A morphing machining strategy for artificial bone

一种基于曲面变形的人工骨骼渐进式加工方法

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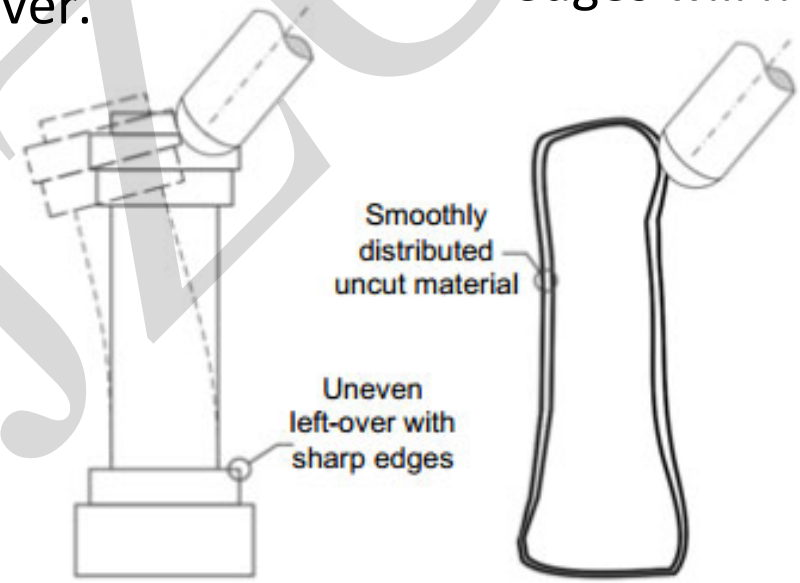
Main goal

Traditional iso-height roughing

- Stock is cut by layers of the same Z-direction height.
- Uneven cutting depths may introduce impact to slender workpieces.
- Stair-case materials with sharp edges are left over.

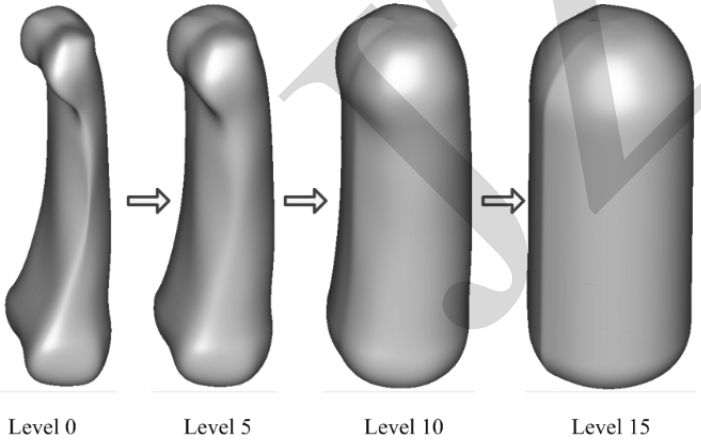
The proposed morphing machining strategy (MMS)

- Stock gradually morphs to final shape.
- Cutting depths are evenly distributed over the surface.
- Stair-case materials with sharp edges will not appear.



Major methods and algorithm

- Set the workpiece surface as the morphing source surface and the stock surface as the goal surface.
- Energy-minimization morphing of the control vertices.
- Tool path generation on each internal surfaces.



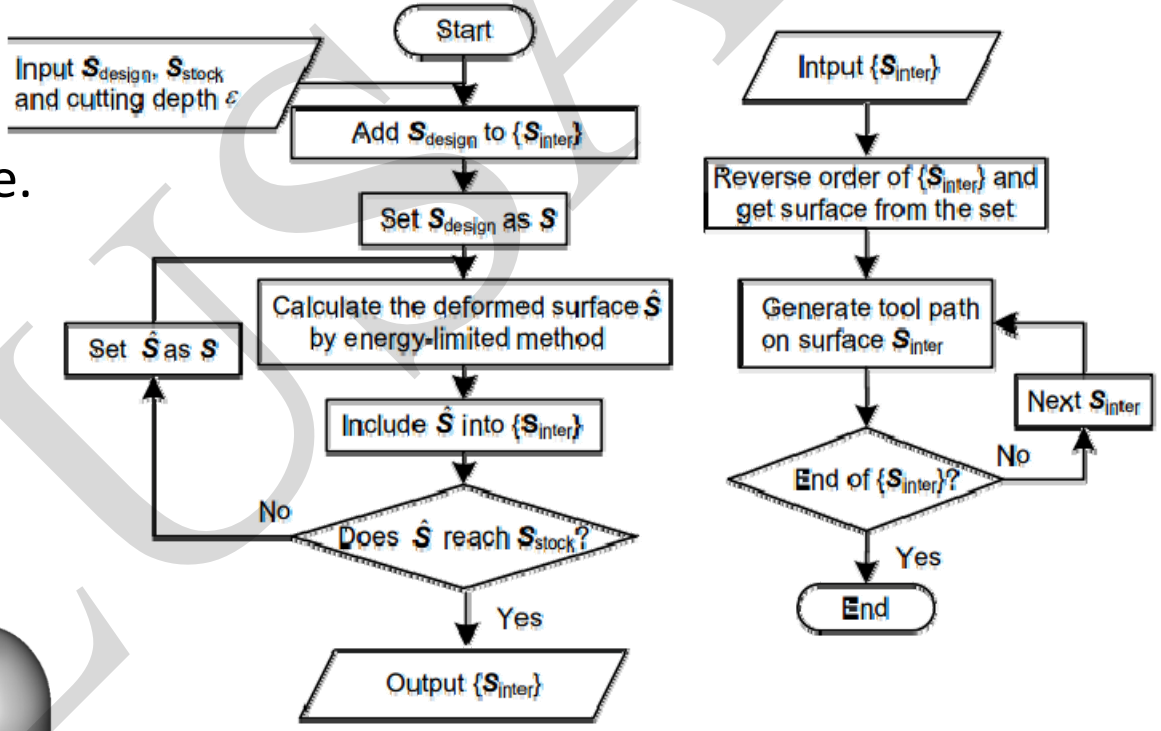


Fig. 5 Complete flowchart of the proposed MMS

Results and contribution

- 1. A novel morphing machining strategy (MMS) is proposed.
- 2. An energy-based surface morphing method for T-spline surface is developed and used for level generation in MMS.
- 3. The application of MMS fabrication to an artificial finger bone is proposed. Results show that it can produce a better machining quality.
- 4. This work is the first attempt to apply T-spline in the area of medical care.