(a) Equation 7

Encode cell features with separate MLPs



(b) Equation 8

Compute messages from encoded features



(c) Equation 9

Propagate messages from nodes, edges, and objects to faces

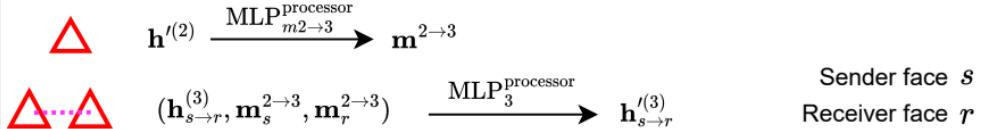
$$(\mathbf{h}^{(2)}, \sum_j \mathbf{m}_j^{0 \rightarrow 2}, \sum_j \mathbf{m}_j^{1 \rightarrow 2}, \sum_k \mathbf{m}_k^{4 \rightarrow 2}) \xrightarrow{\text{MLP}_2^{\text{processor}}} \mathbf{h}'^{(2)}$$

All nodes in the face All edges in the face Object owning the face

B. Processing inter-object collisions using mesh faces

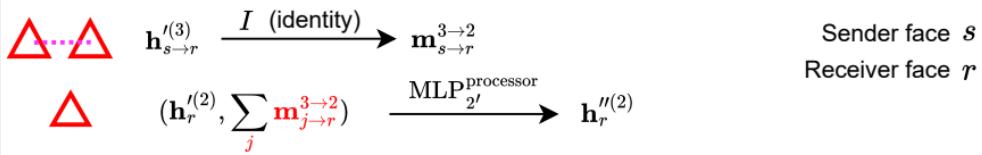
(d) Equation 10

Compute messages from faces and propagate them to collision cells



(e) Equation 11

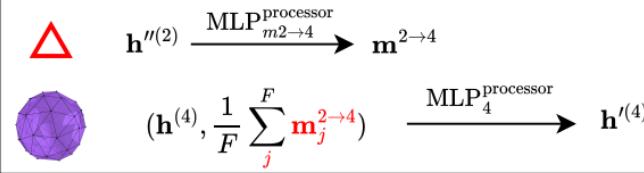
Aggregate and propagate collisions to faces



C. Updating intra-objects cells after collisions

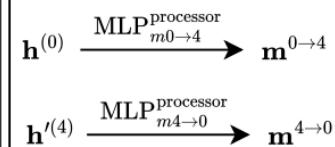
(f) Equation 12

Compute messages from updated faces and propagate them to objects



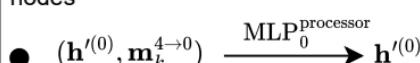
(g) Equation 13

Compute messages from nodes and updated objects



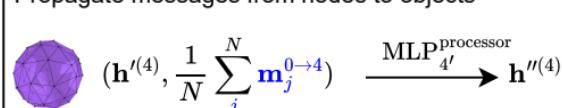
(h) Equation 14

Propagate messages from objects to nodes



(i) Equation 15

Propagate messages from nodes to objects



D. Predicting accelerations and the next pose

(j) Equation 11

Decode per-node acceleration



Decode per-object acceleration

