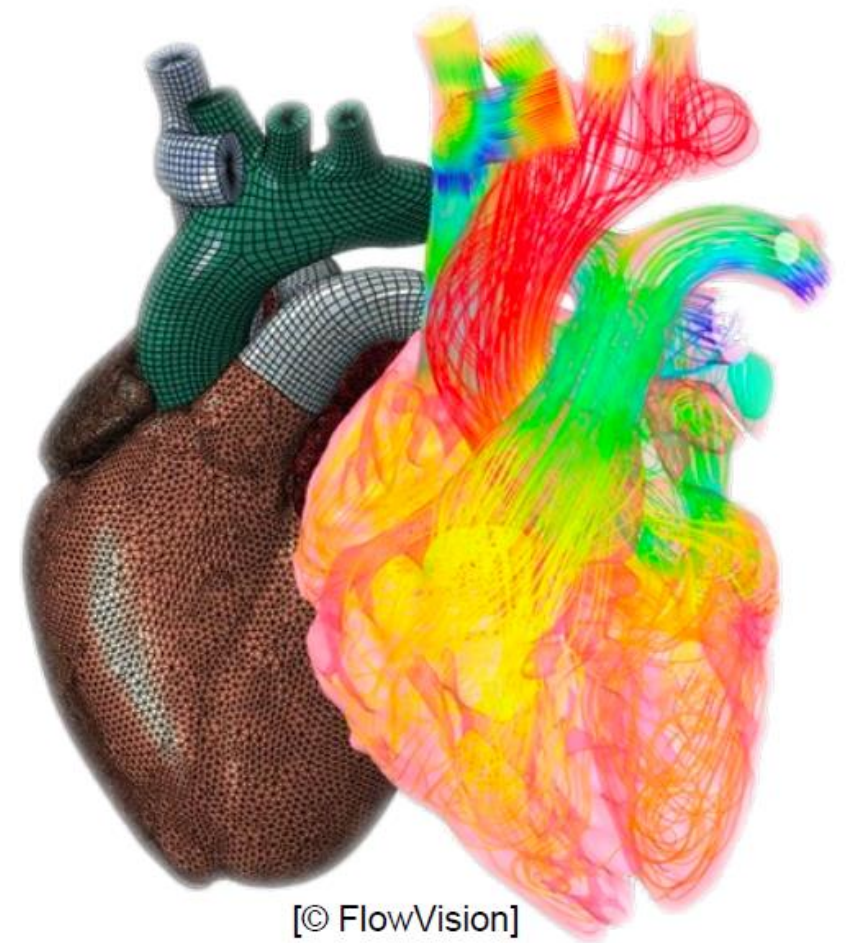
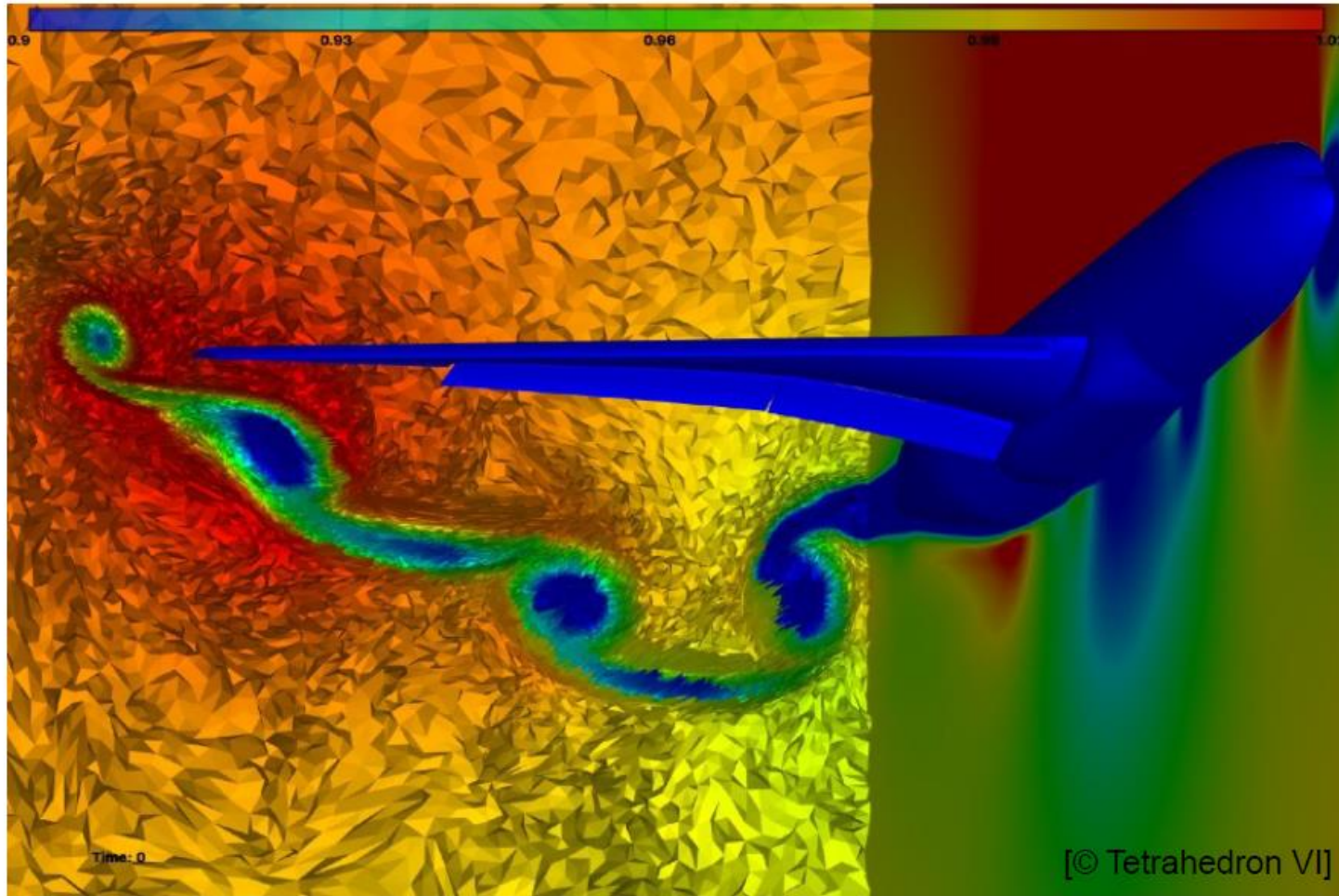


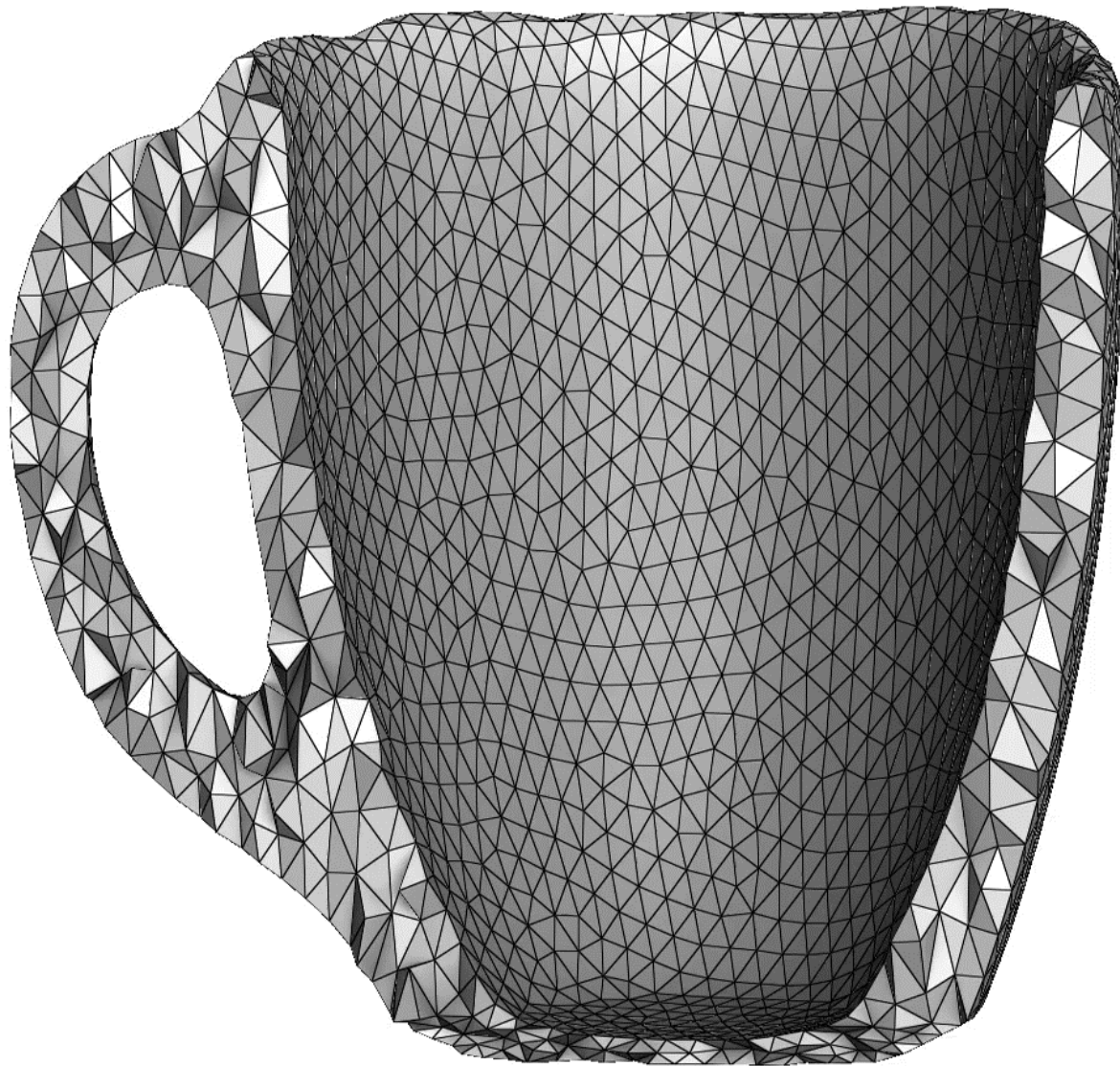
Génération de maillage hexaédrique avec des Polycubes

François Protais

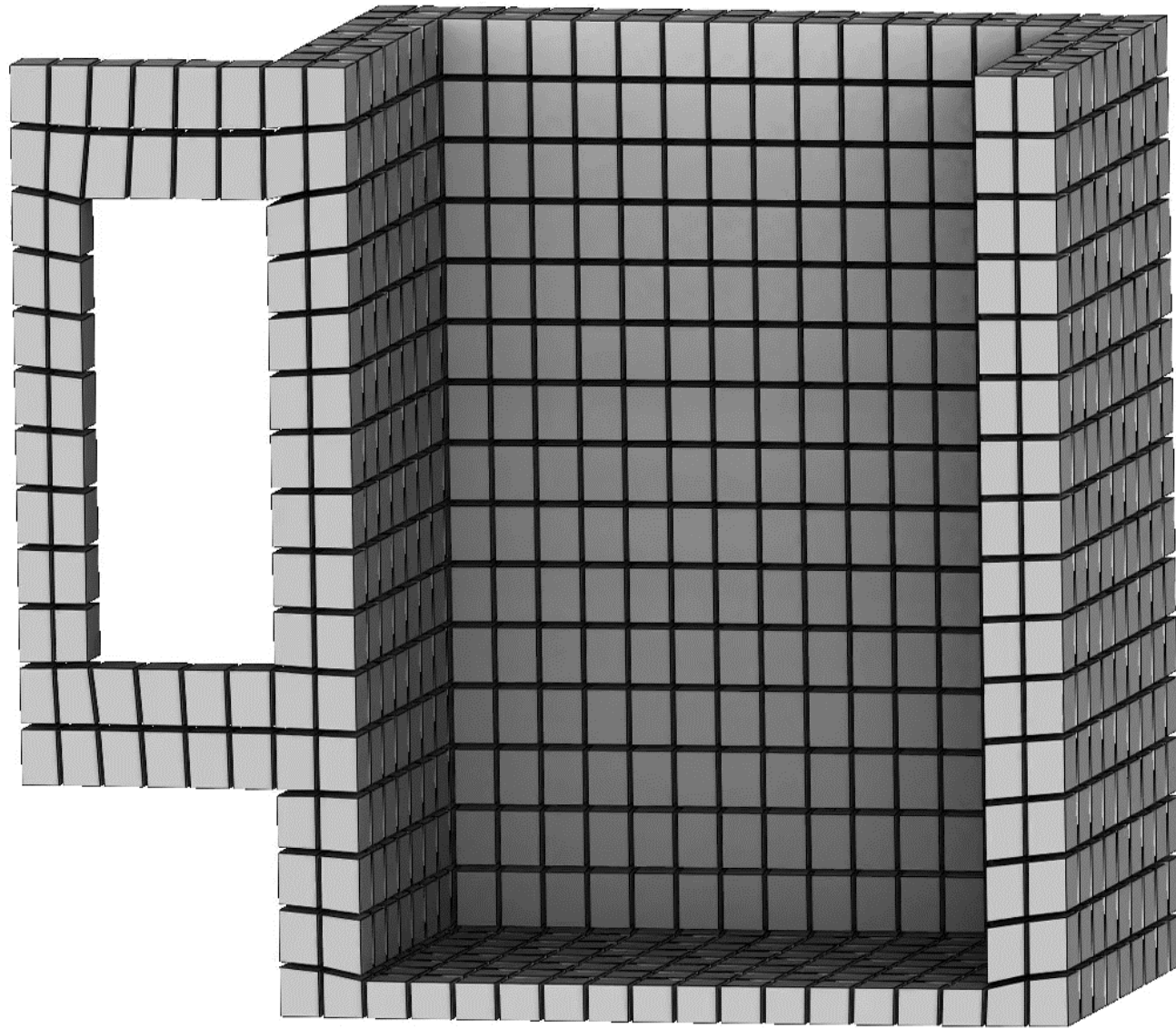
Introduction



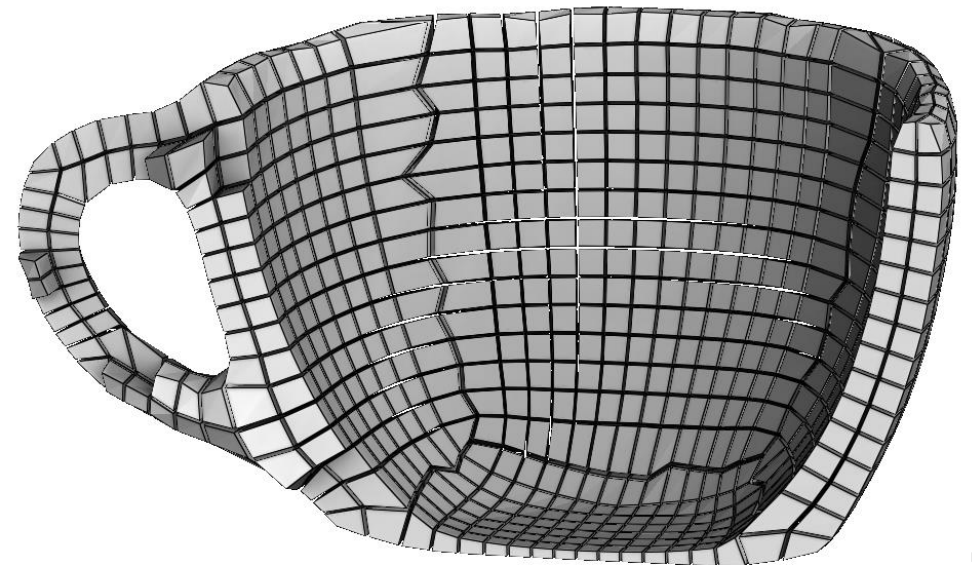
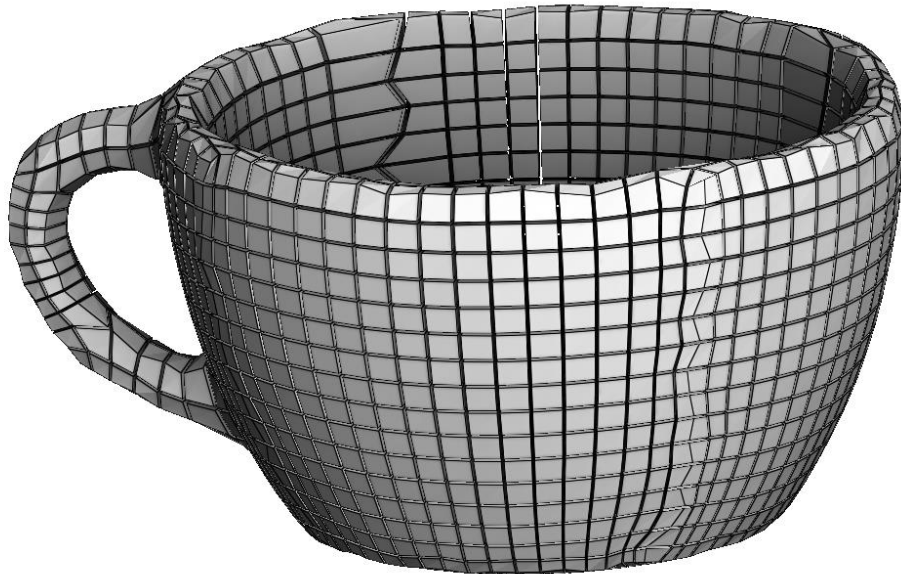
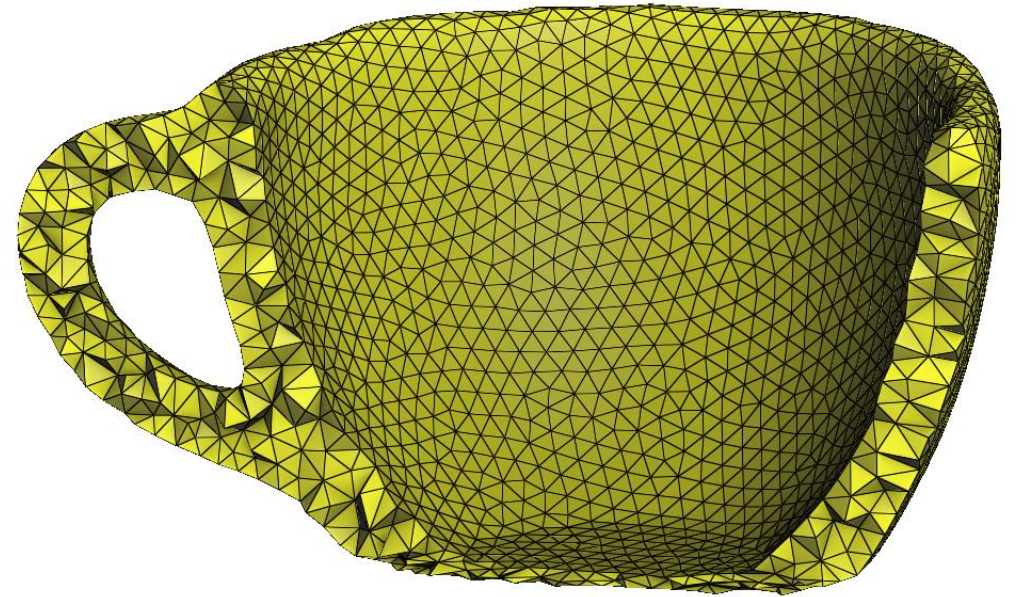
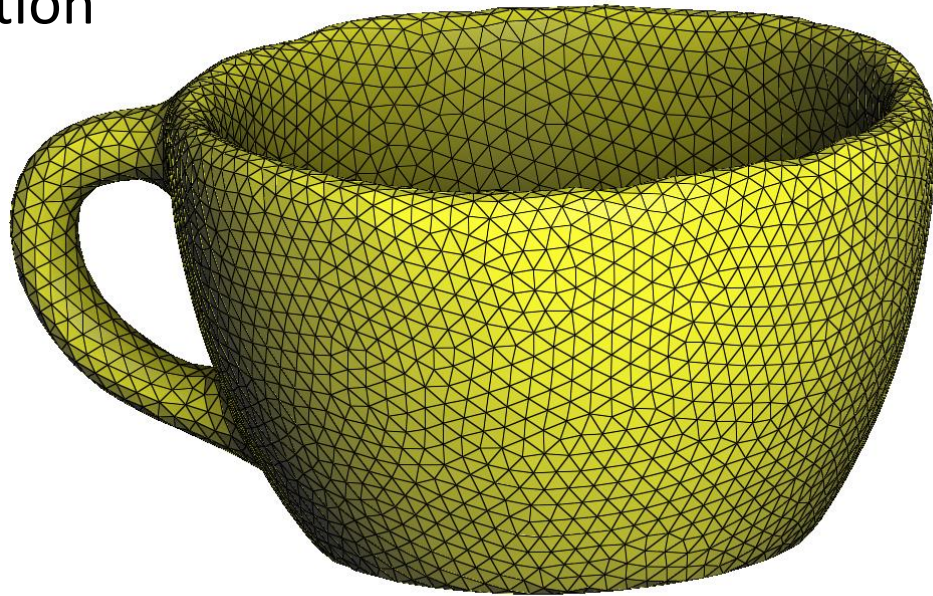
Introduction



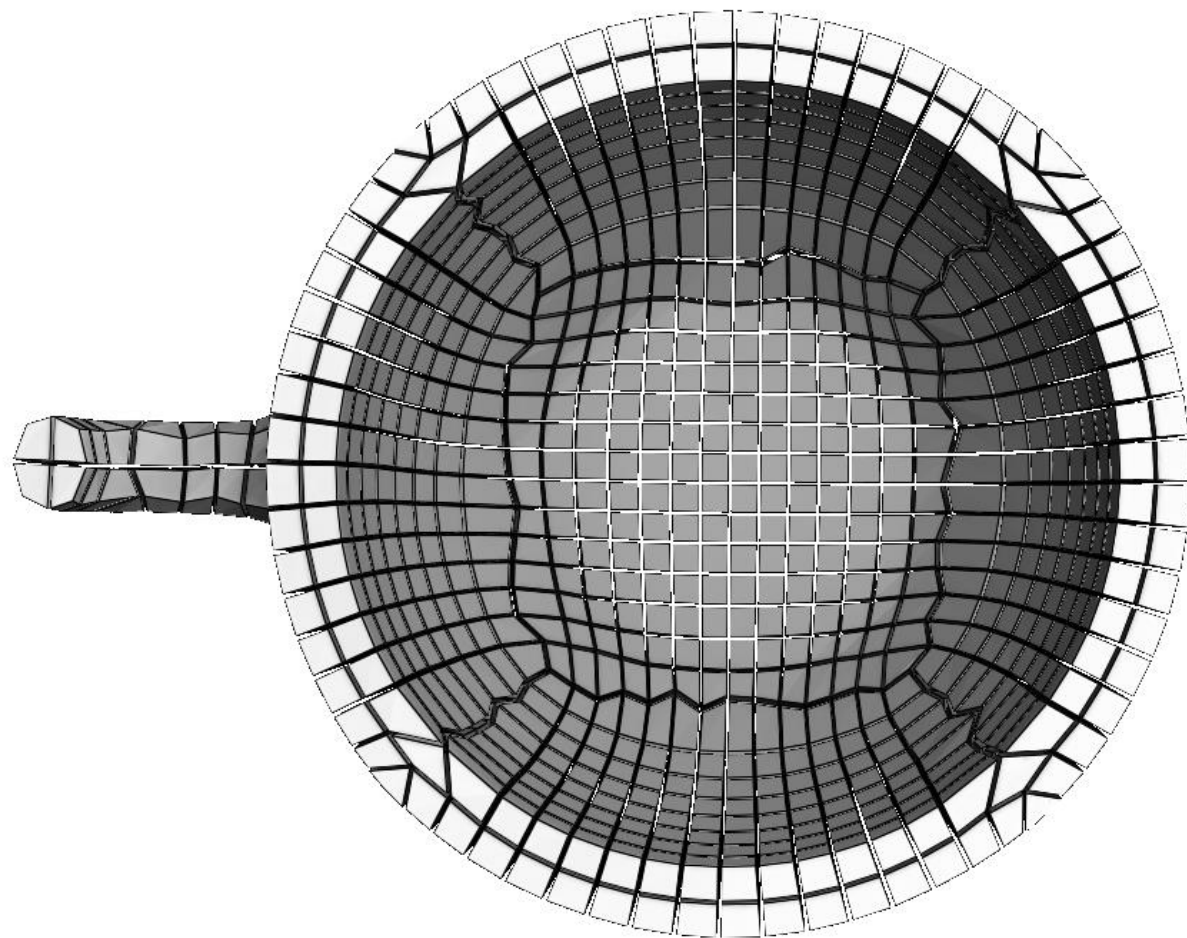
Introduction



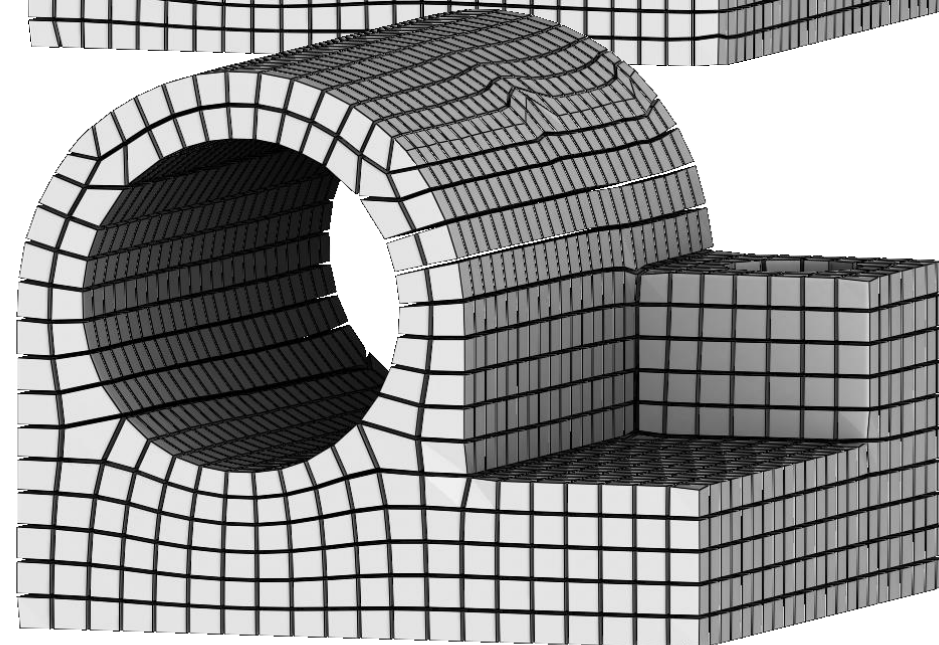
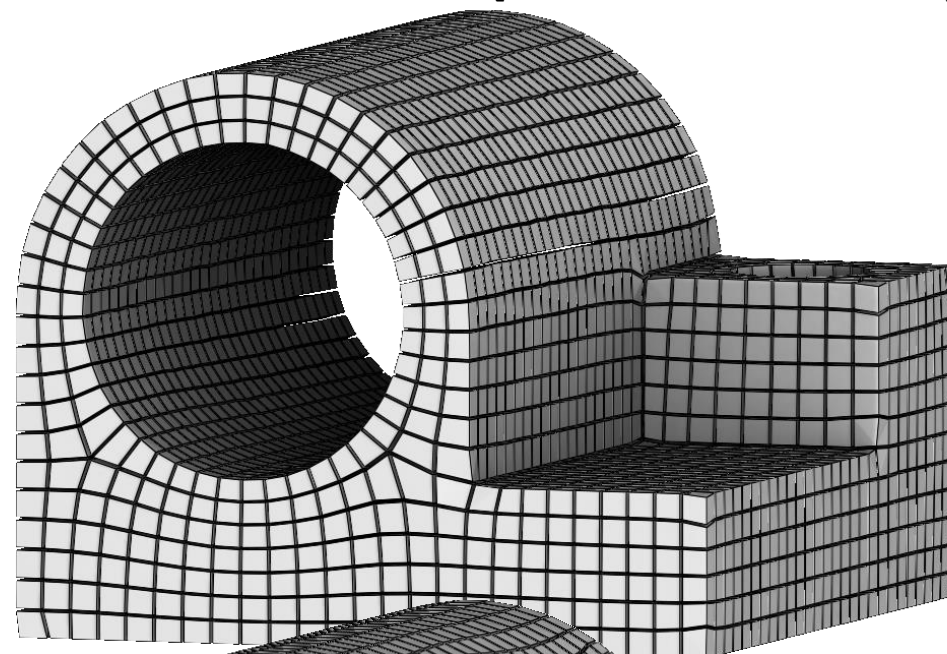
Introduction



Introduction – Défauts des polycubes

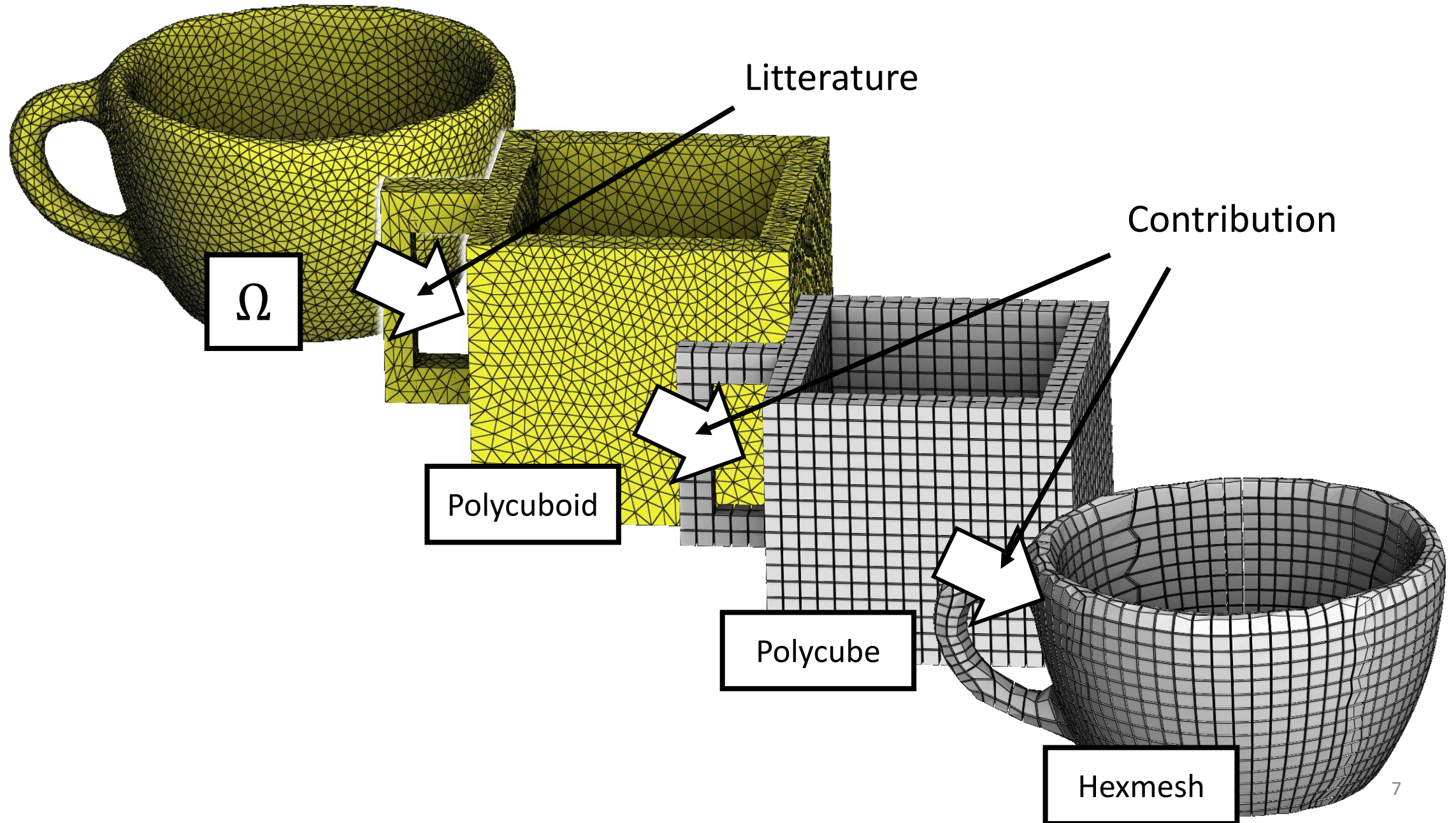


méthode Frame Field [Corman et Crane 2019]

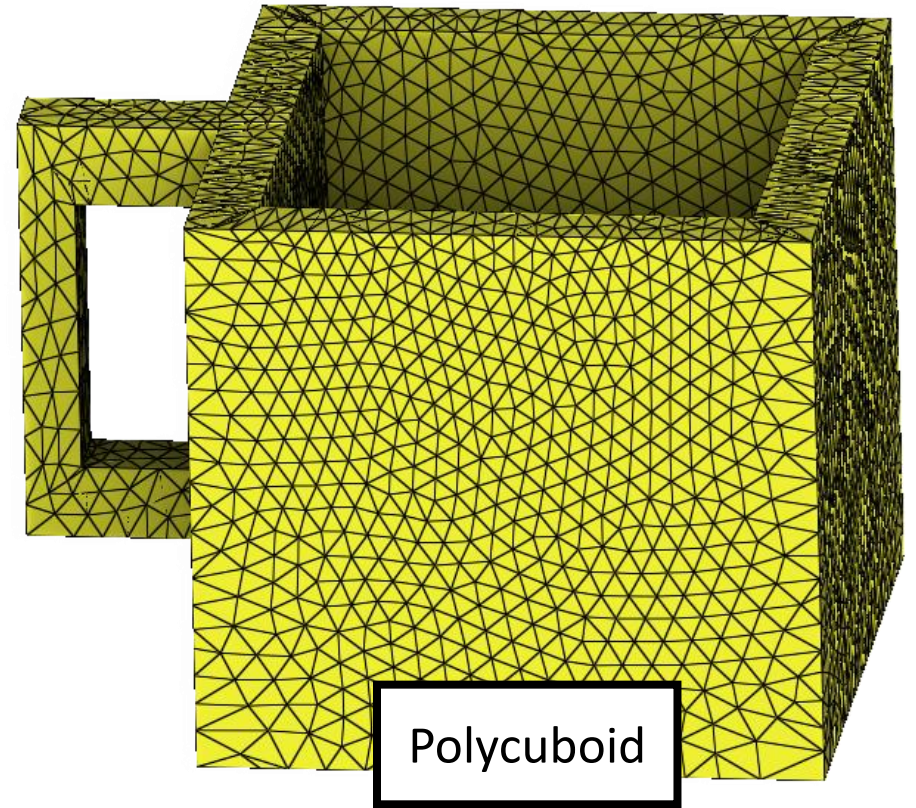
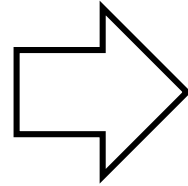
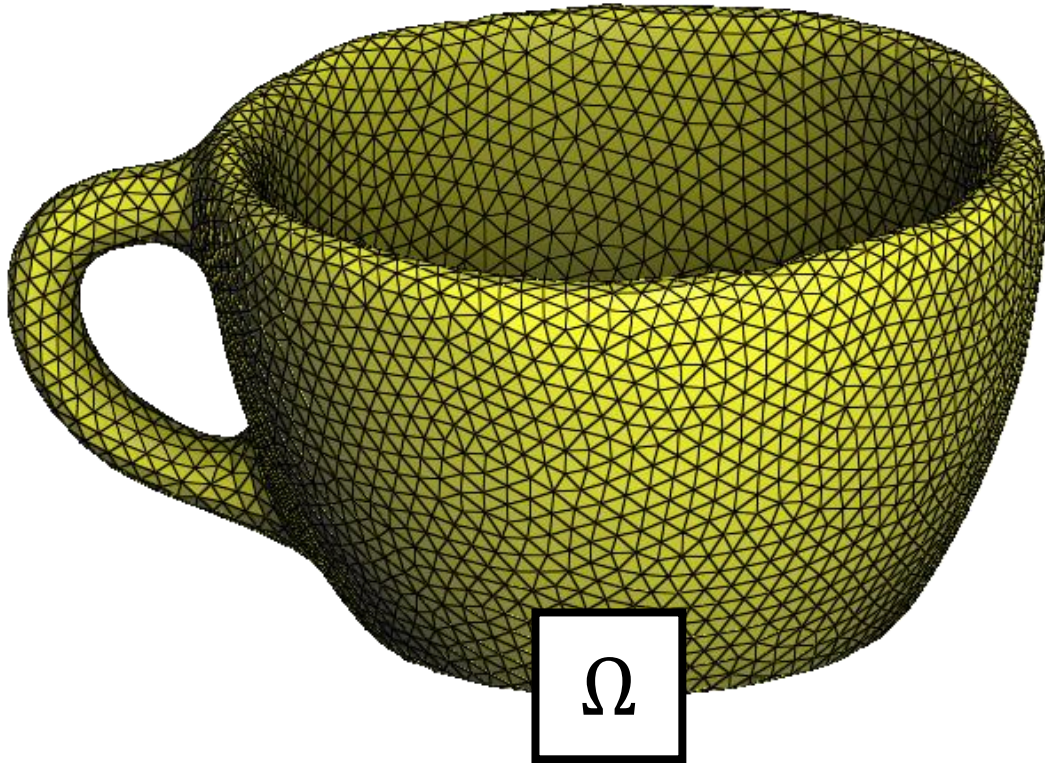


méthode Polycube [Us 2020]

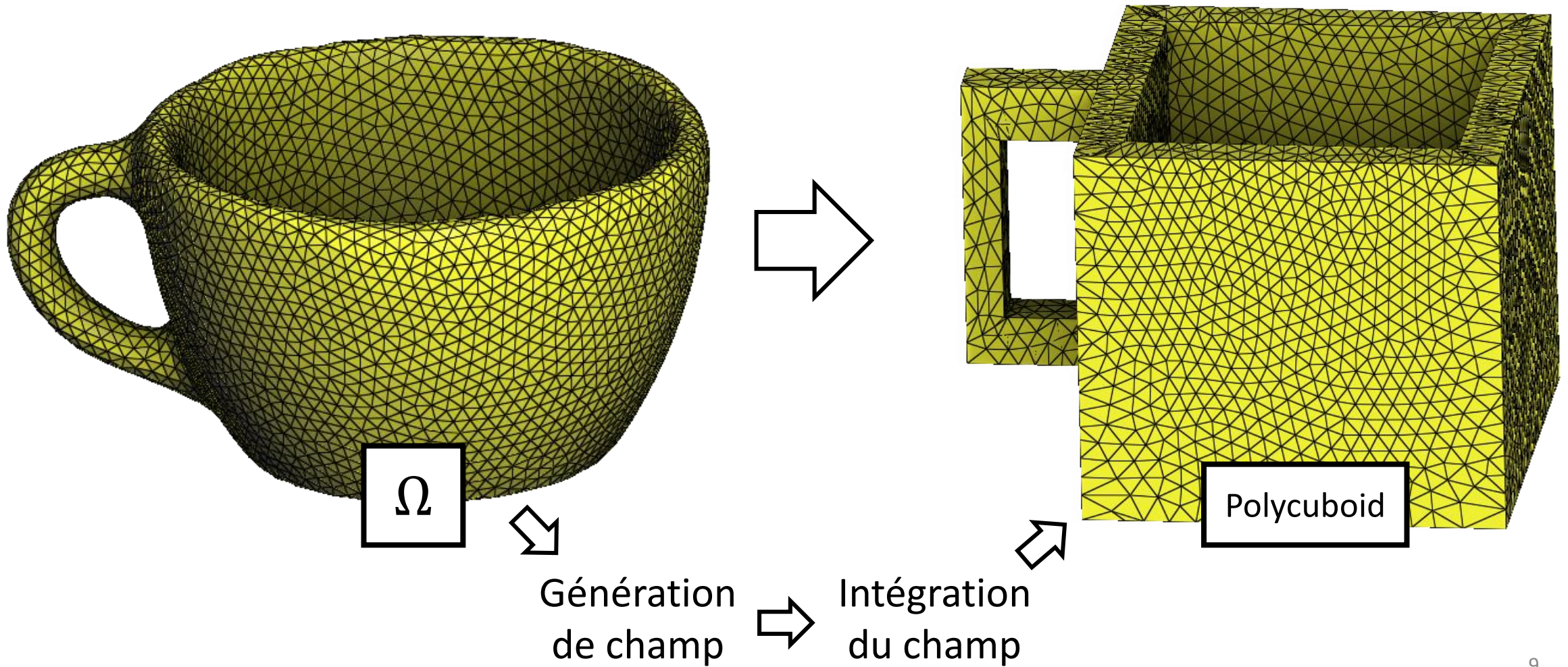
Introduction – Polycube pipeline



1 - génération du Polycuboid

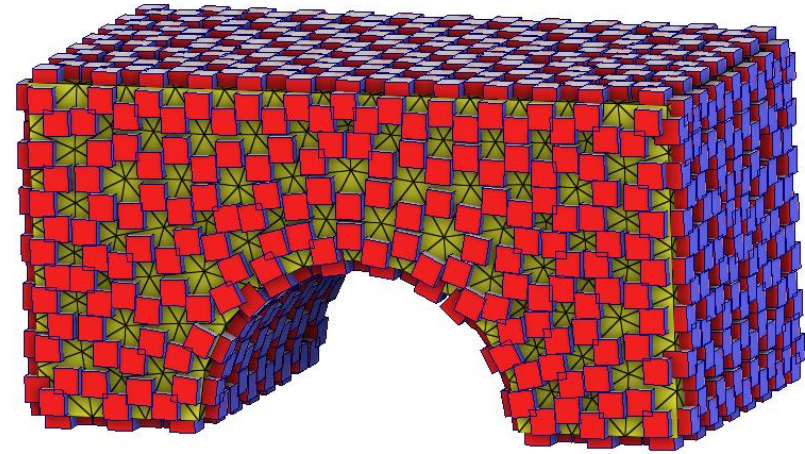
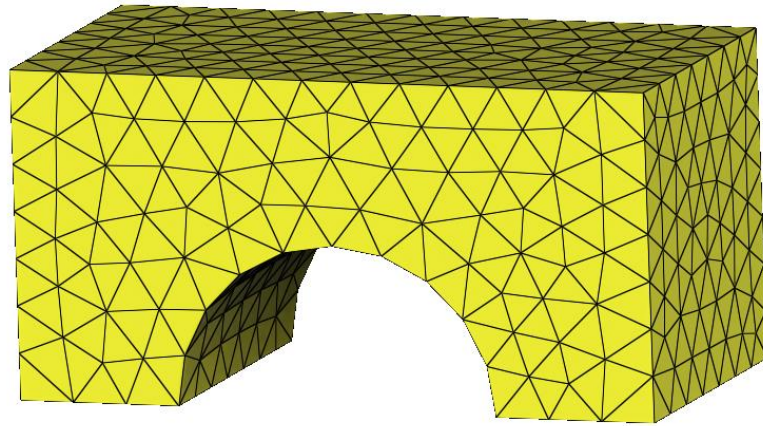


1 - génération du Polycuboid



1 - génération du Polycuboid

a. Génération de champ

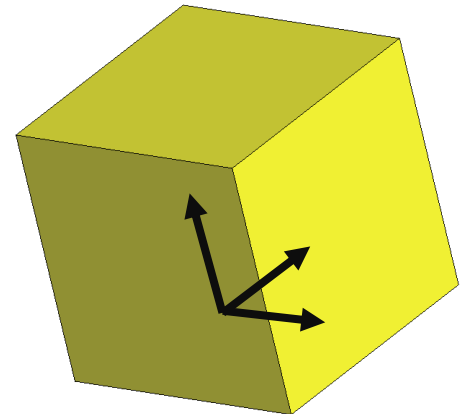
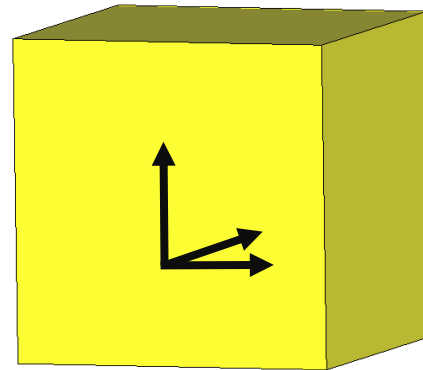


```

M = Id;
for i = 1 → 5 do
  Compute  $M_b$ ;
   $\alpha = 1 - i/6$ ;
   $M = \operatorname{argmin}_M \left\{ \alpha \int_{\Omega} \|\nabla M(x)\| dx + (1 - \alpha) \int_{\partial\Omega} \|M(x) - M_b(x)\| dx \right\}$ ;
end

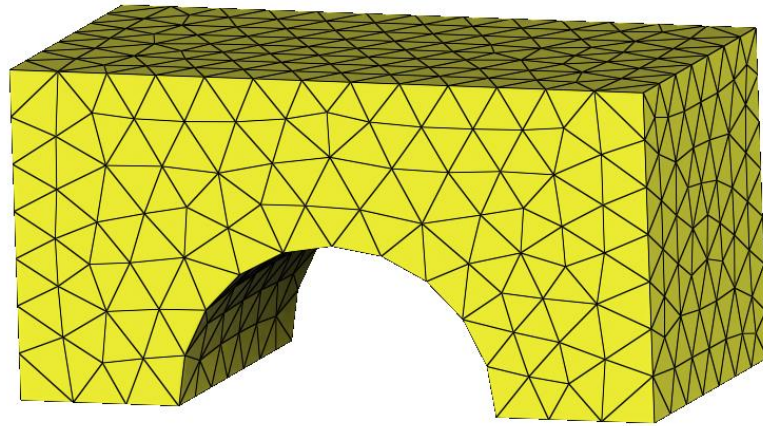
```

En fonction de M

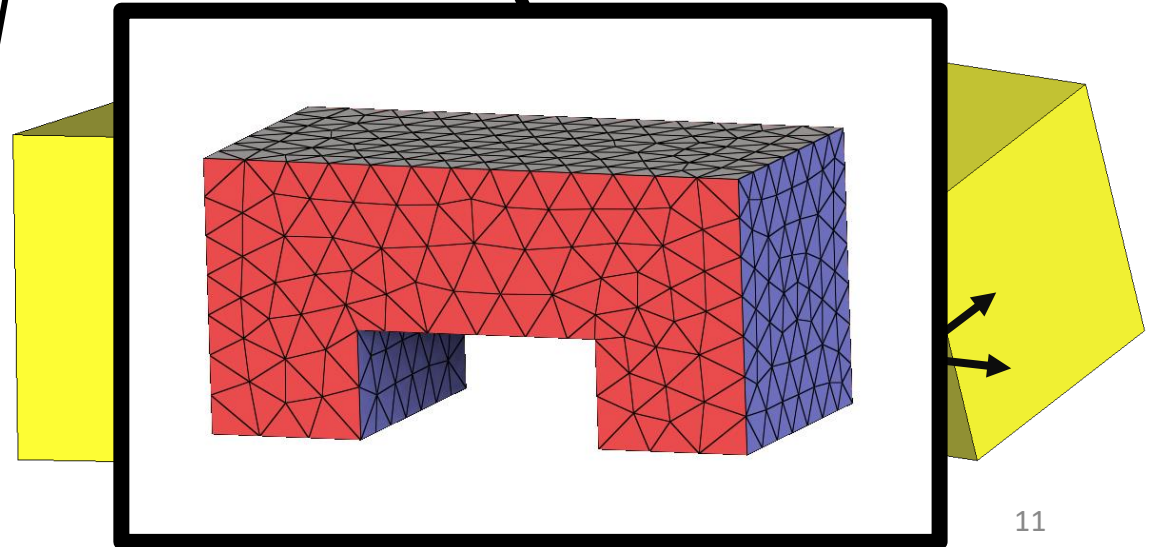
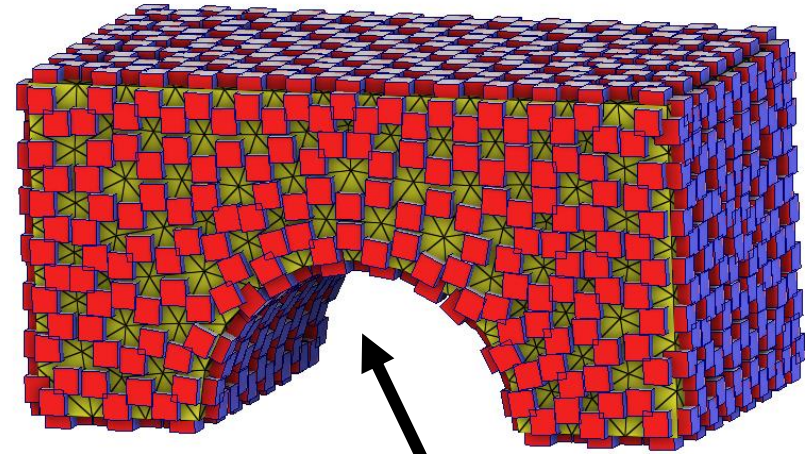


1 - génération du Polycuboid

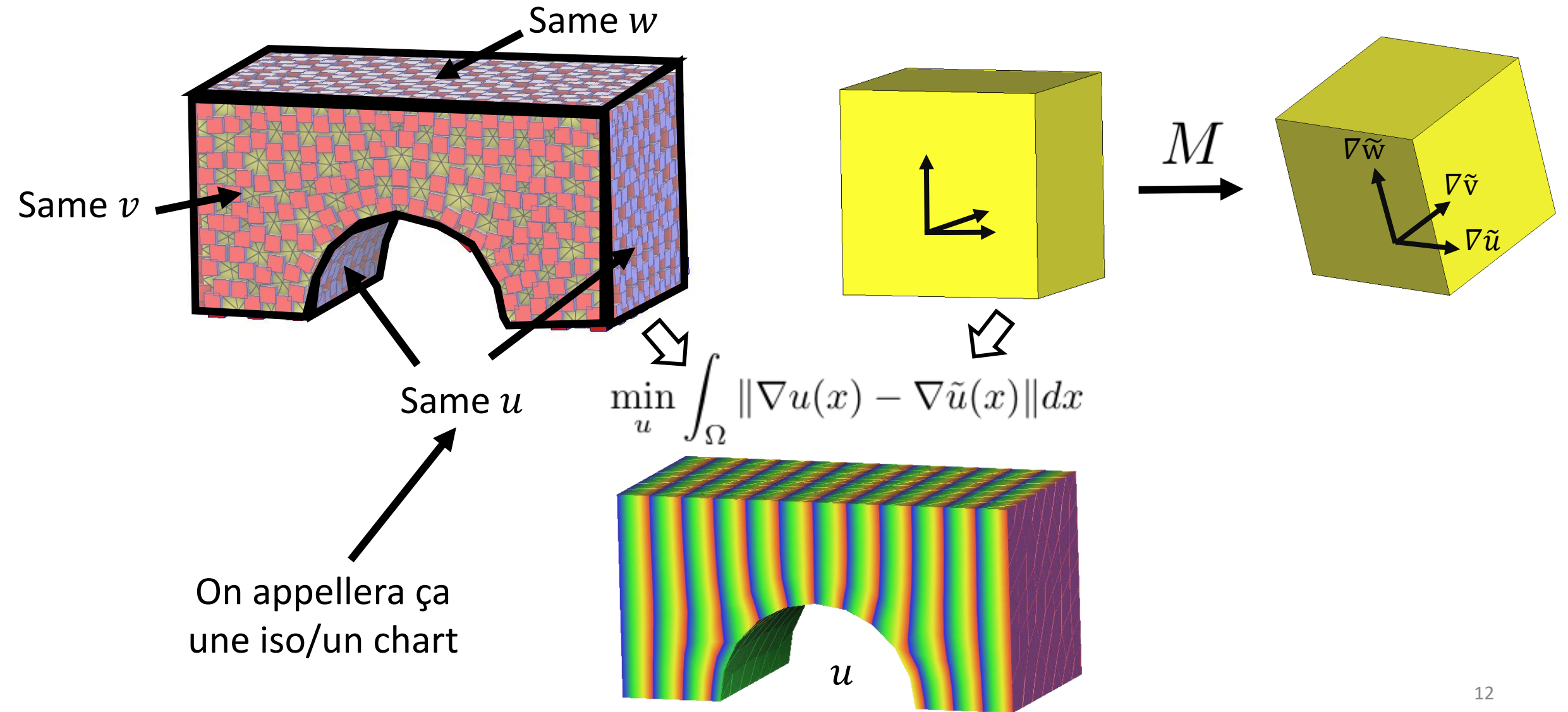
a. Génération de champ



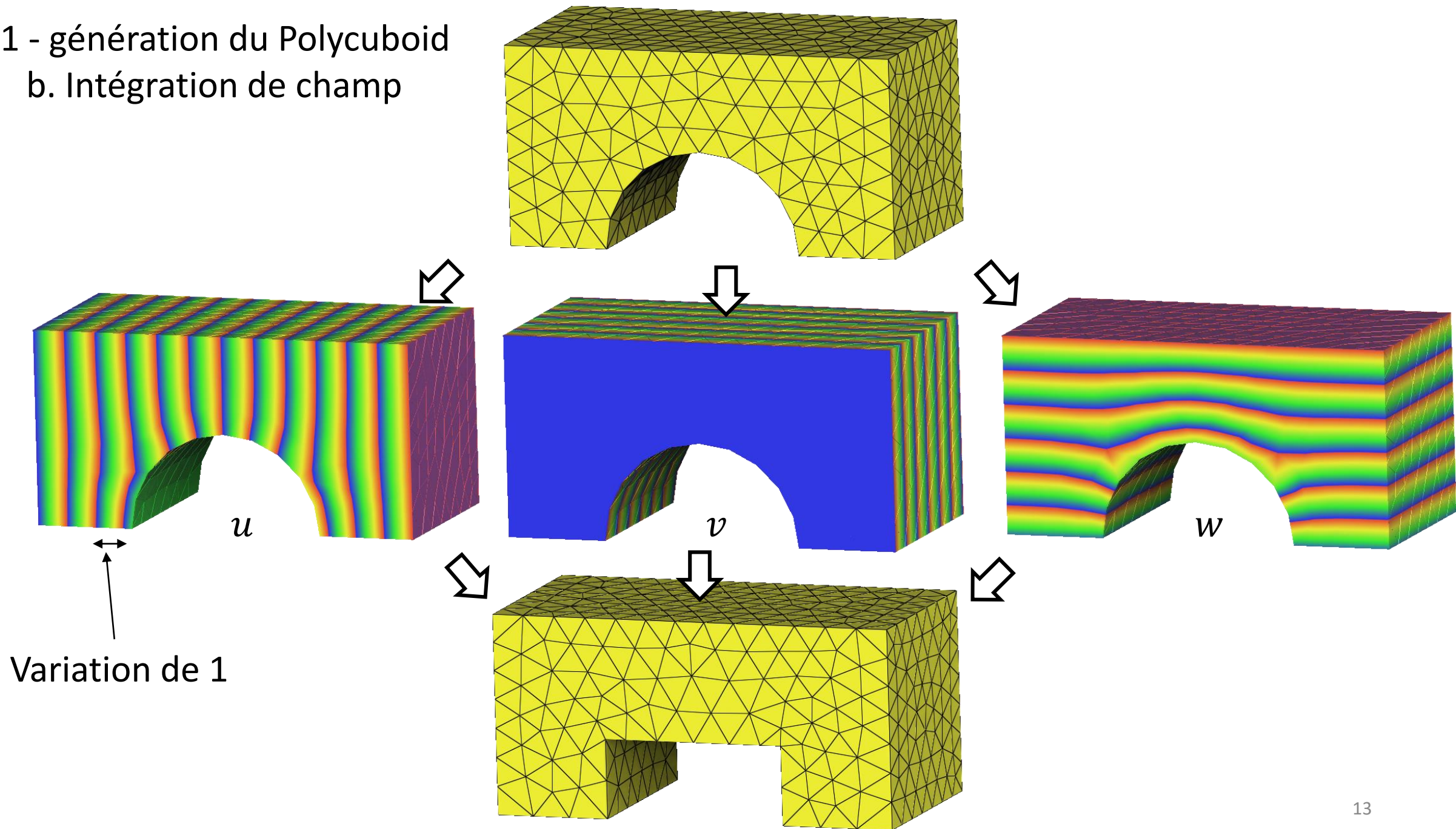
```
M = Id;  
for i = 1 → 5 do  
  Compute  $M_b$ ; ← En fonction de  $M$   
   $\alpha = 1 - i/6$ ;  
   $M = \operatorname{argmin}_M \left\{ \alpha \int_{\Omega} \|\nabla M(x)\| dx + (1 - \alpha) \int_{\partial\Omega} \|M(x) - M_b(x)\| dx \right\}$ ;  
end
```



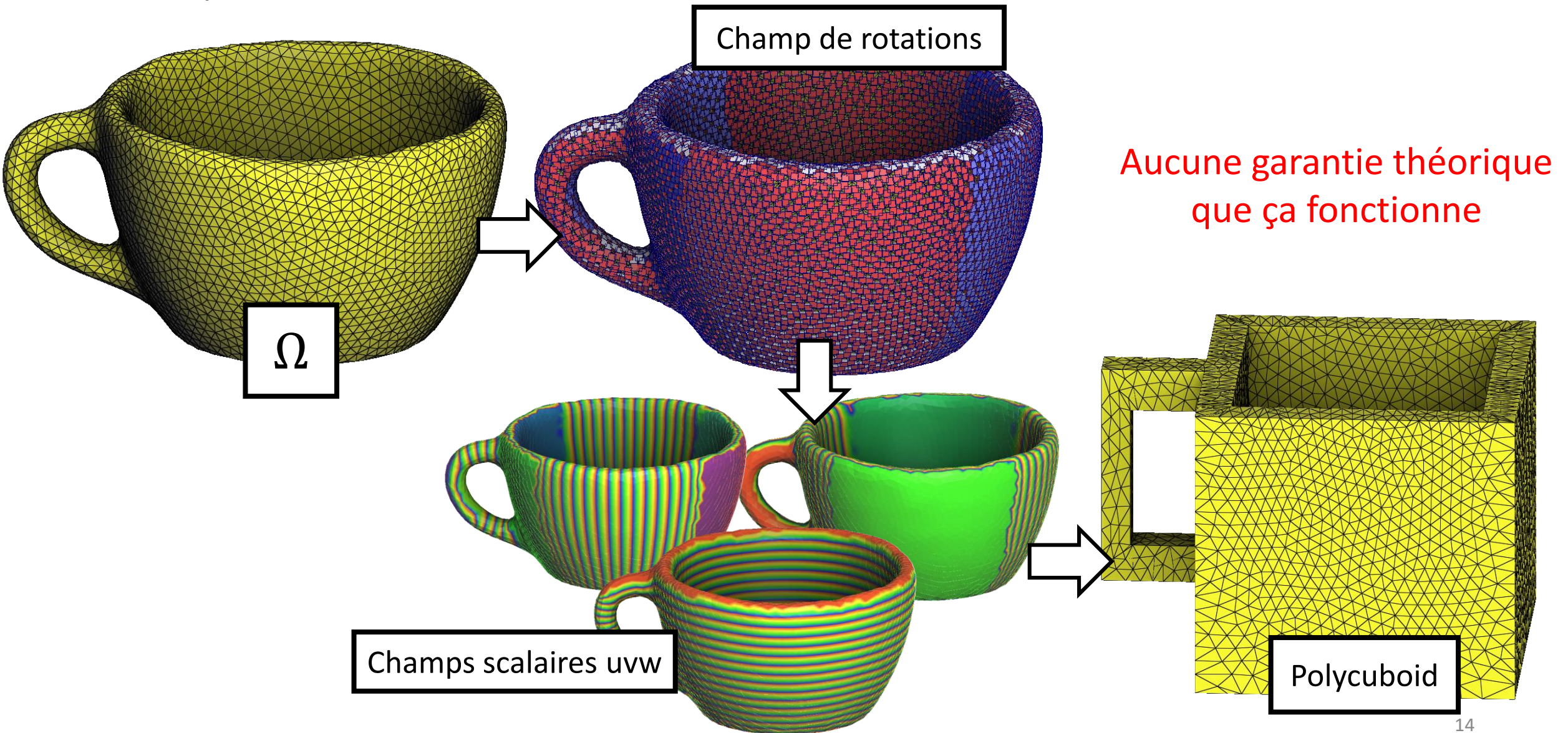
1 - génération du Polycuboid
b. Intégration de champ



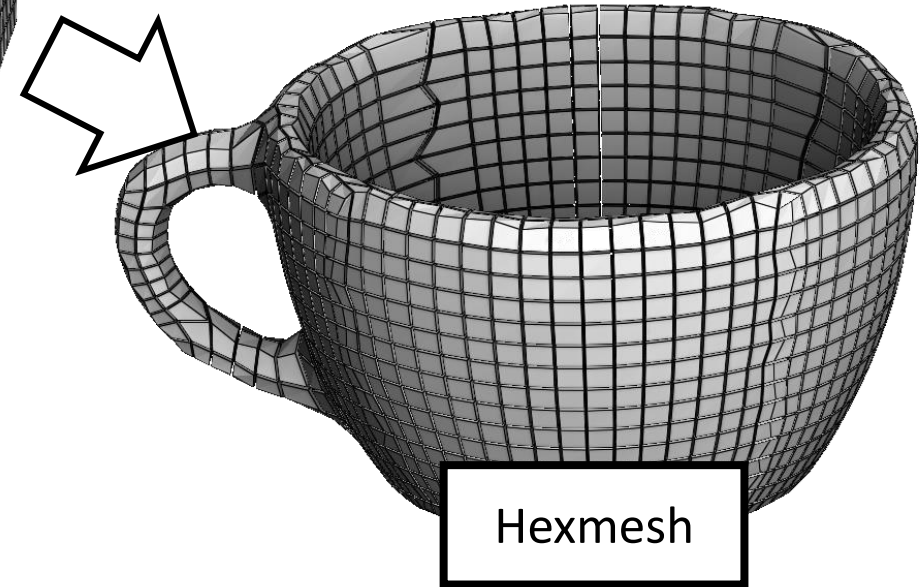
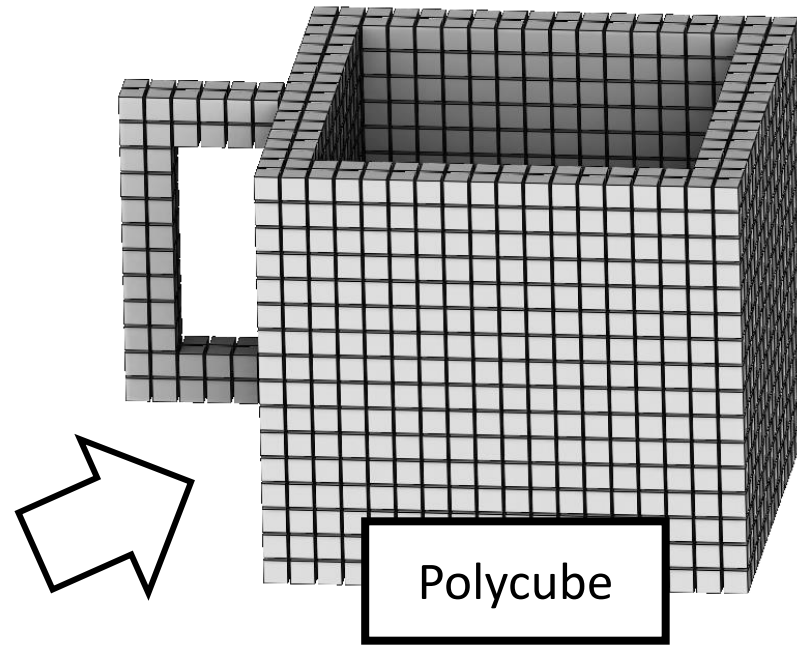
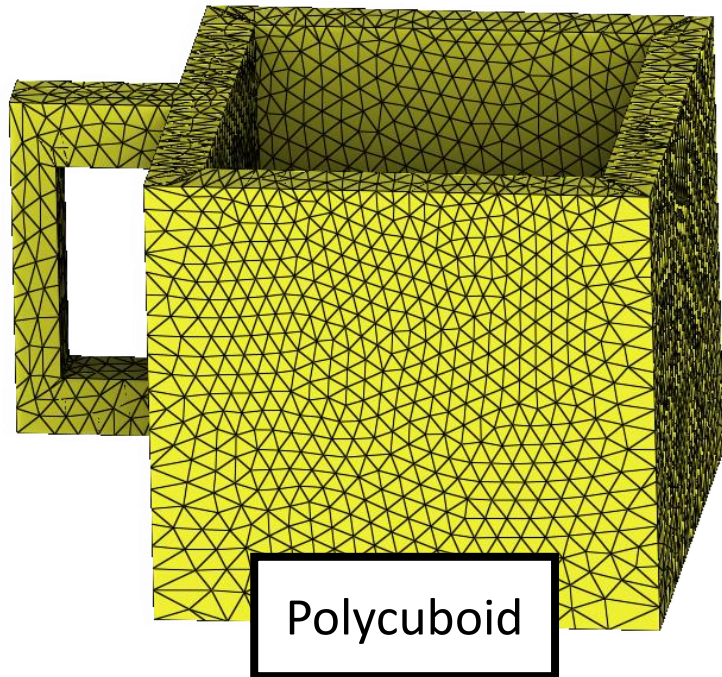
1 - génération du Polycuboid
b. Intégration de champ



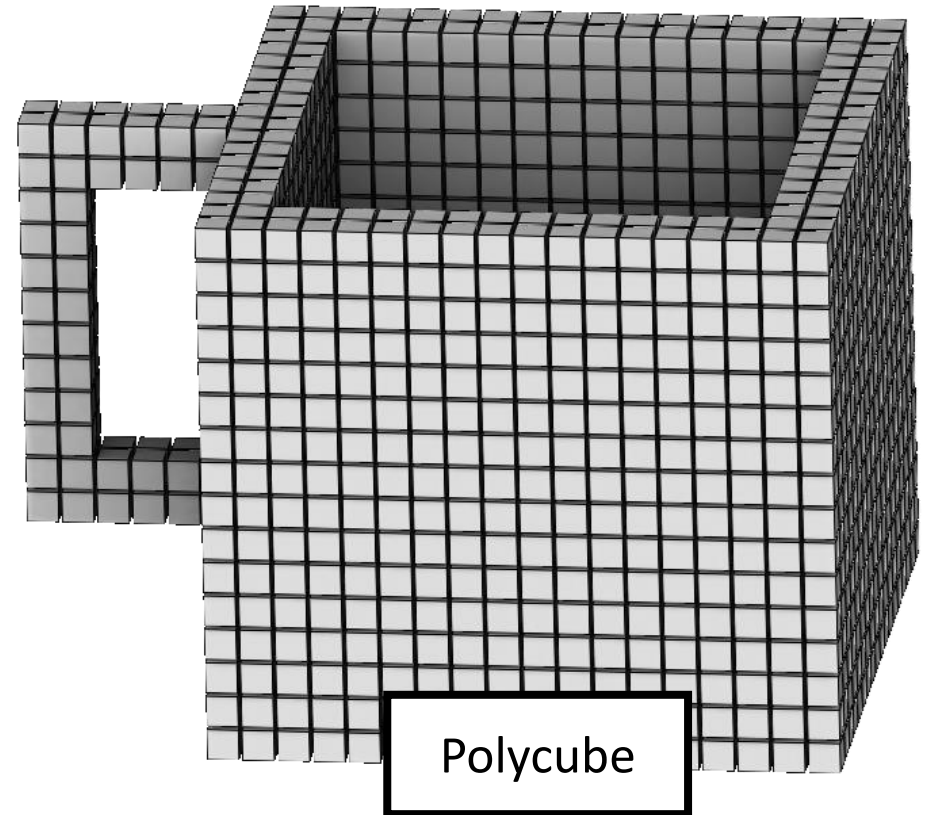
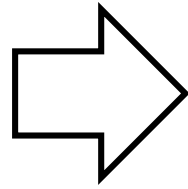
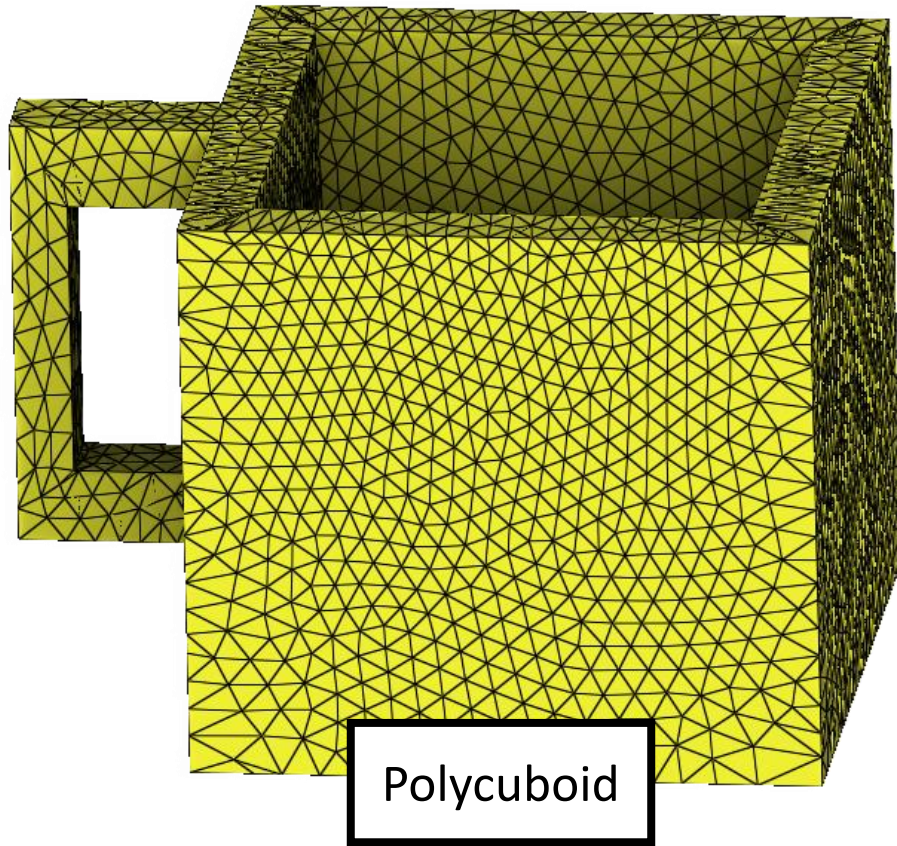
1 - génération du Polycuboid c. Récapitulation



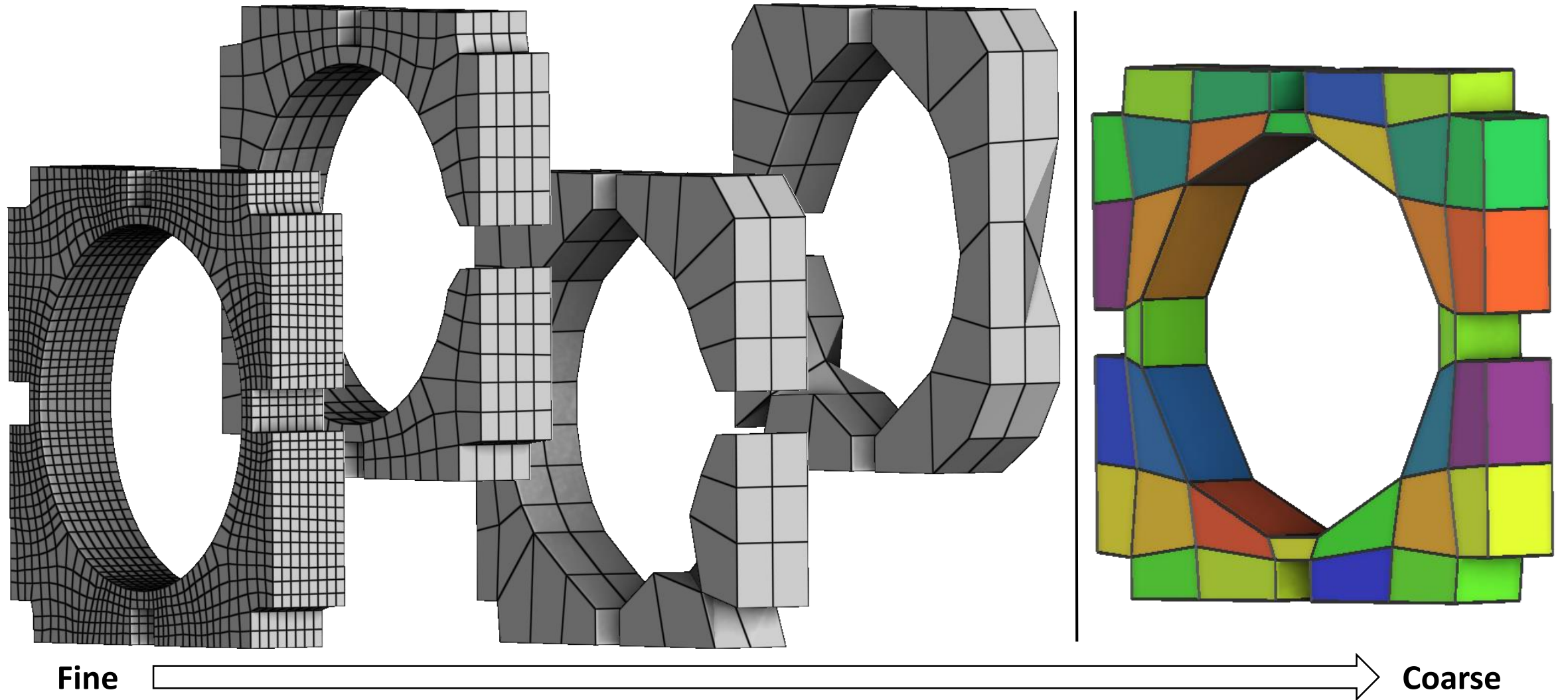
1 - Suite



2 - Quantization

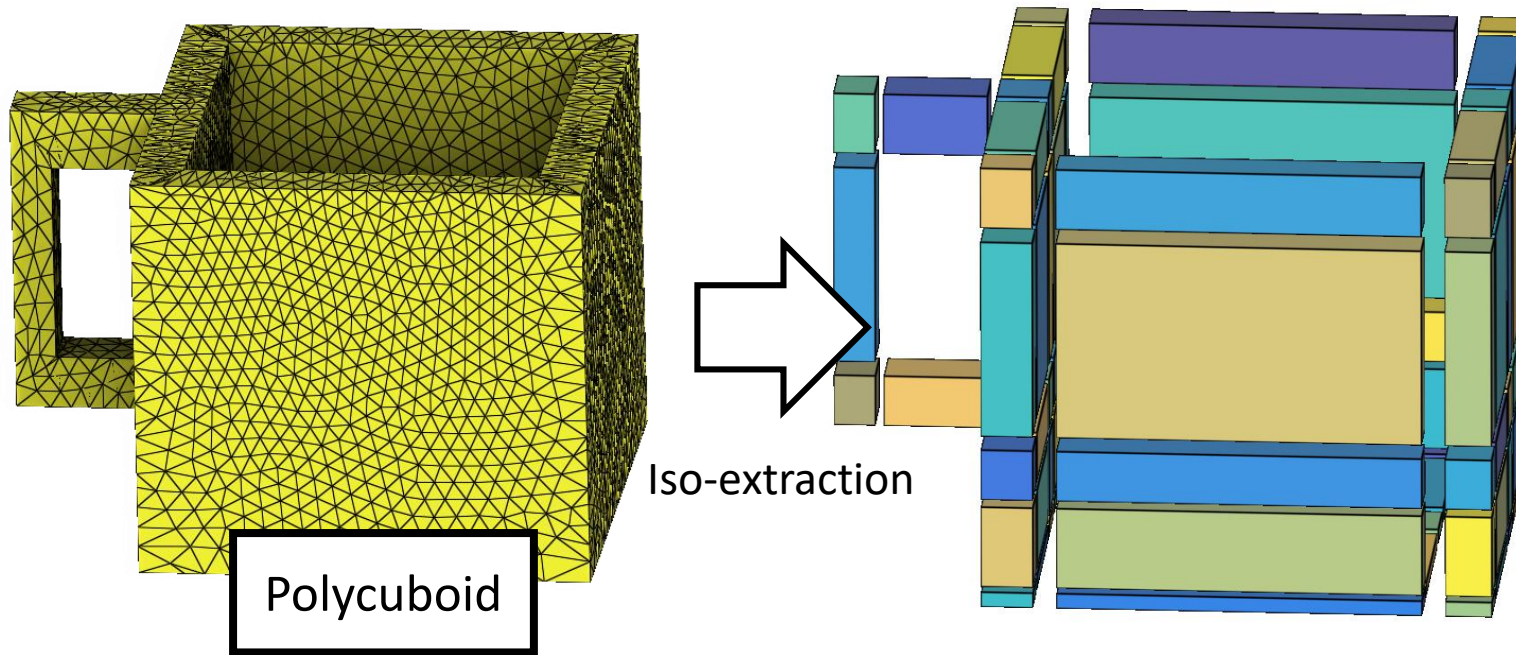


2 - Quantization



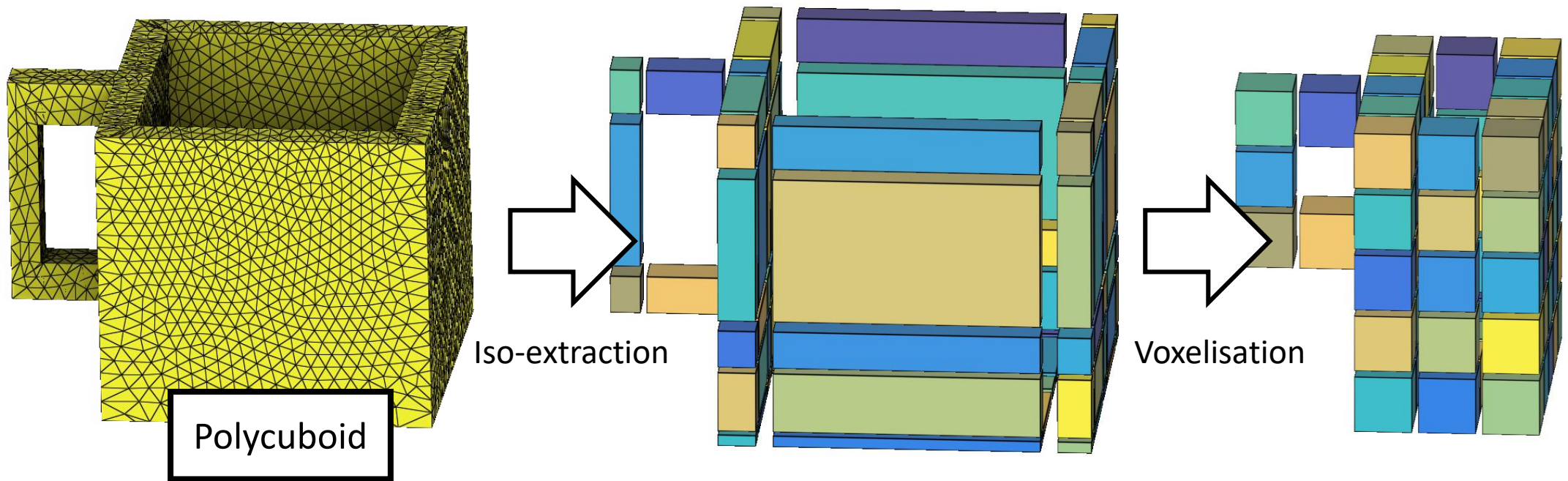
2 – Quantization

a. Block extraction



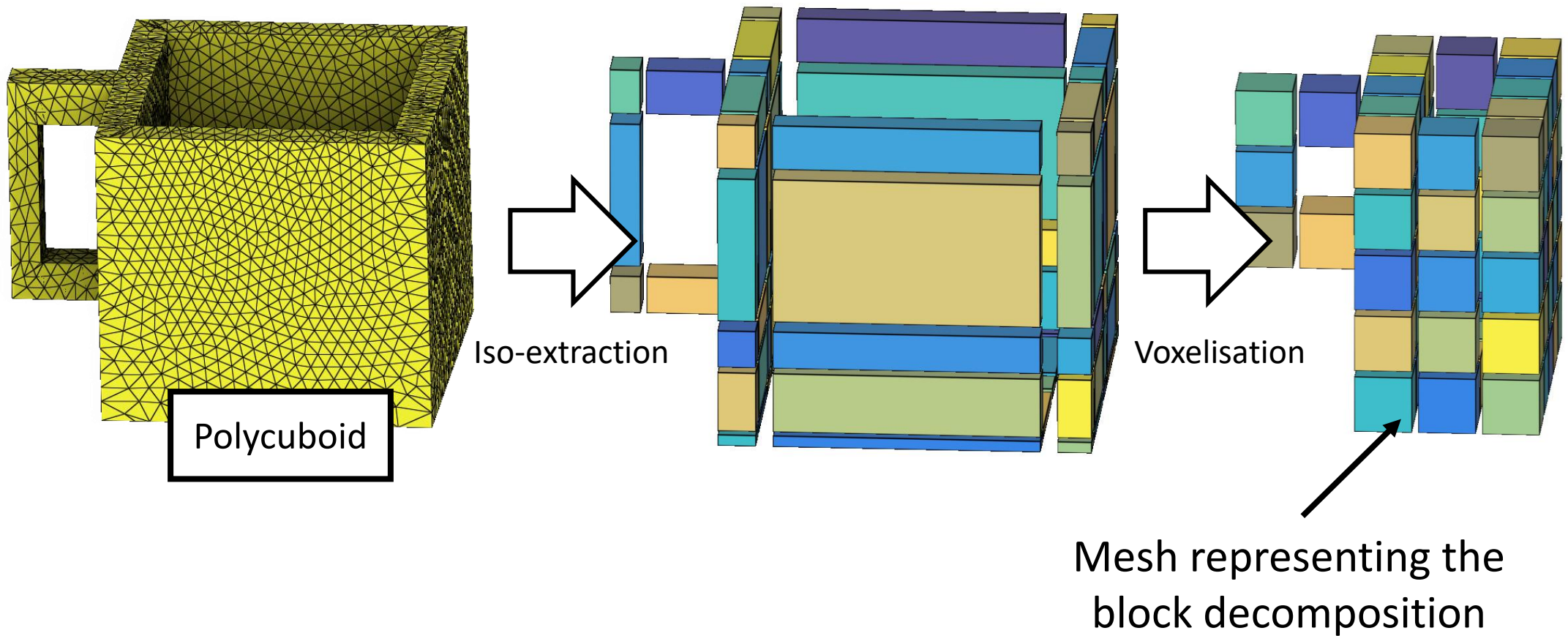
2 – Quantization

a. Block extraction



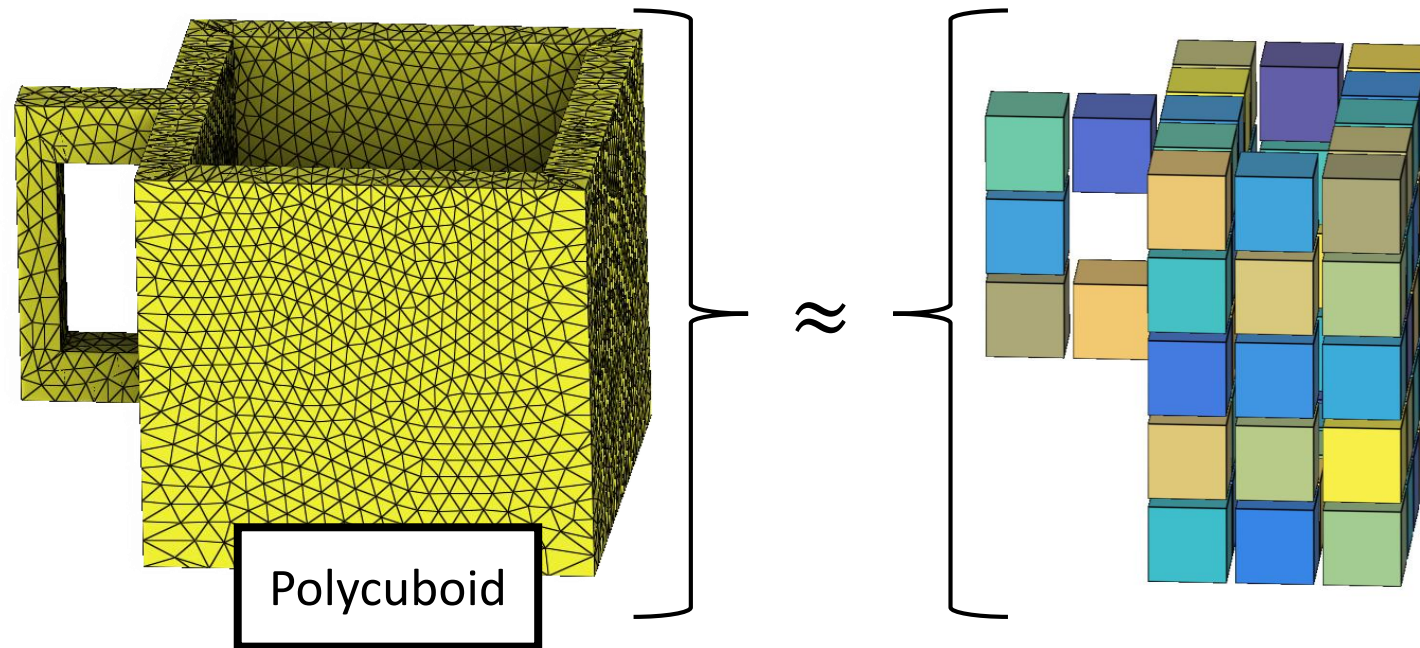
2 – Quantization

a. Block extraction



2 – Quantization

b. Size optimization



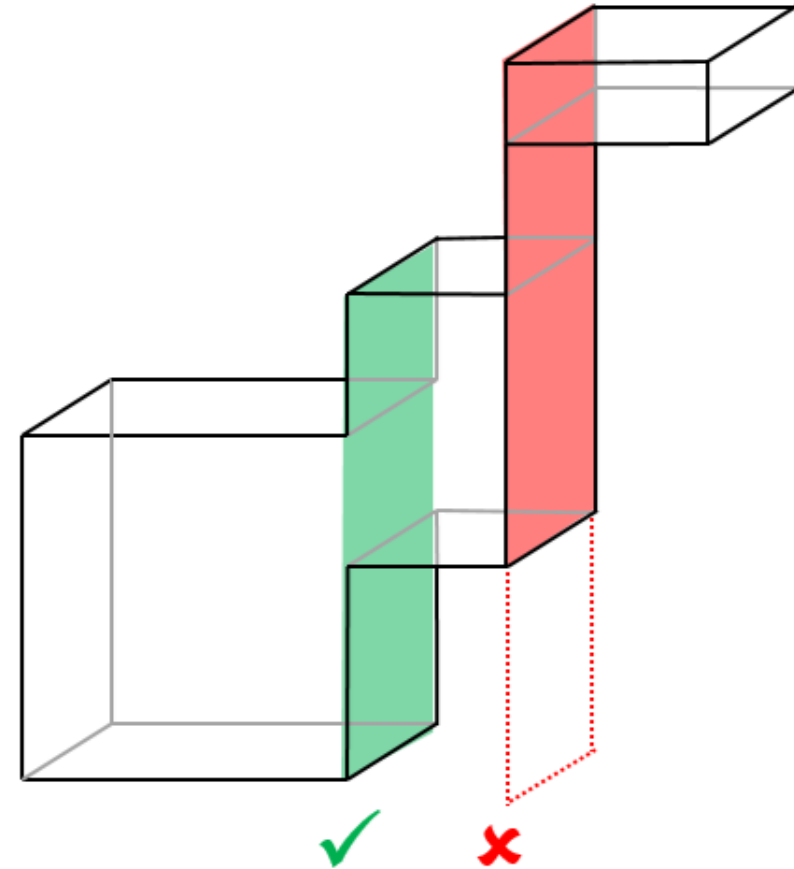
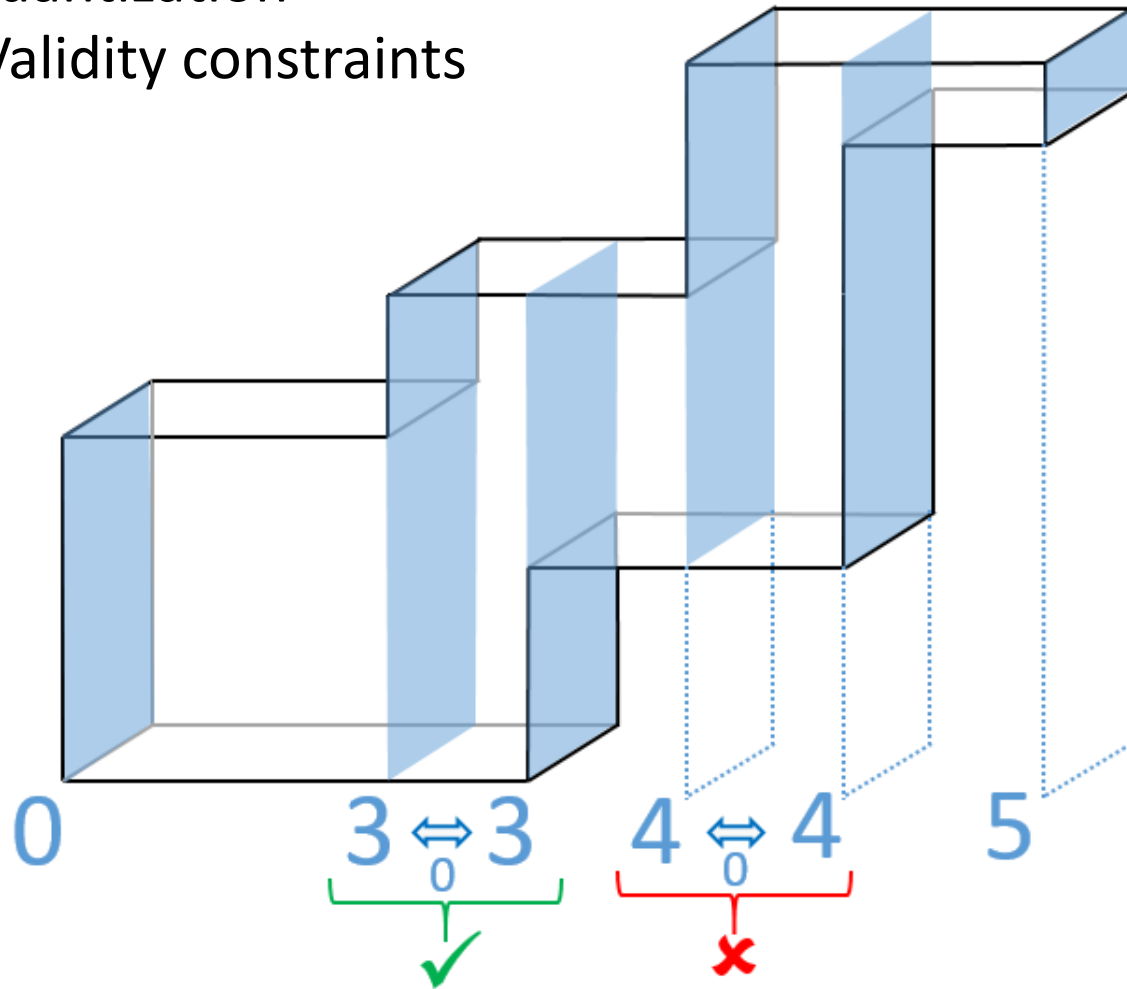
$$E = \sum_{\eta} \sum_{(i,j)} \#links^{\eta}(i,j) \left| \left| \eta_i^f - \eta_j^f \right| - \left| \eta_i^o - \eta_j^o \right| \right|$$

← Positions des isos

On optimise la distorsion le long de segments présents dans les deux maillages

2 – Quantization

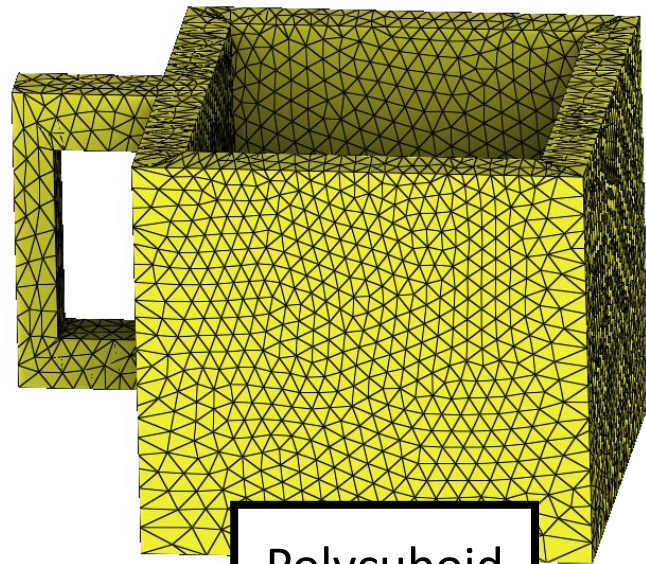
c. Validity constraints



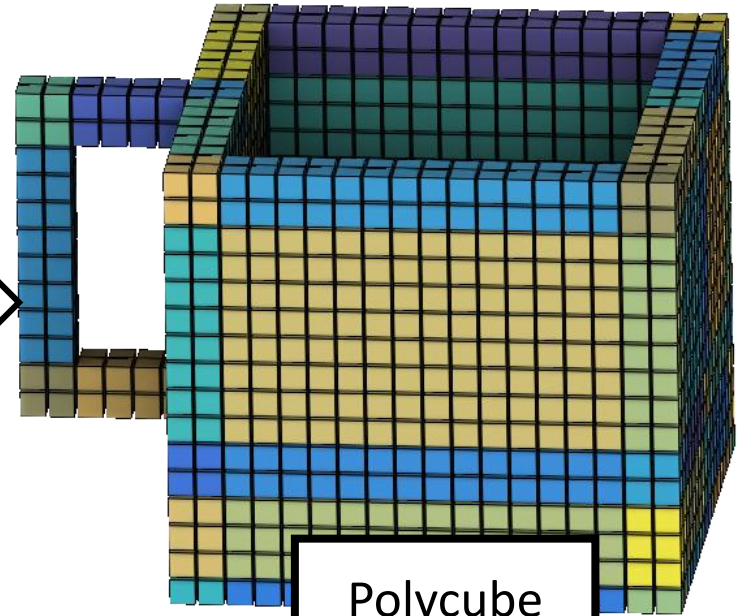
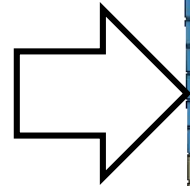
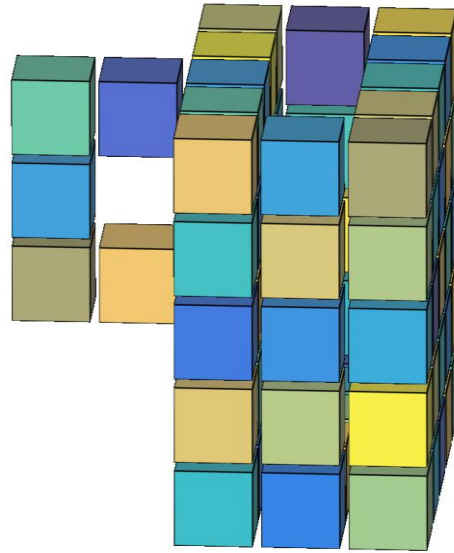
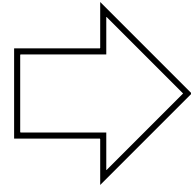
- ⇒ [C1] On conserve une relation d'ordre faible
[C2] « On ne doit pas écraser l'intérieur »

2 – Quantization

d. Solving

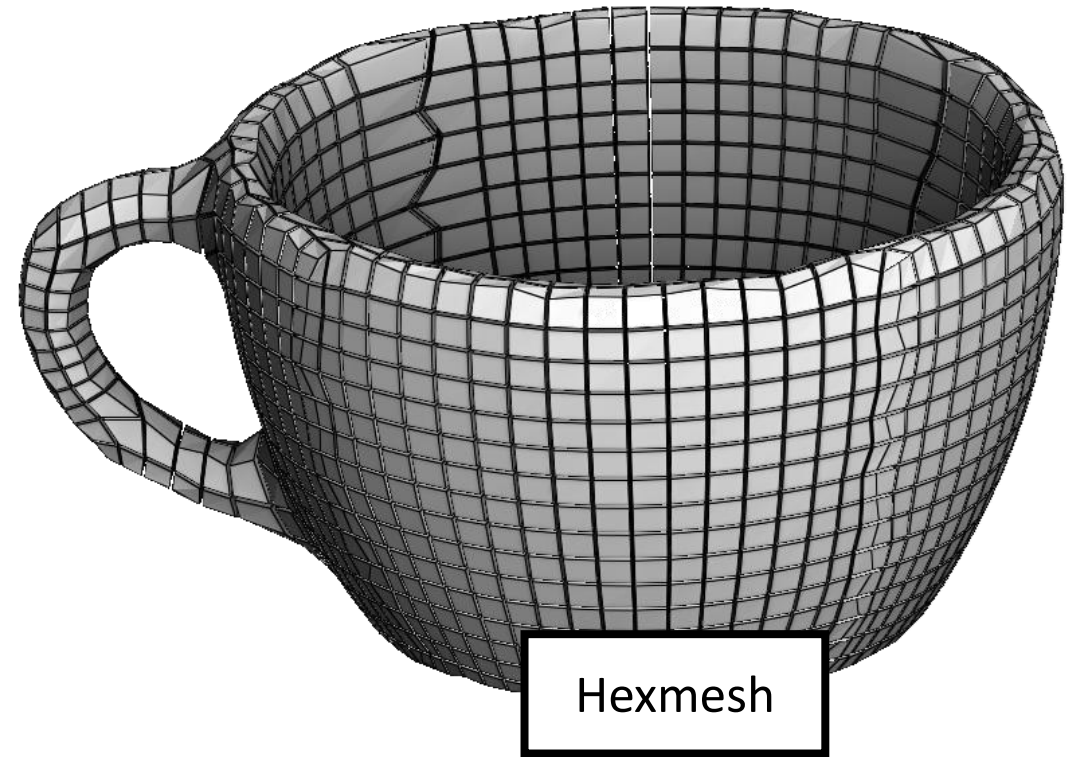
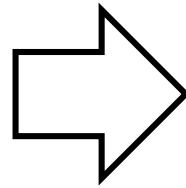
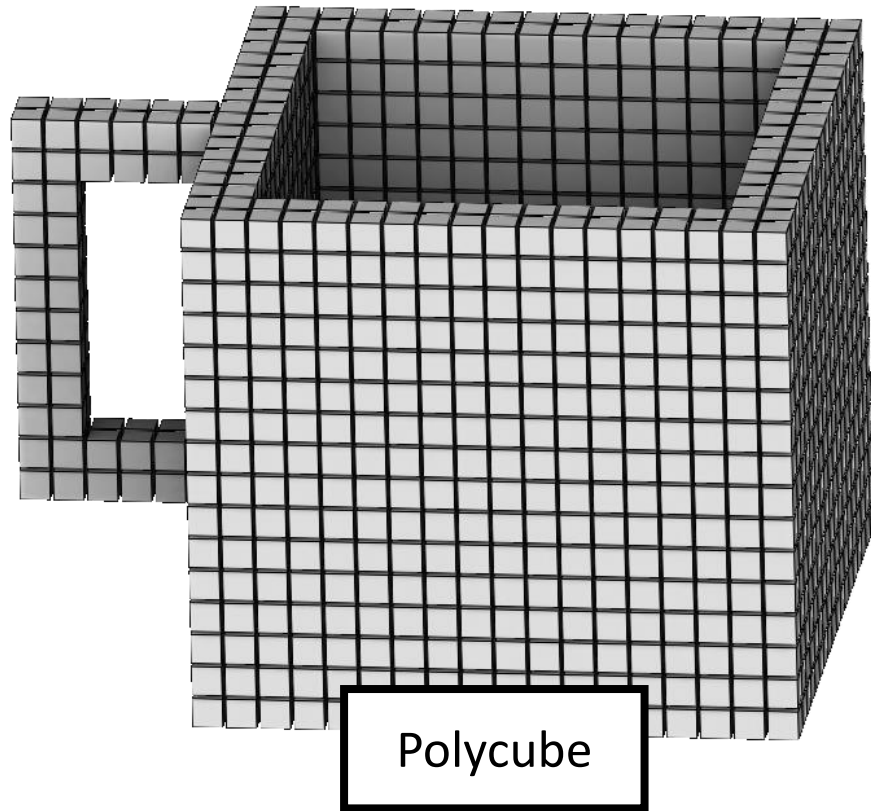


Polycuboid



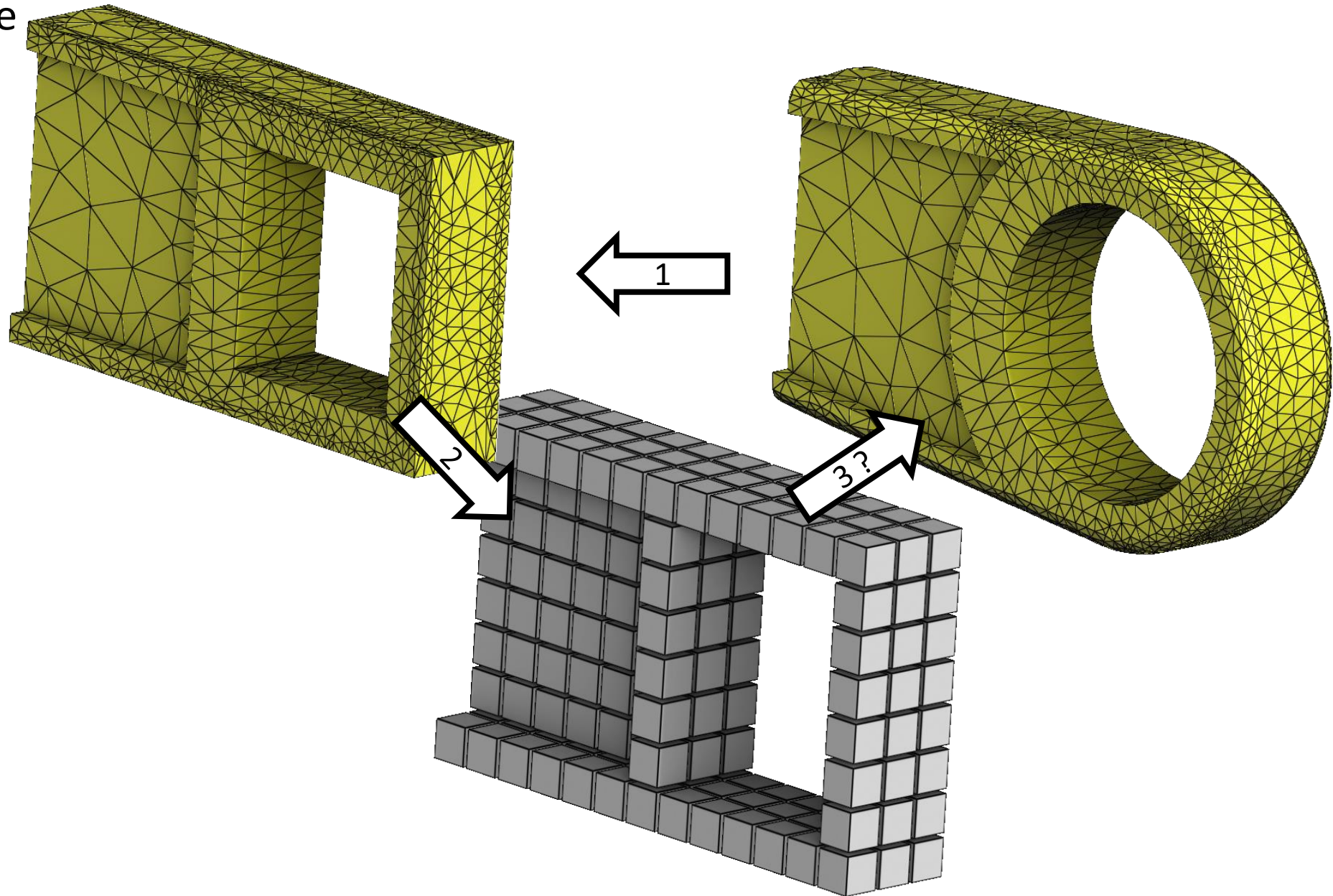
Polycube

3 - Inversion



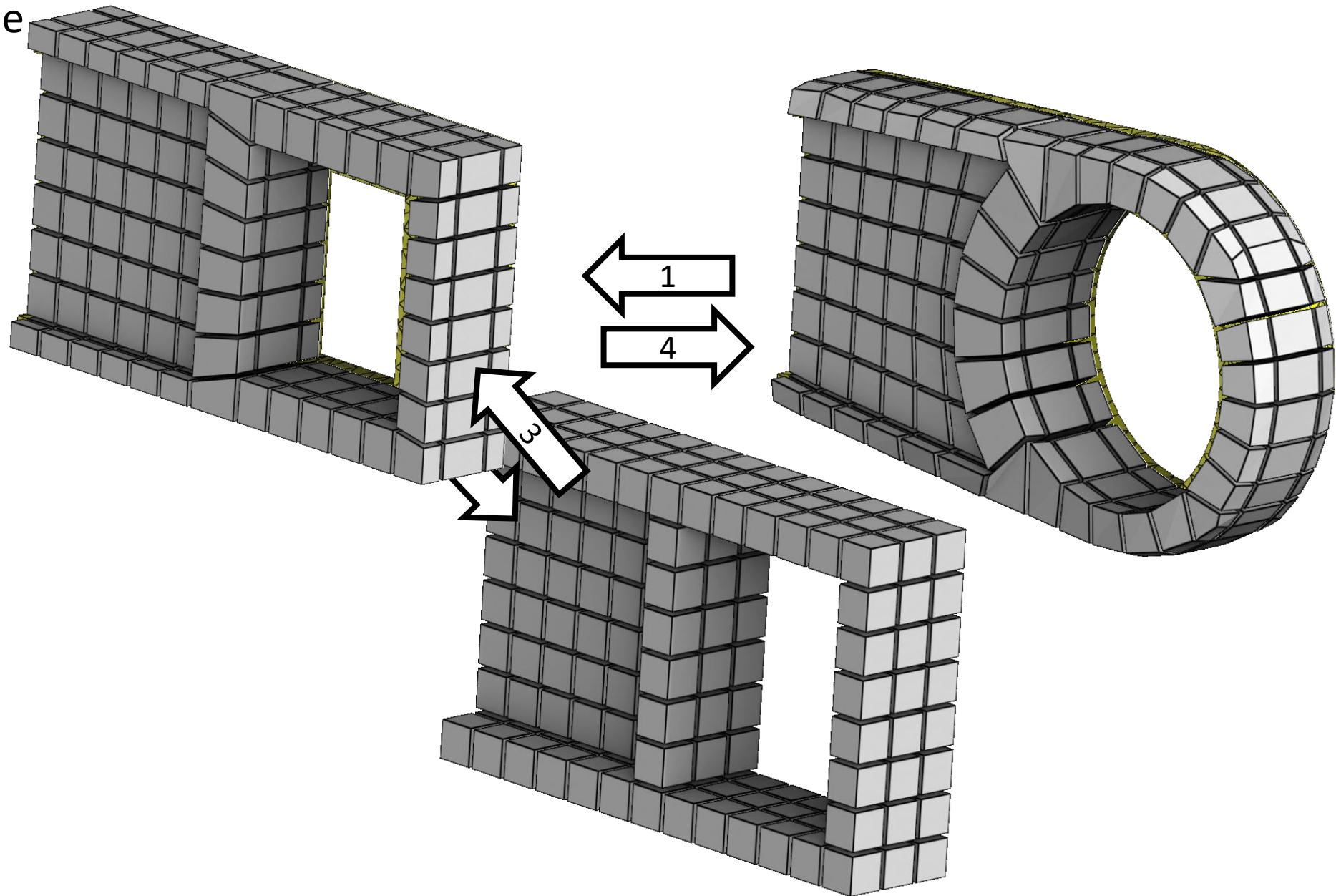
3 - Inversion

a. Principle

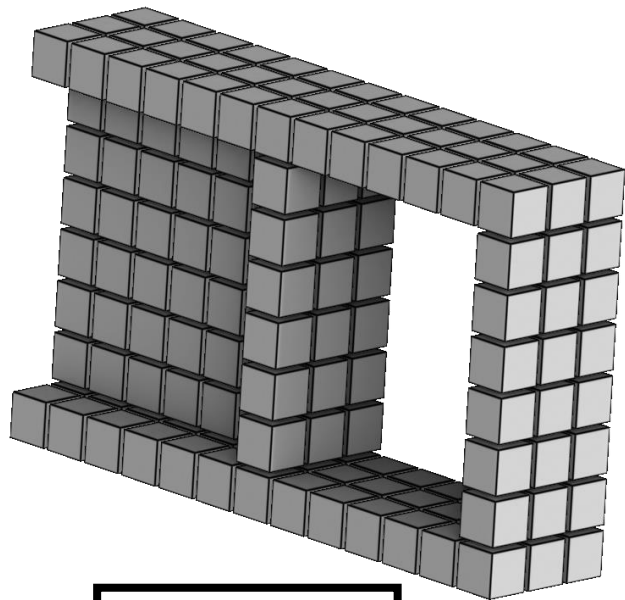


3 - Inversion

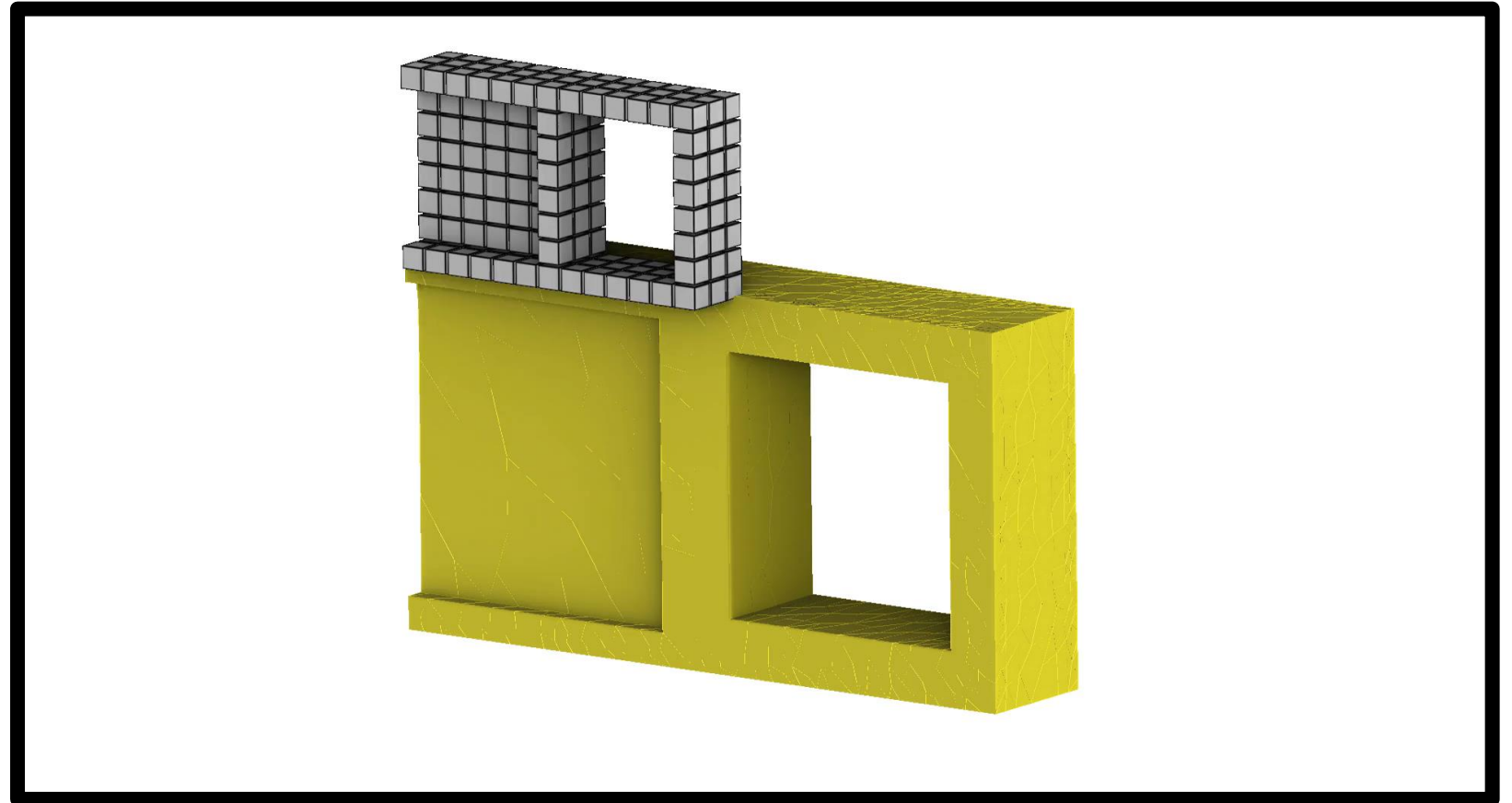
a. Principle



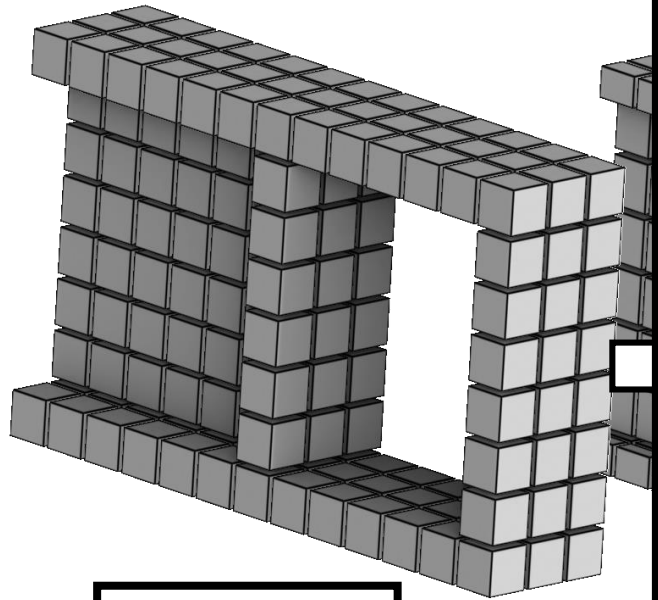
3 - Inversion b. Solving



Polycube

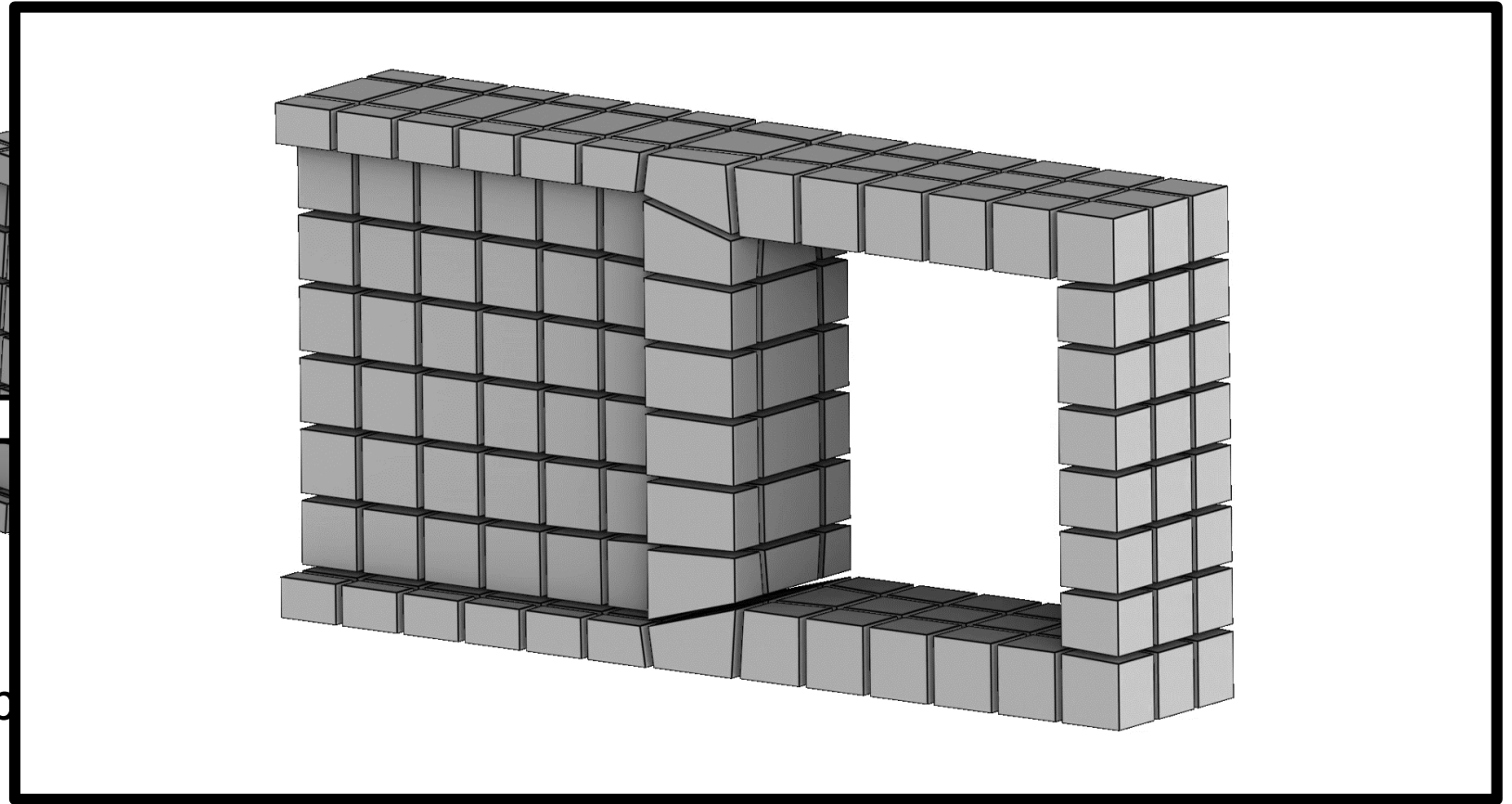


3 - Inversion b. Solving

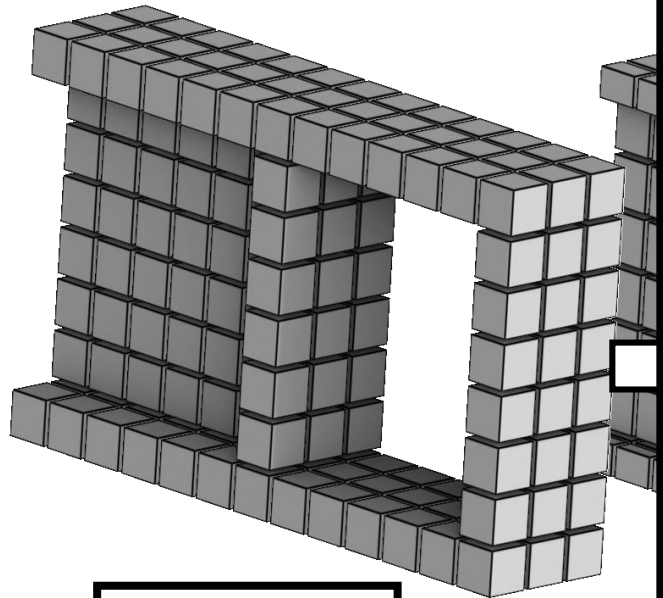


Polycube

Lap

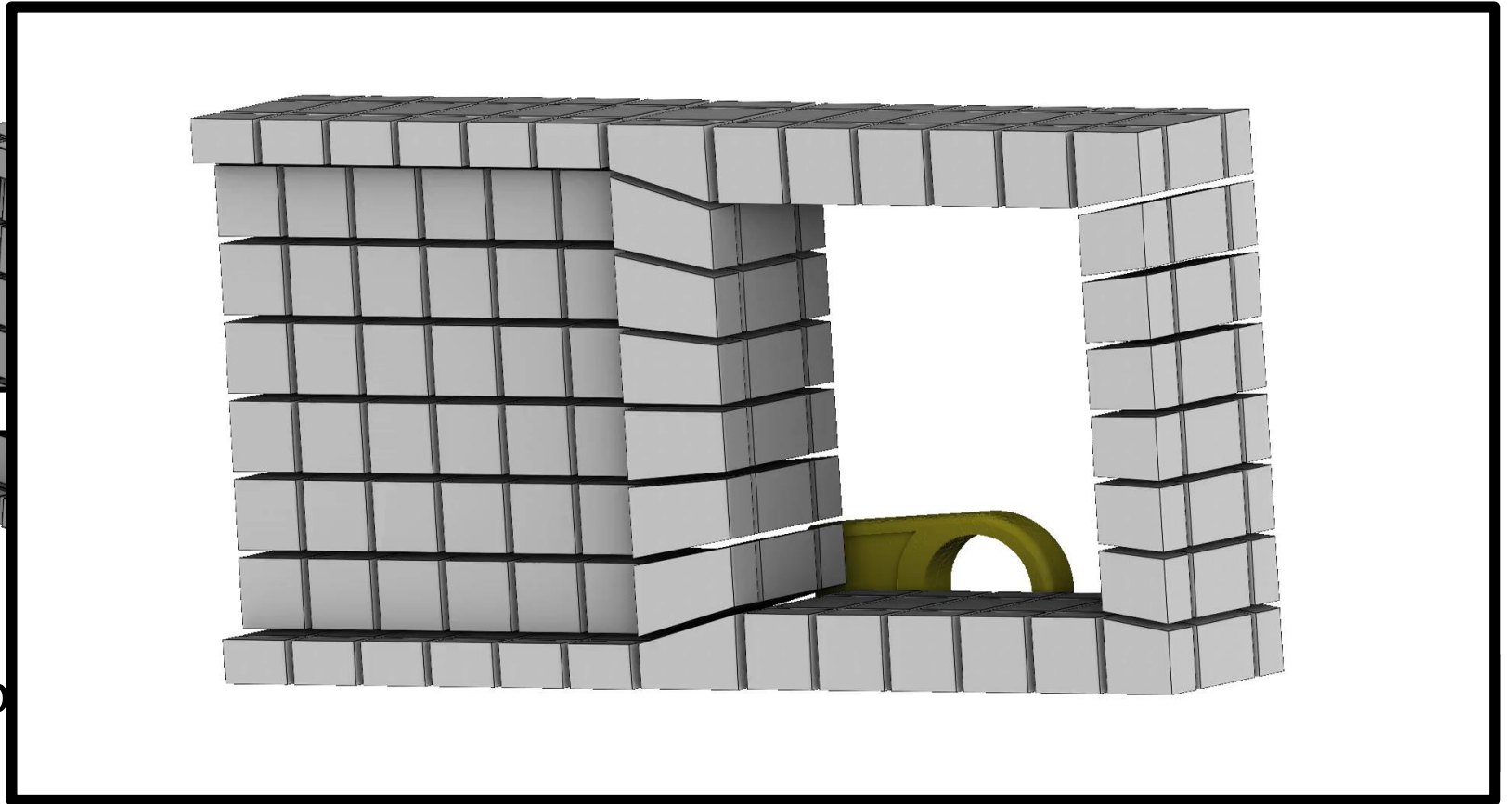


3 - Inversion b. Solving

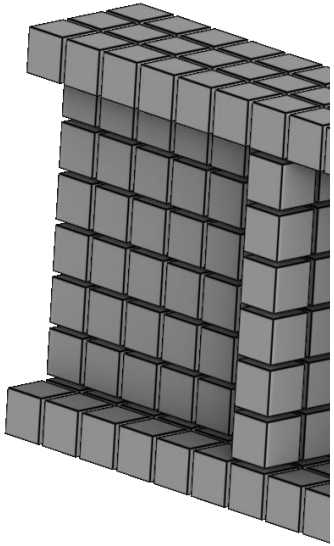


Polycube

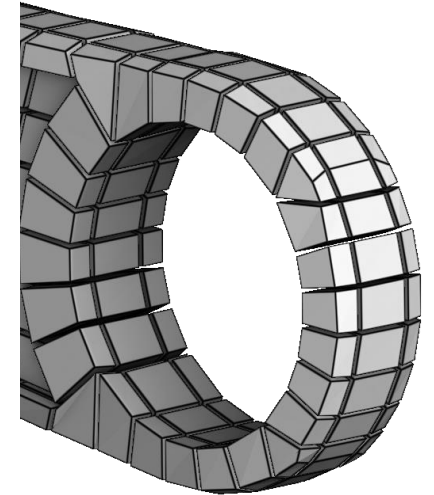
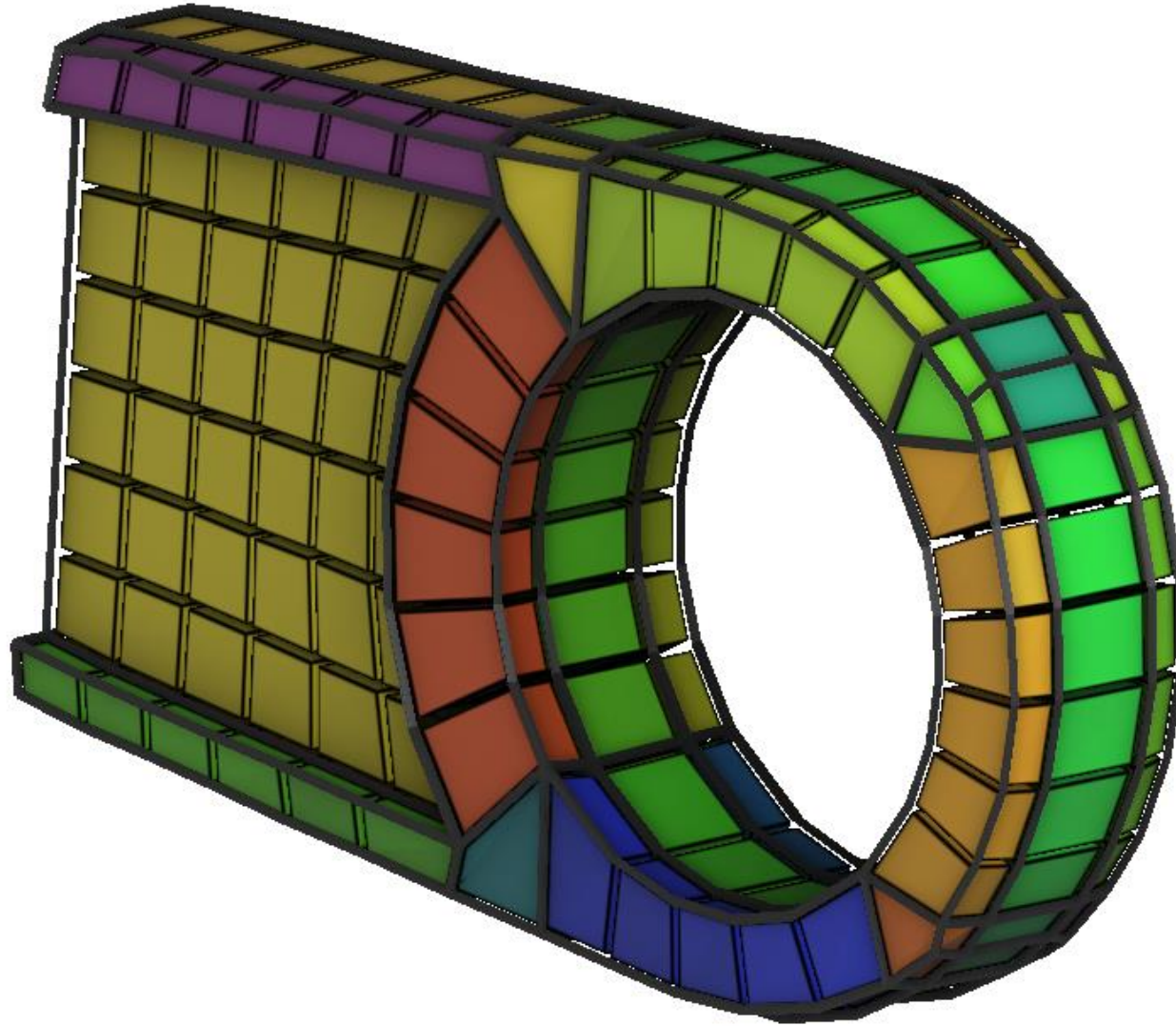
Lap



3 - Inversion b. Solving



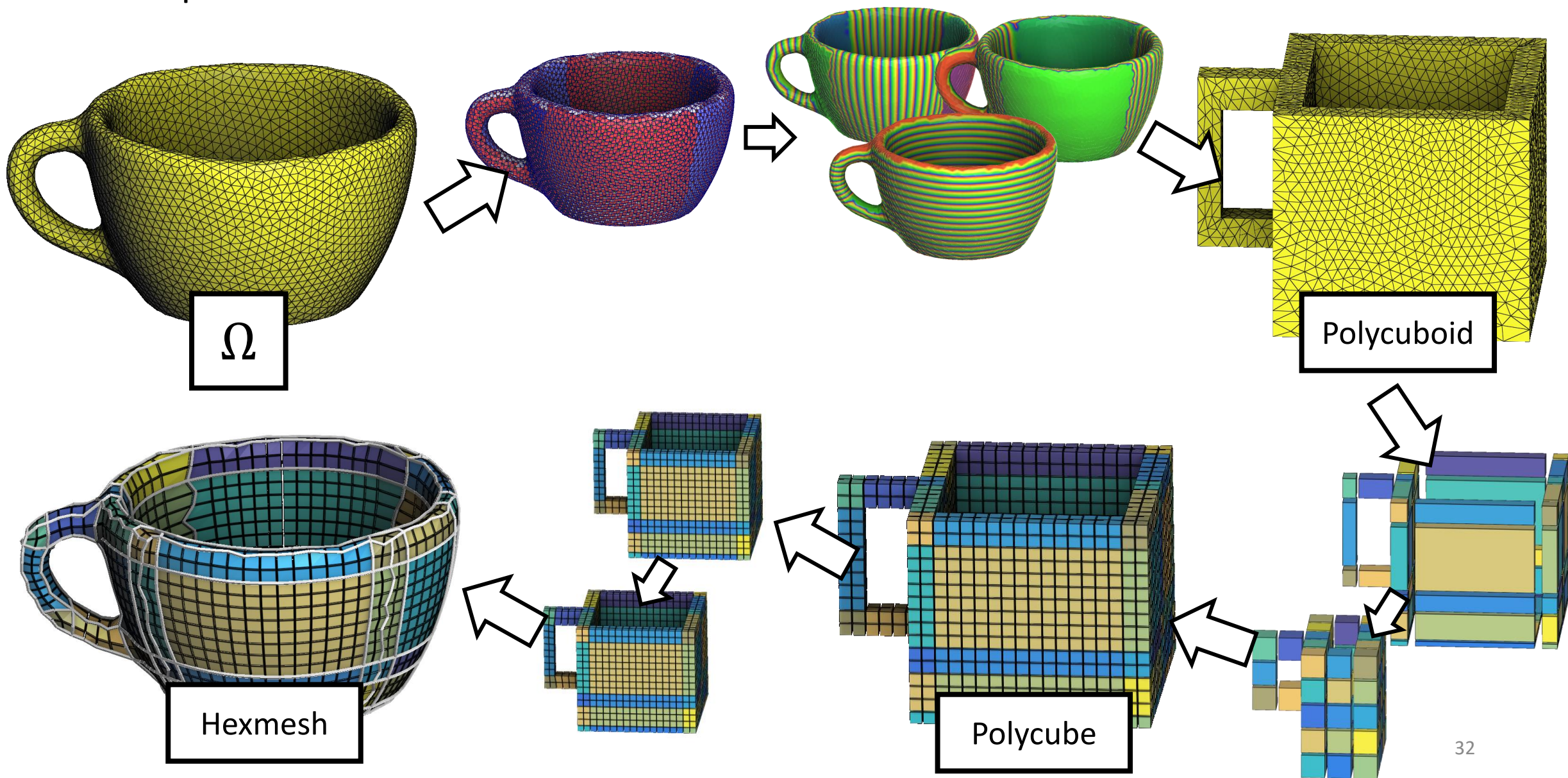
Polycube



Hexmesh

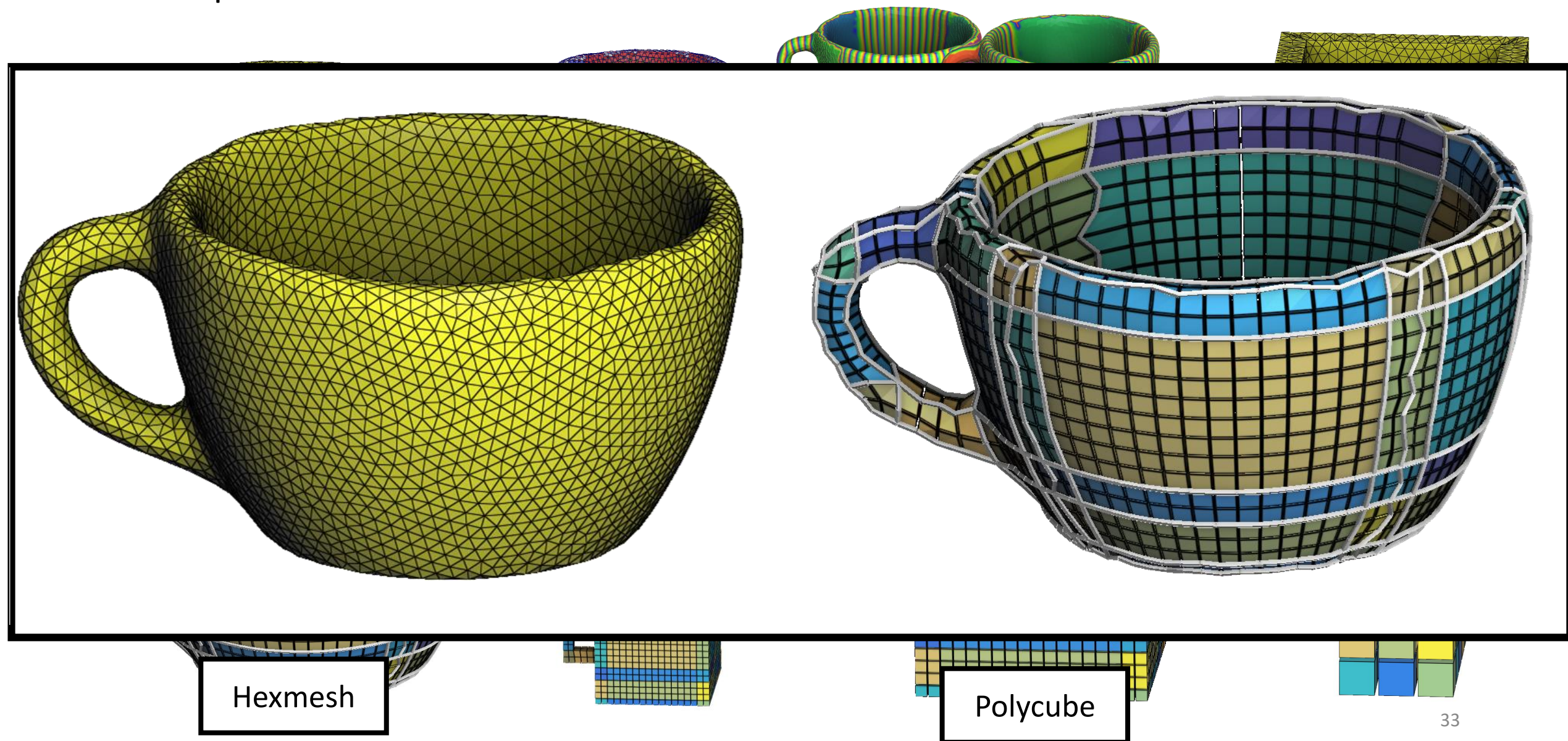
4 – Discussion et résultats

b. Recap



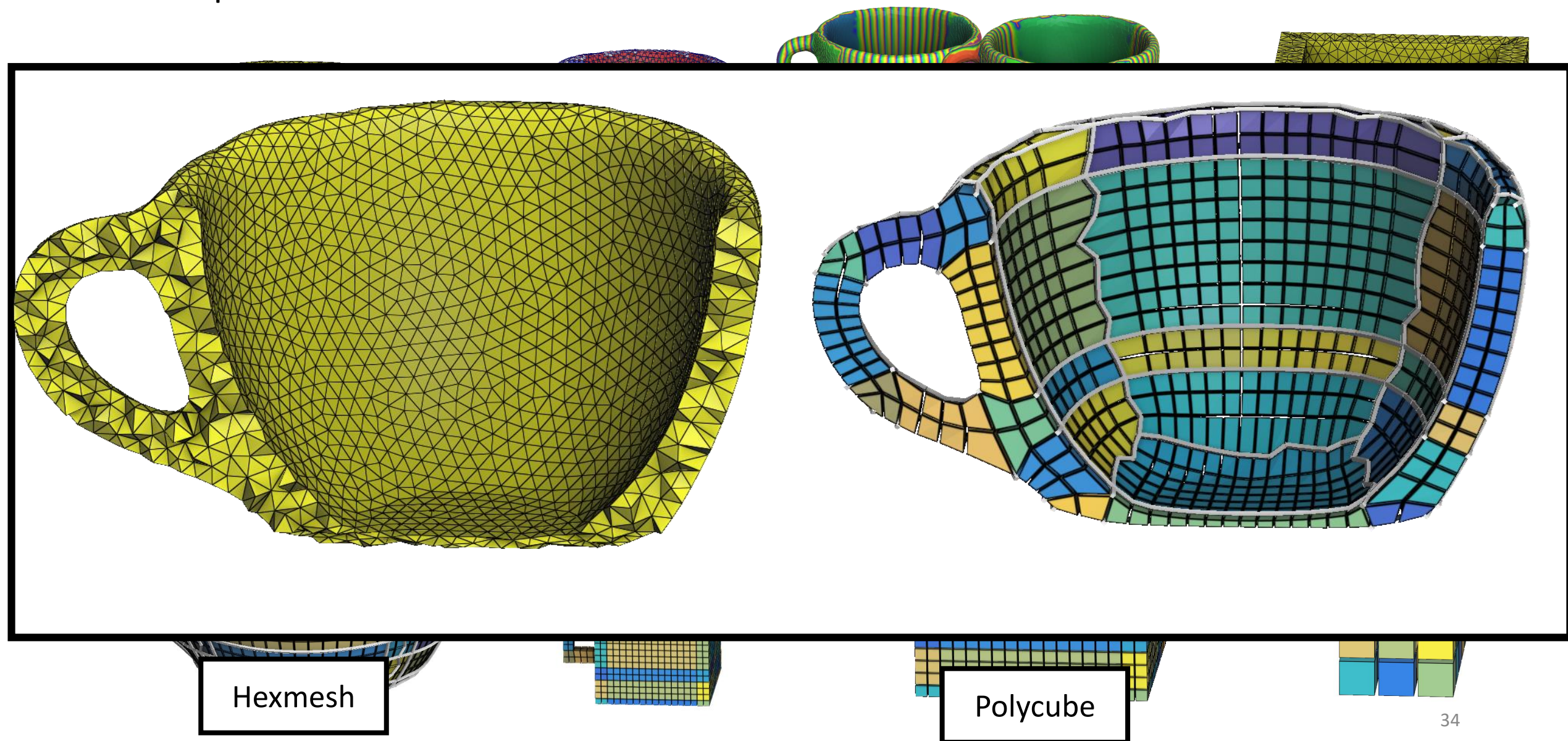
4 – Discussion et résultats

b. Recap



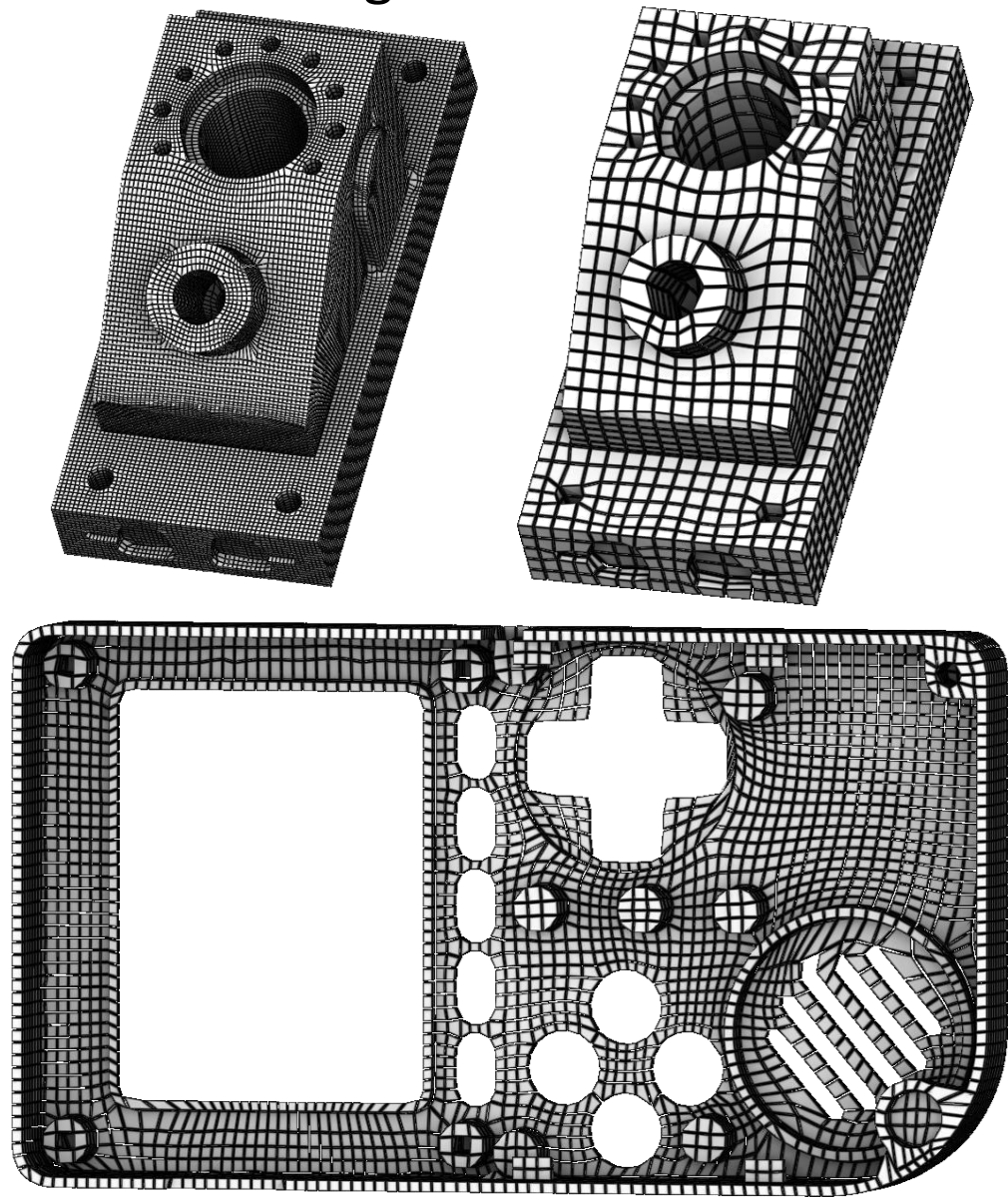
4 – Discussion et résultats

b. Recap



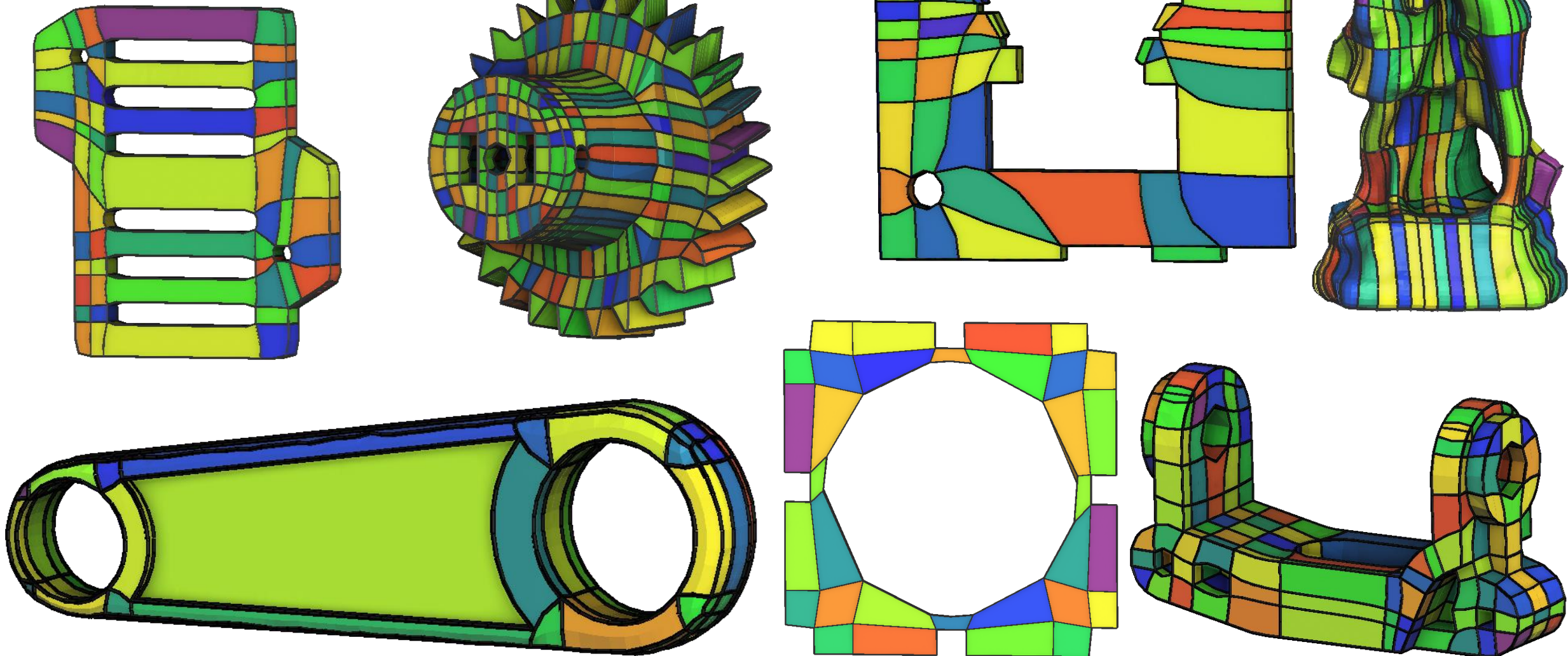
4 – Discussion et résultats

b. Hex-Meshing



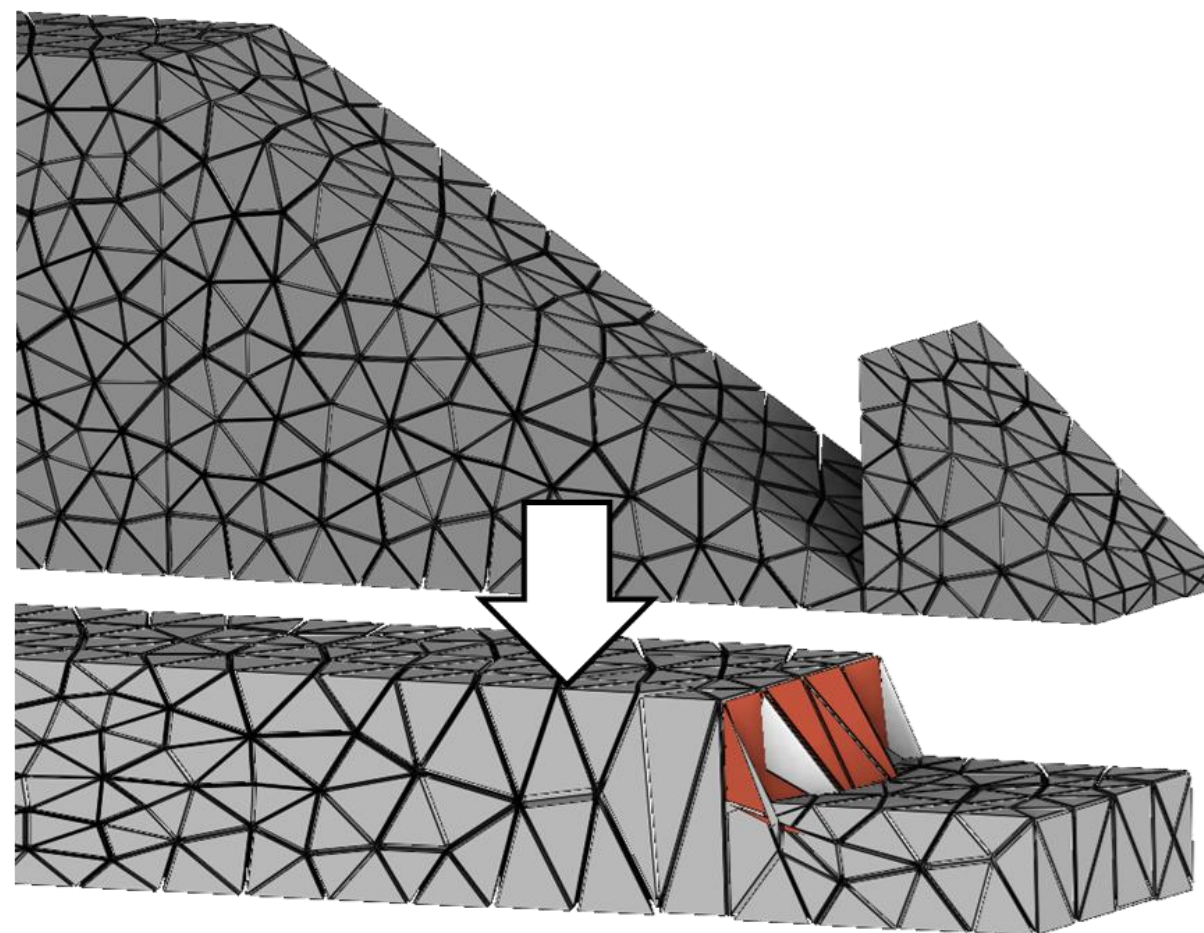
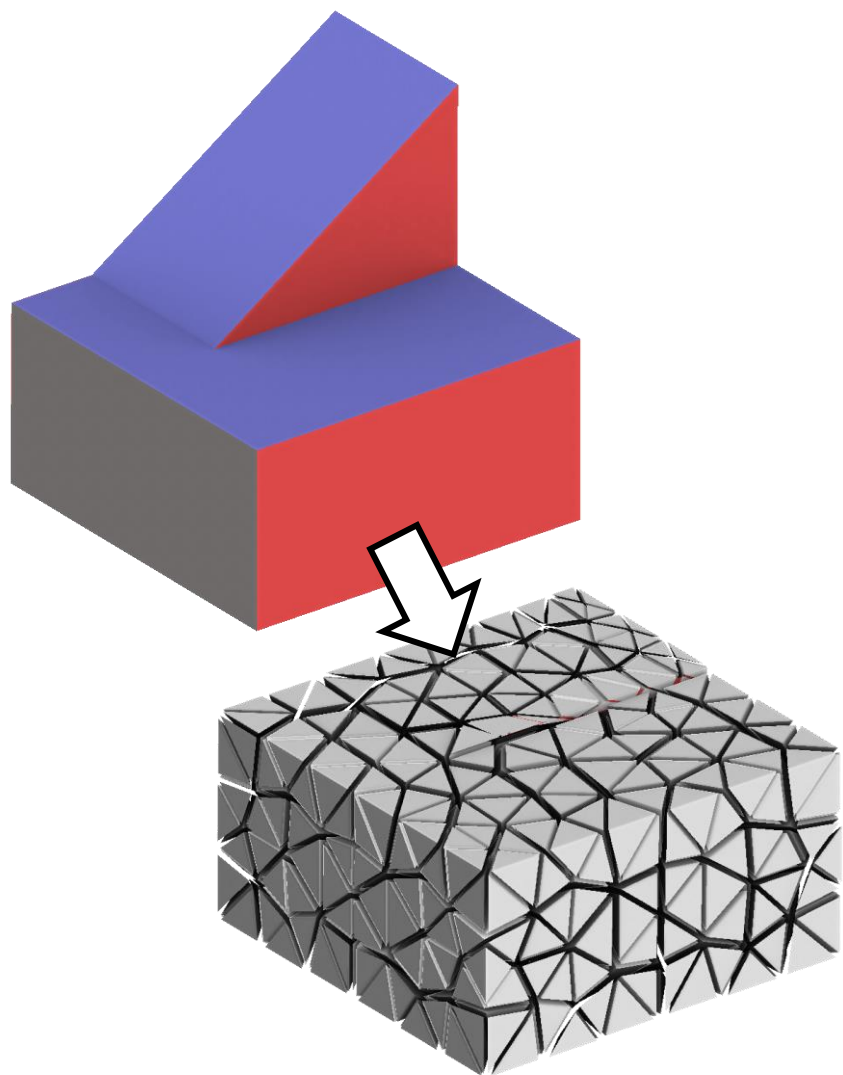
4 – Discussion et résultats

c. Robustness and coarse bloc decomposition



4 – Discussion et résultats

c. Weakness



Merci pour votre attention

