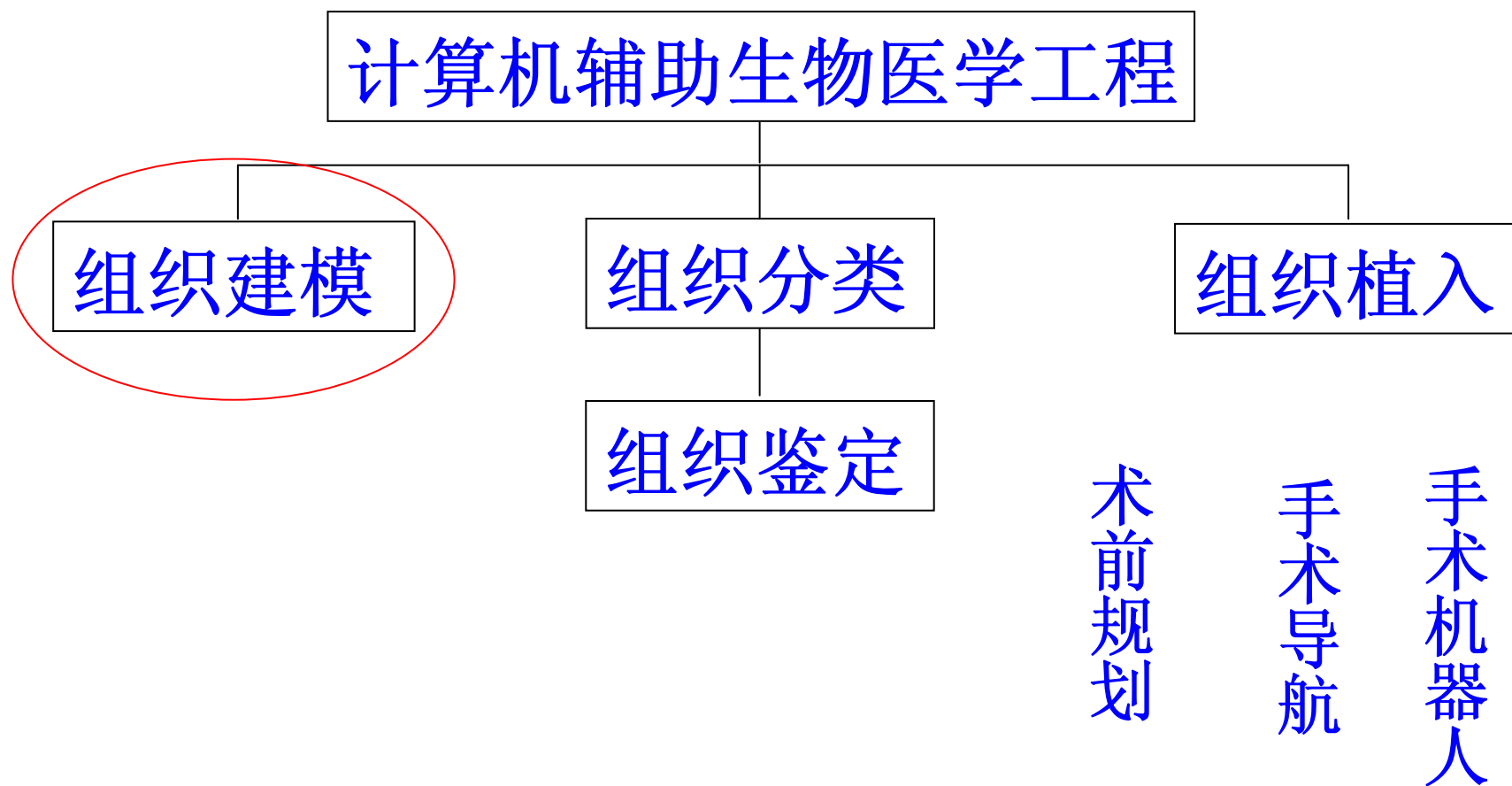

CAD在计算机辅助生物医学工程中的应用

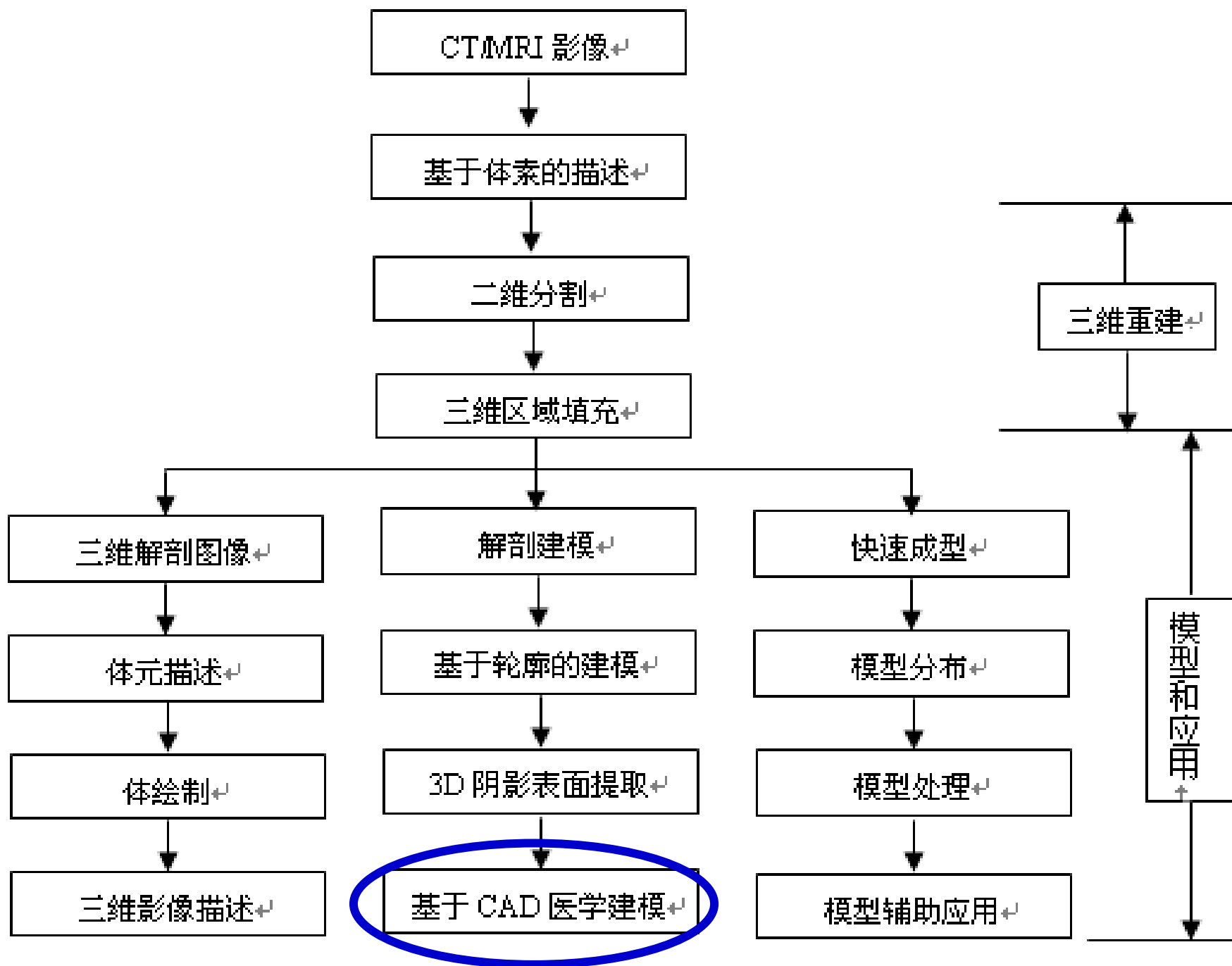
报告者：刘浩

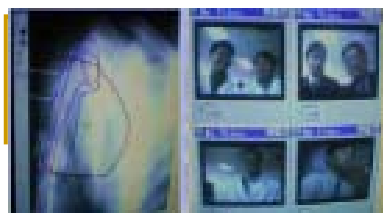
报告提纲

- 计算机辅助生物医学工程与
CAD/CAM/CAE
- 生物医学工程中的几何建模现状
- 细分曲面几何建模构想

计算机辅助生物医学工程



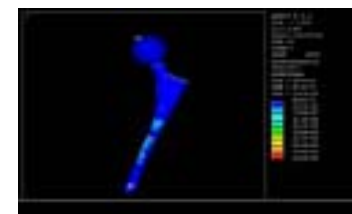
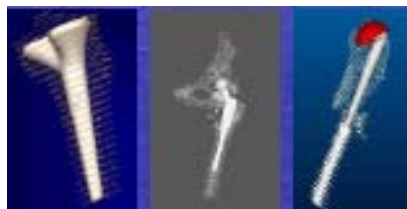
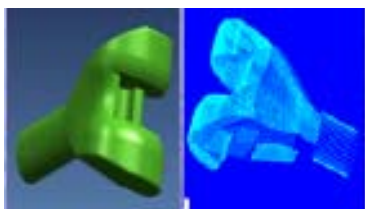




手术方案讨论
与假体概念设计
讨论

几何图像的处理与建模

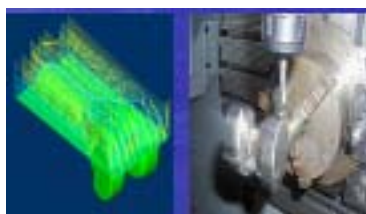
快速成型制作骨架



对成品模型进行反求

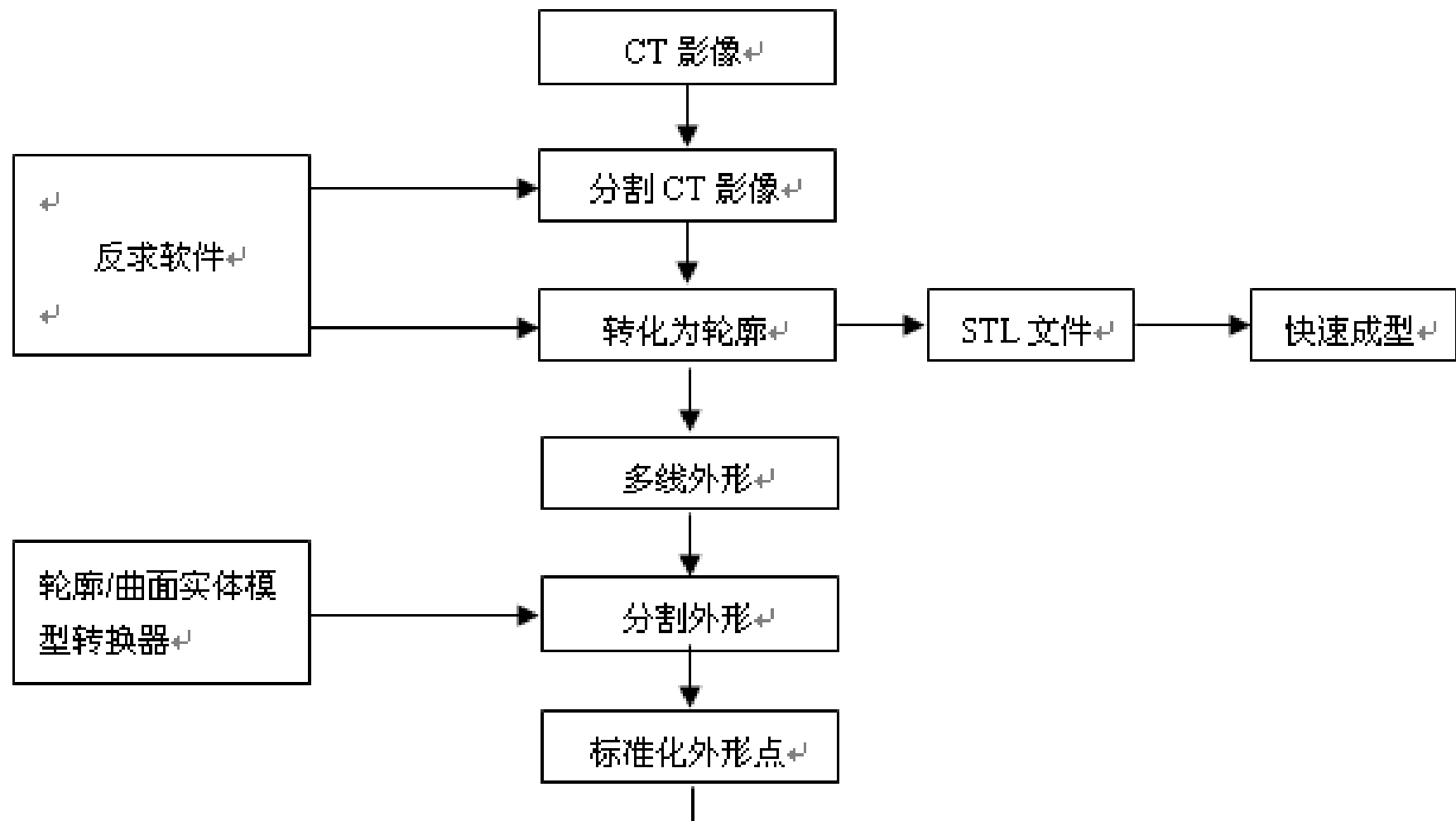
个性化三维设计

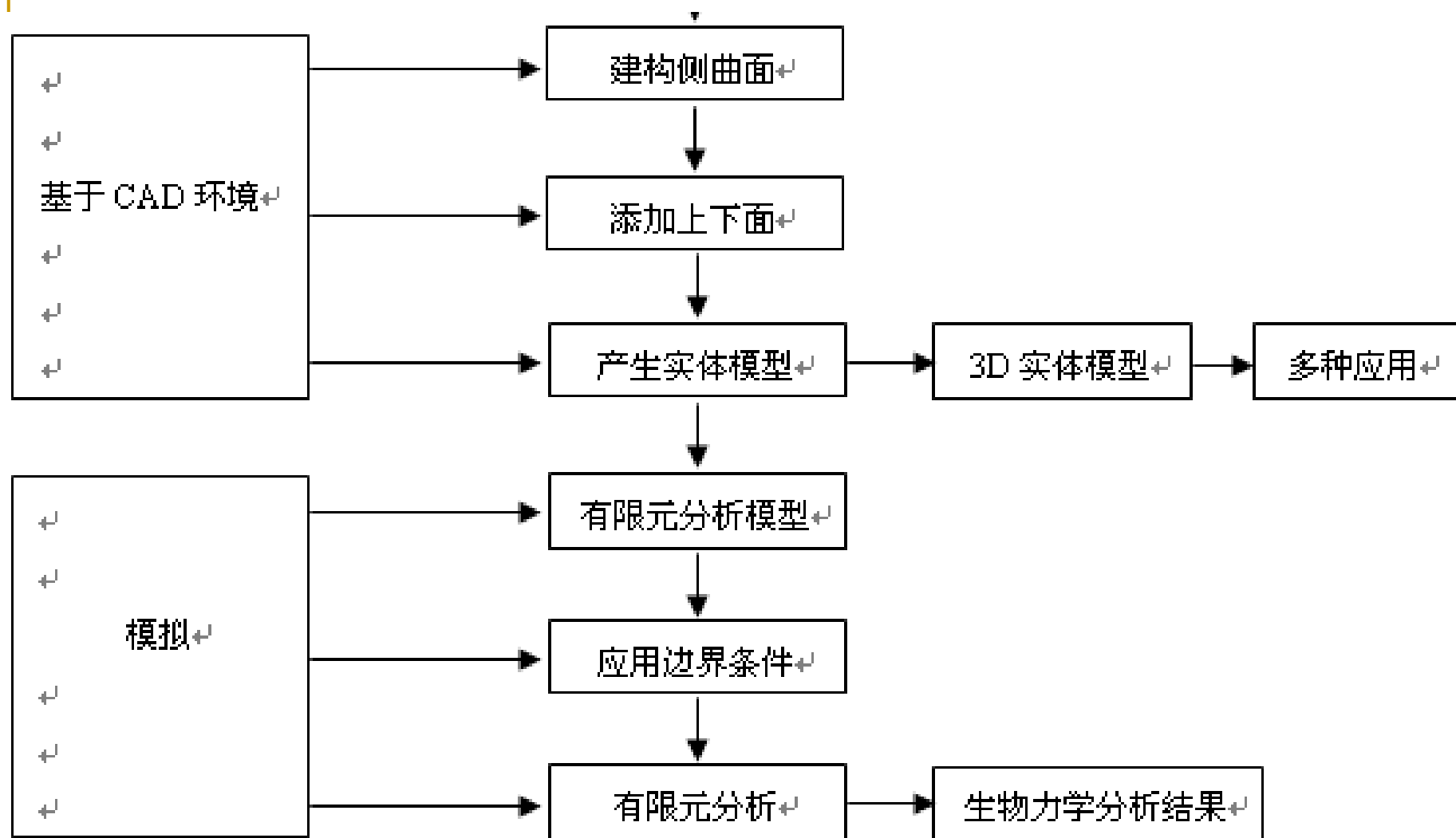
有限元分析



生成数控加工指令

制作成品交付使用



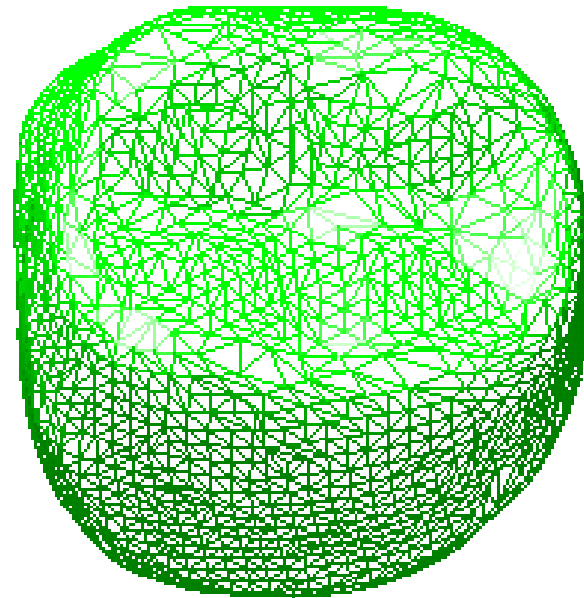
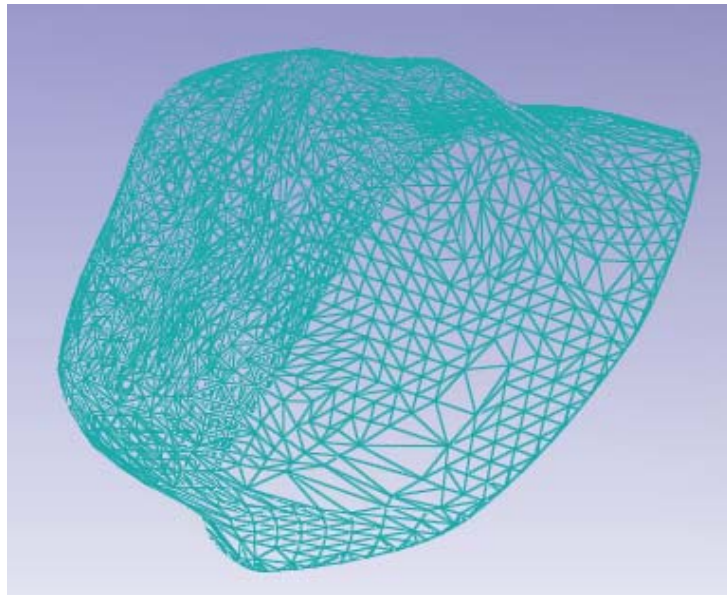


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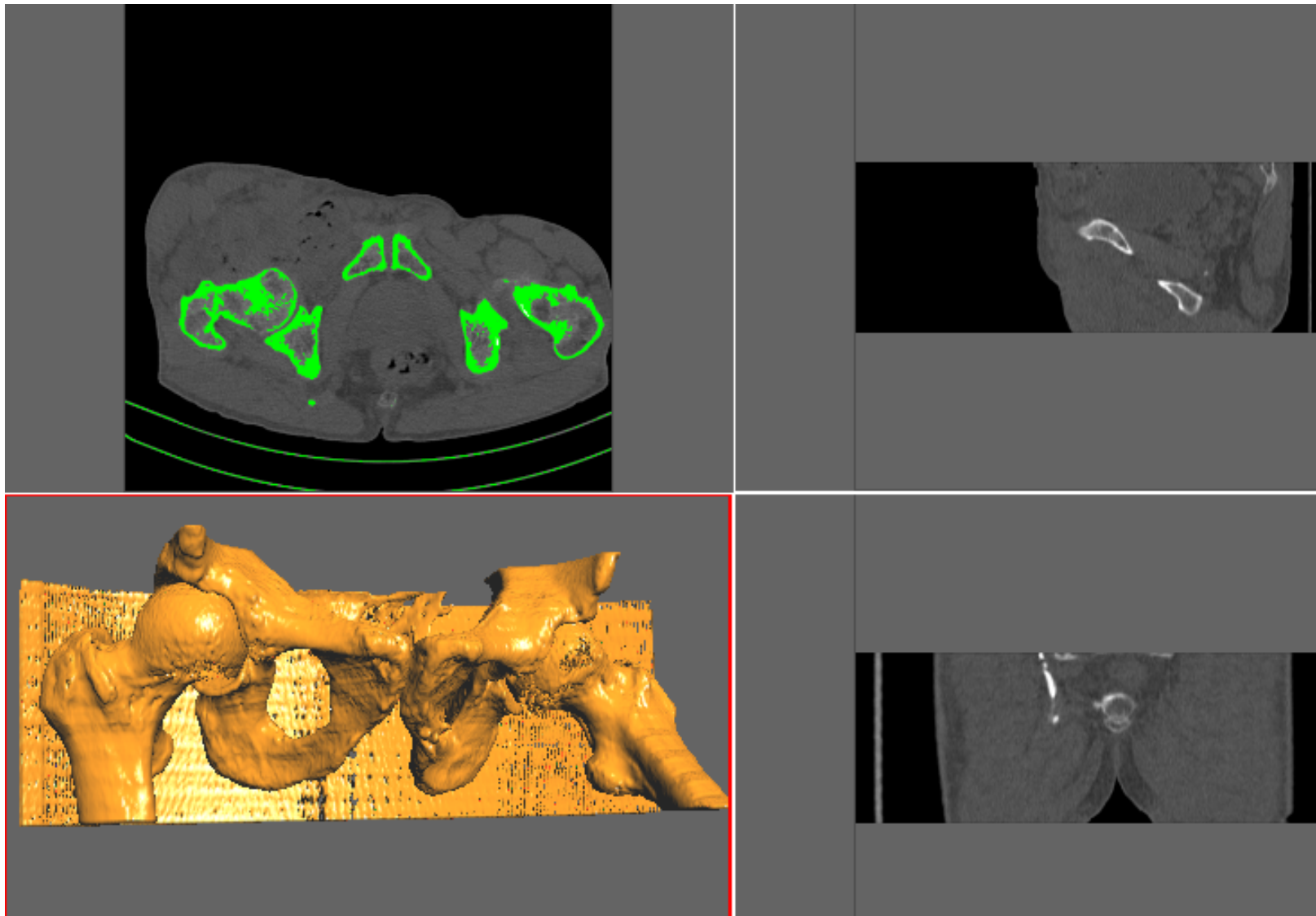
生物医学工程中的几何建模现状

无结构三角网格1



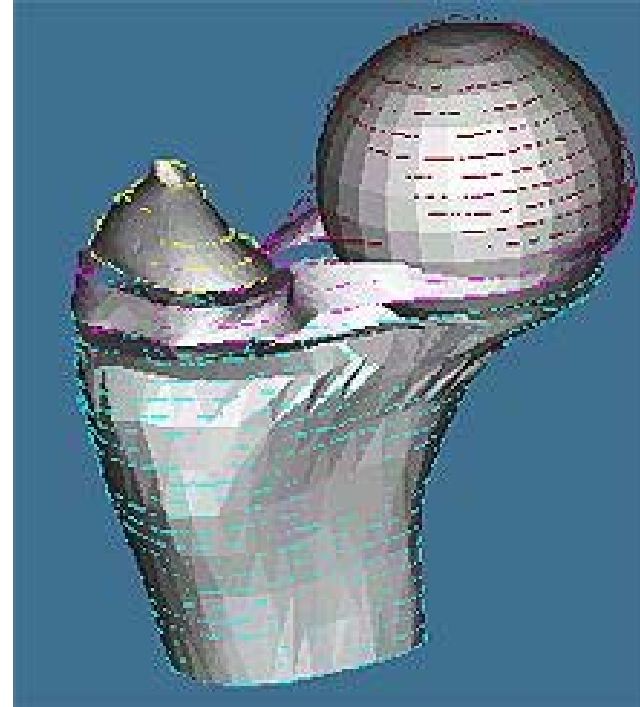
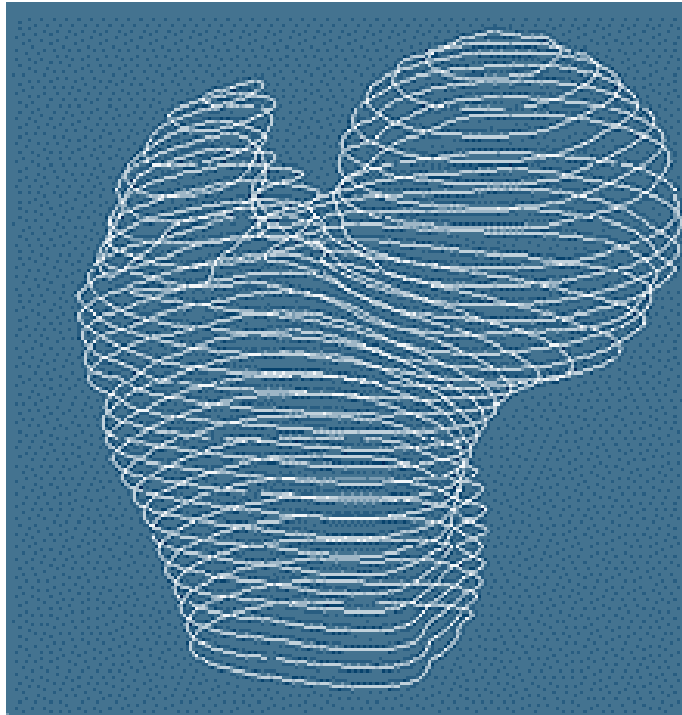
优点：简单，适用于任意复杂的形体

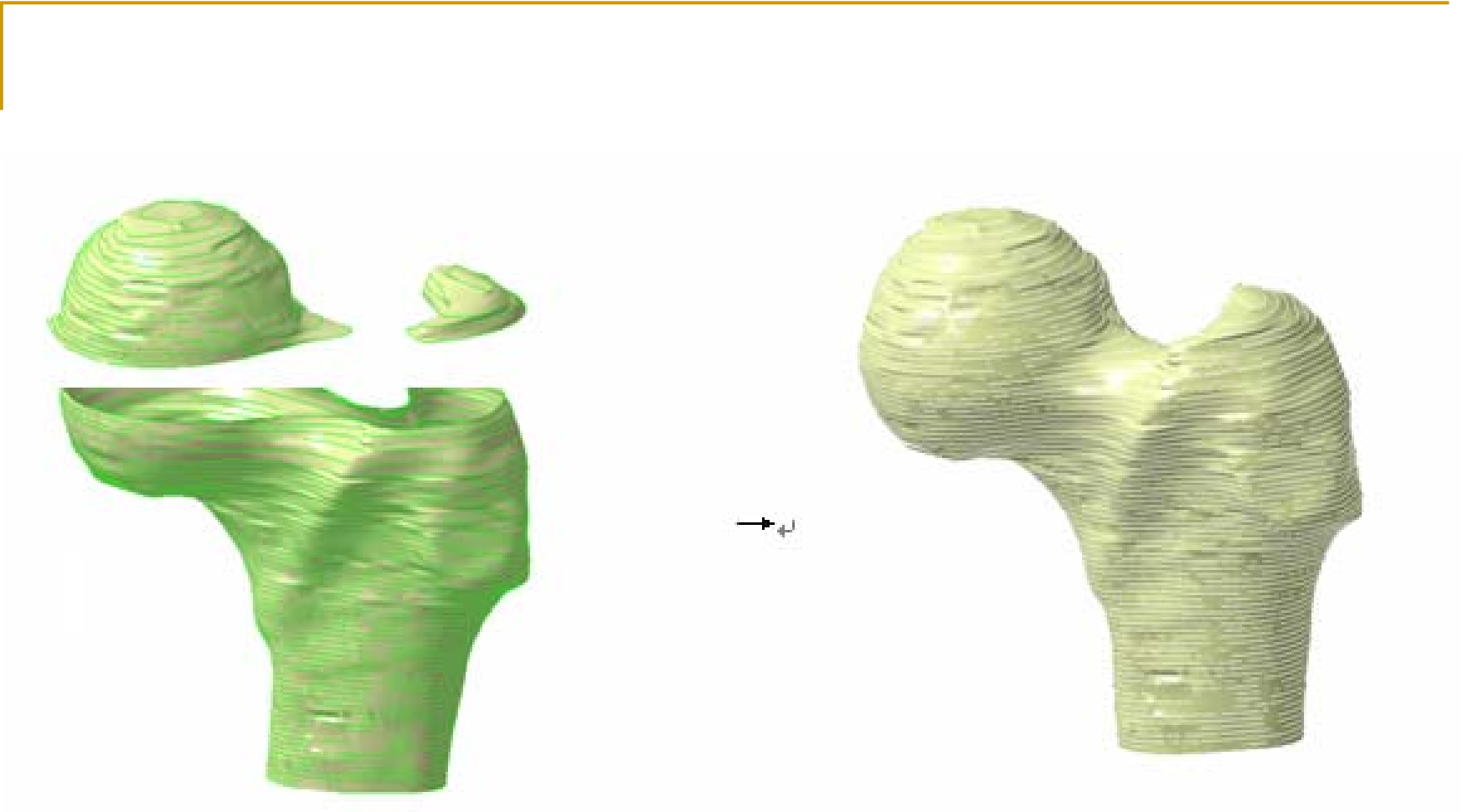
无结构三角网格2



缺点：数据量大

NURBS 曲面1

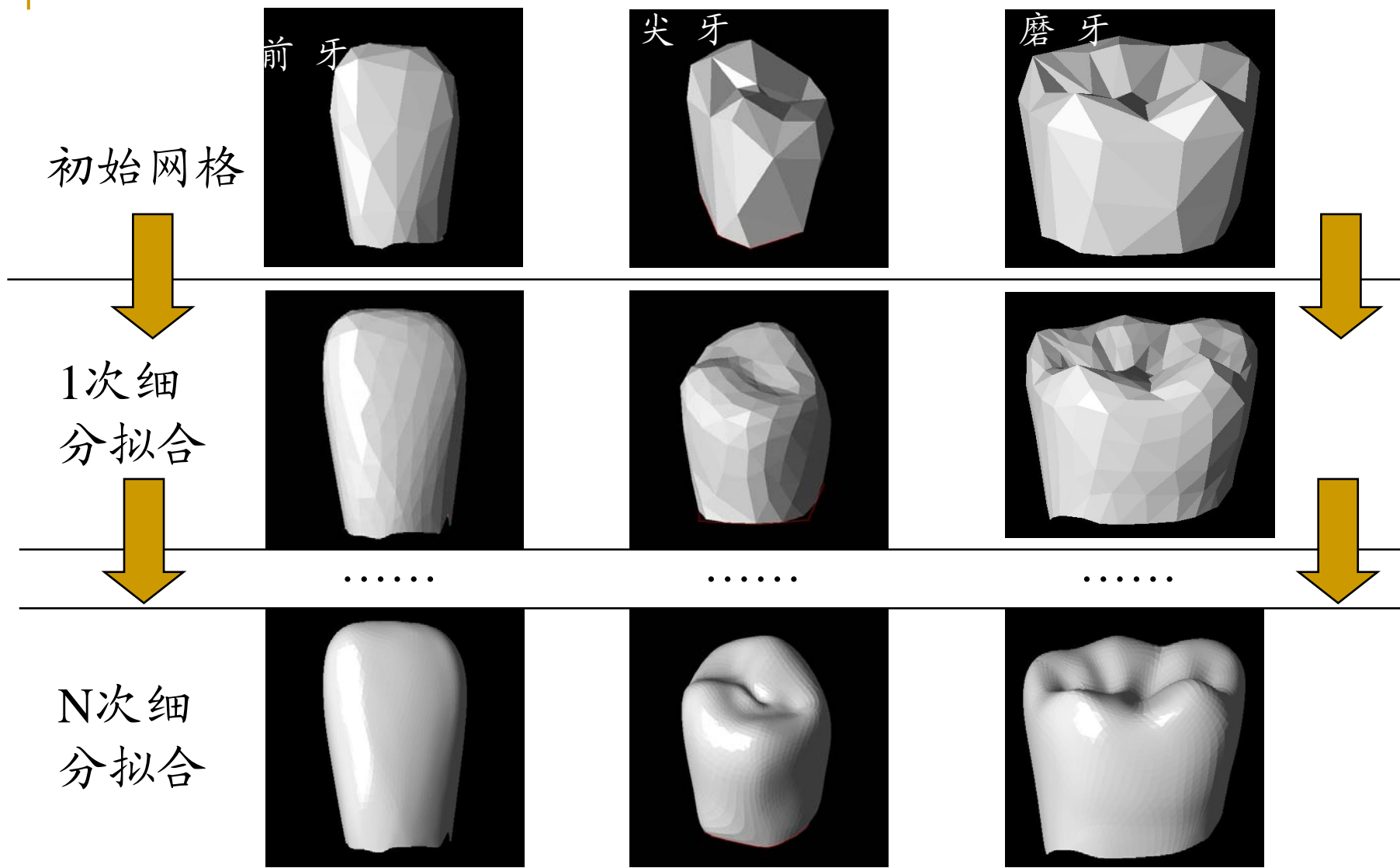


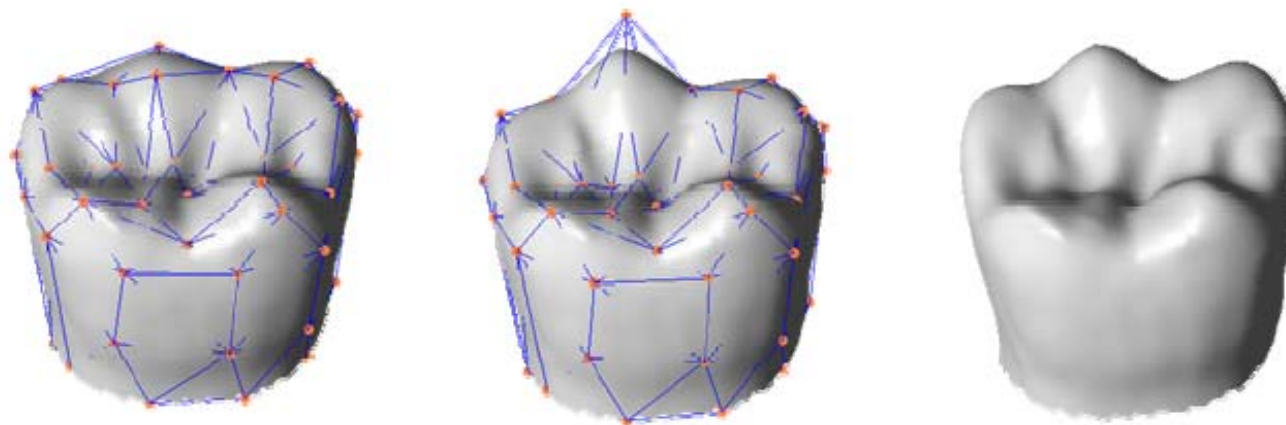
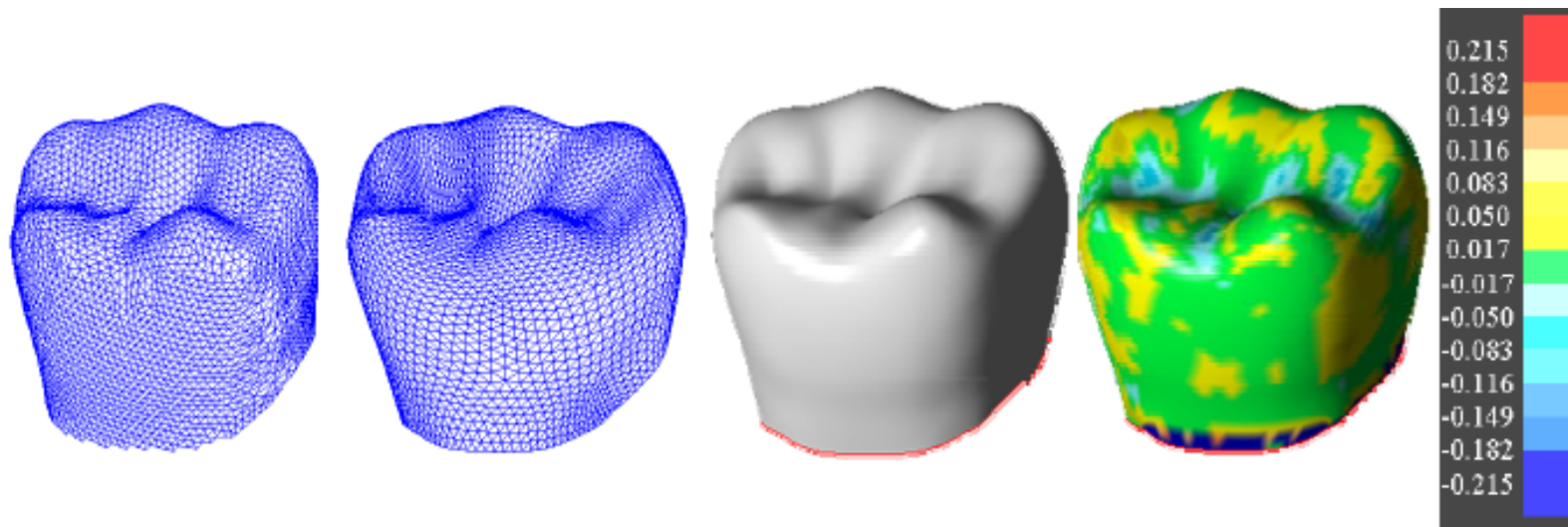


NURBS曲面2

- 优点：
技术比较成熟；
- 缺点：
操作比较繁琐
复杂外形需要使用多个**NURBS**曲面

细分曲面解决方案

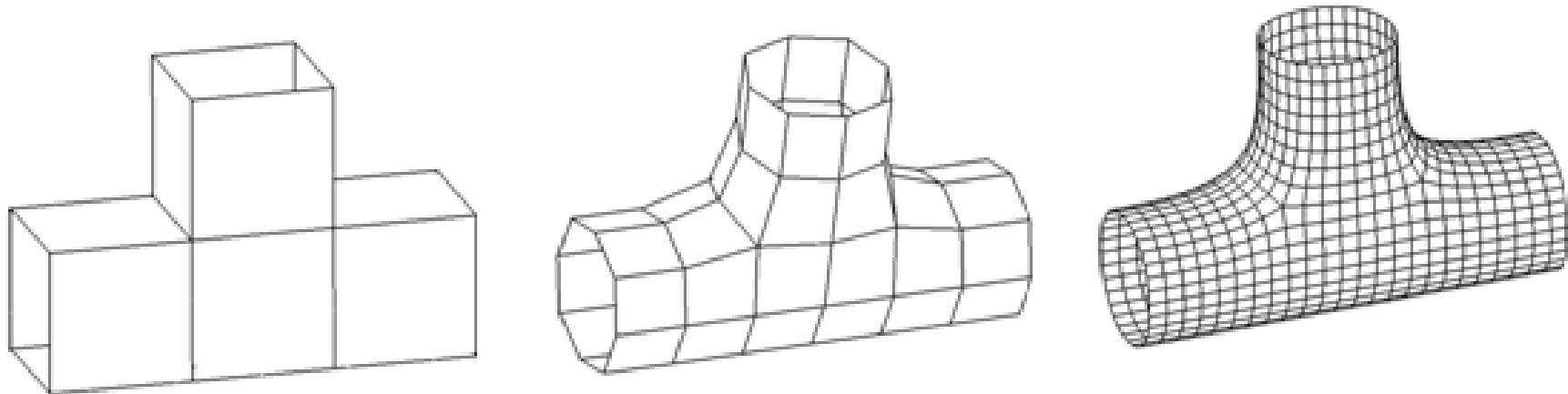




报告提纲

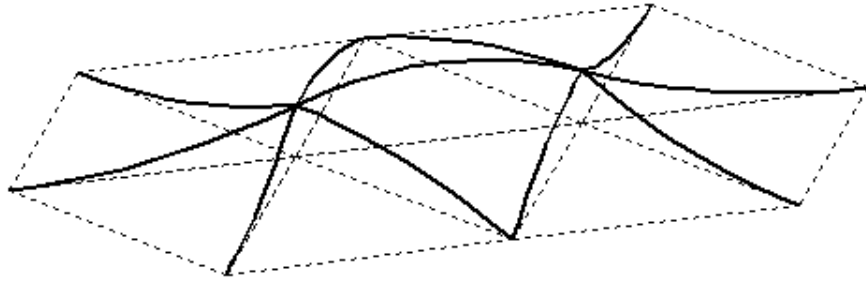
- 计算机辅助生物医学工程与
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细分曲面的概念

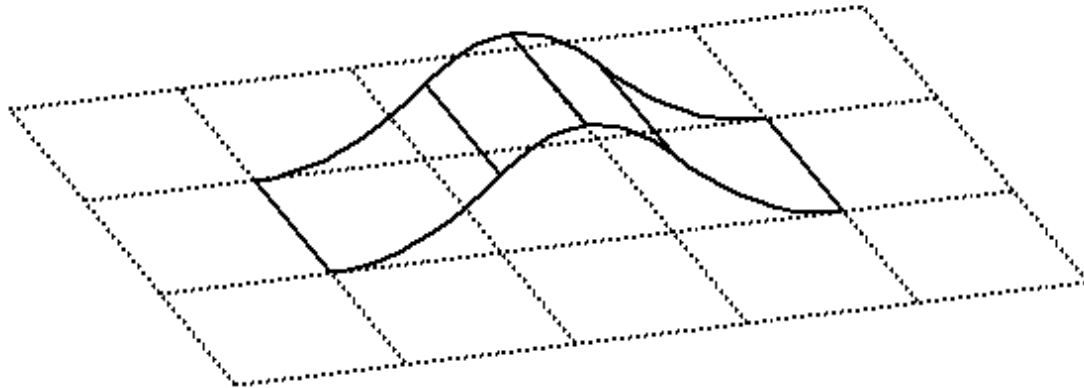


Constructing process of a subdivision surface. (a) Initial mesh; (b) Subdivide once; (c) Subdivide twice

细分曲面2

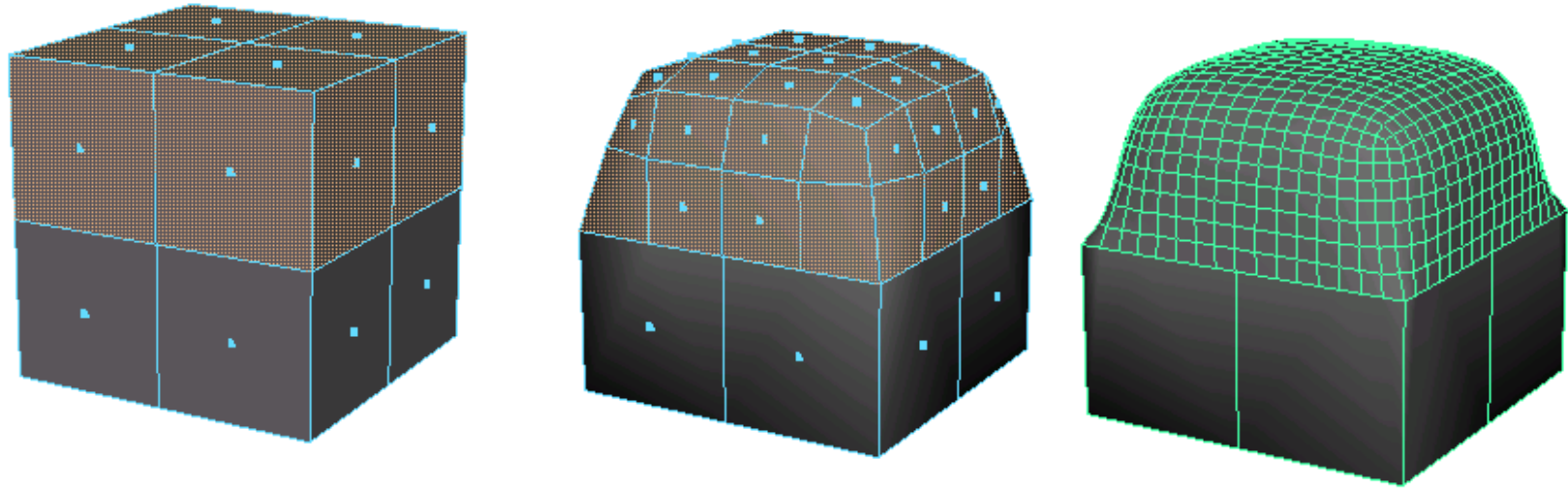


$$D_4 = \{\mathbf{e}_1, \mathbf{e}_2, \mathbf{e}_3, \mathbf{e}_3\}$$

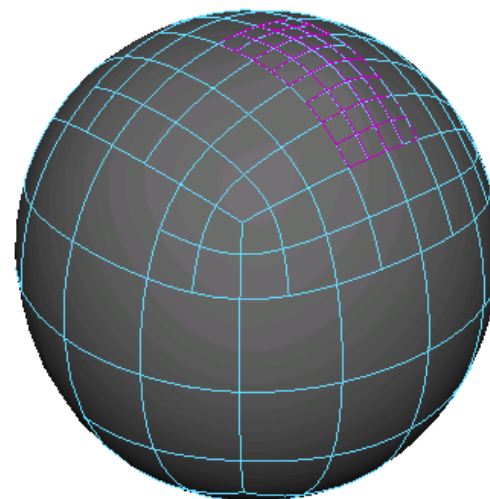
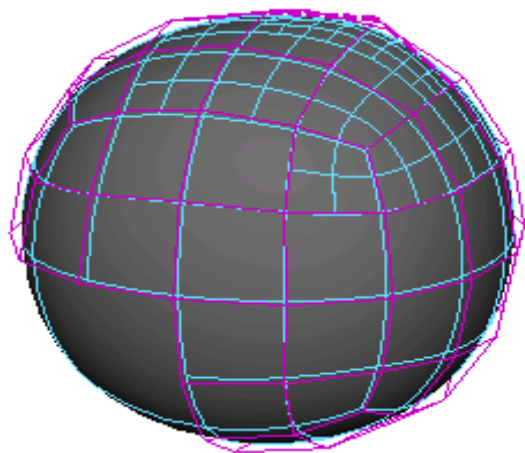
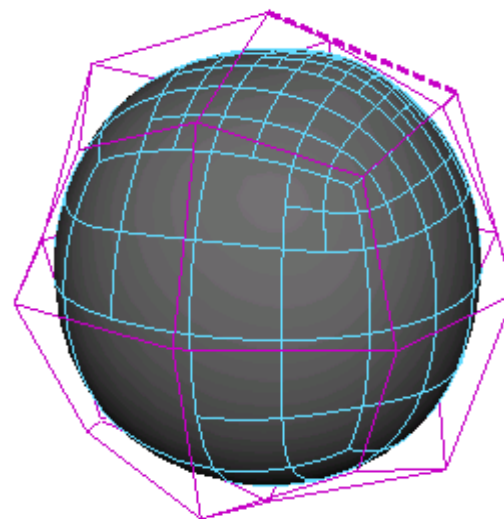
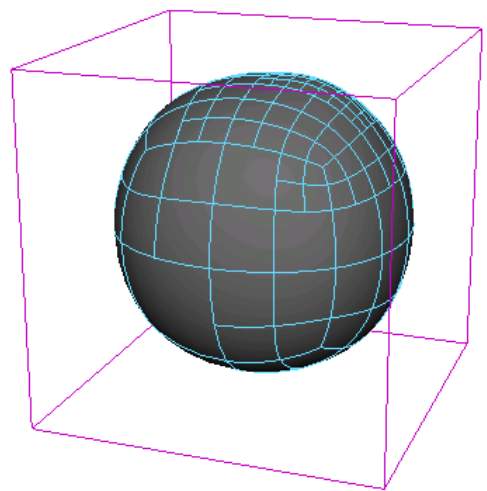


$$D_4 = \{\mathbf{e}_1, \mathbf{e}_1, \mathbf{e}_1, \mathbf{e}_2\}$$

很多细分规则来源于样条曲面的推广

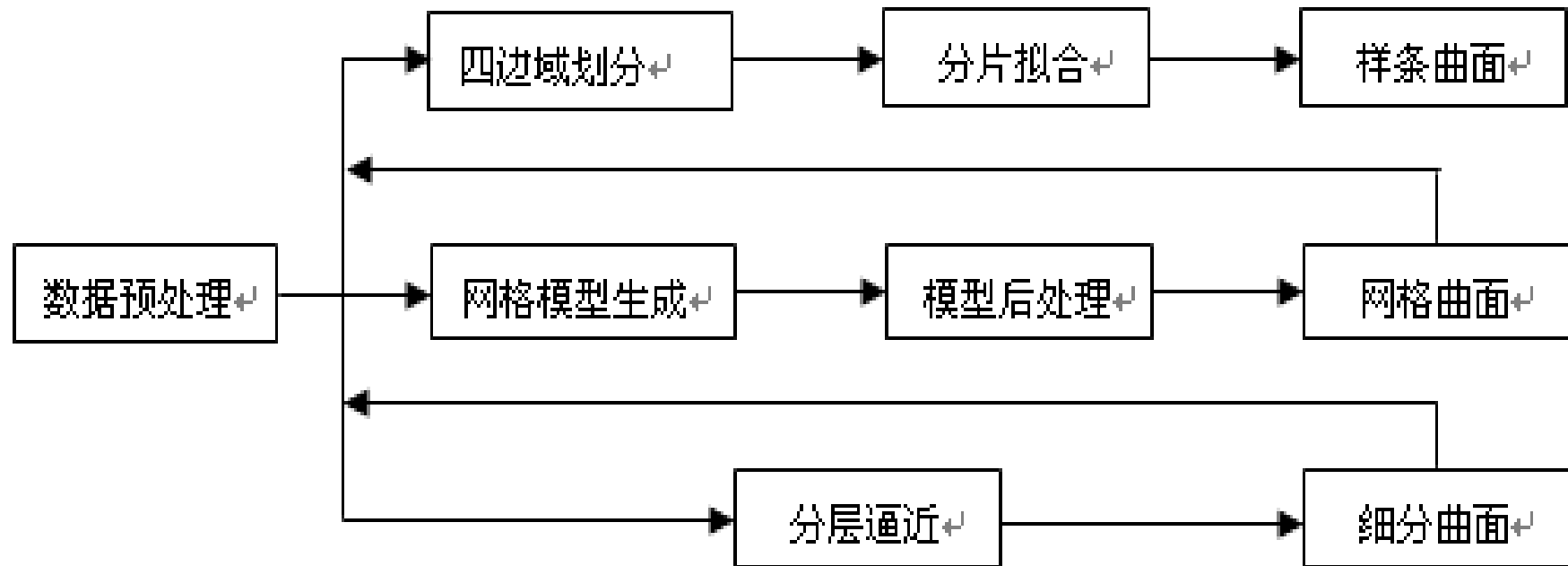


动画中的细分曲面

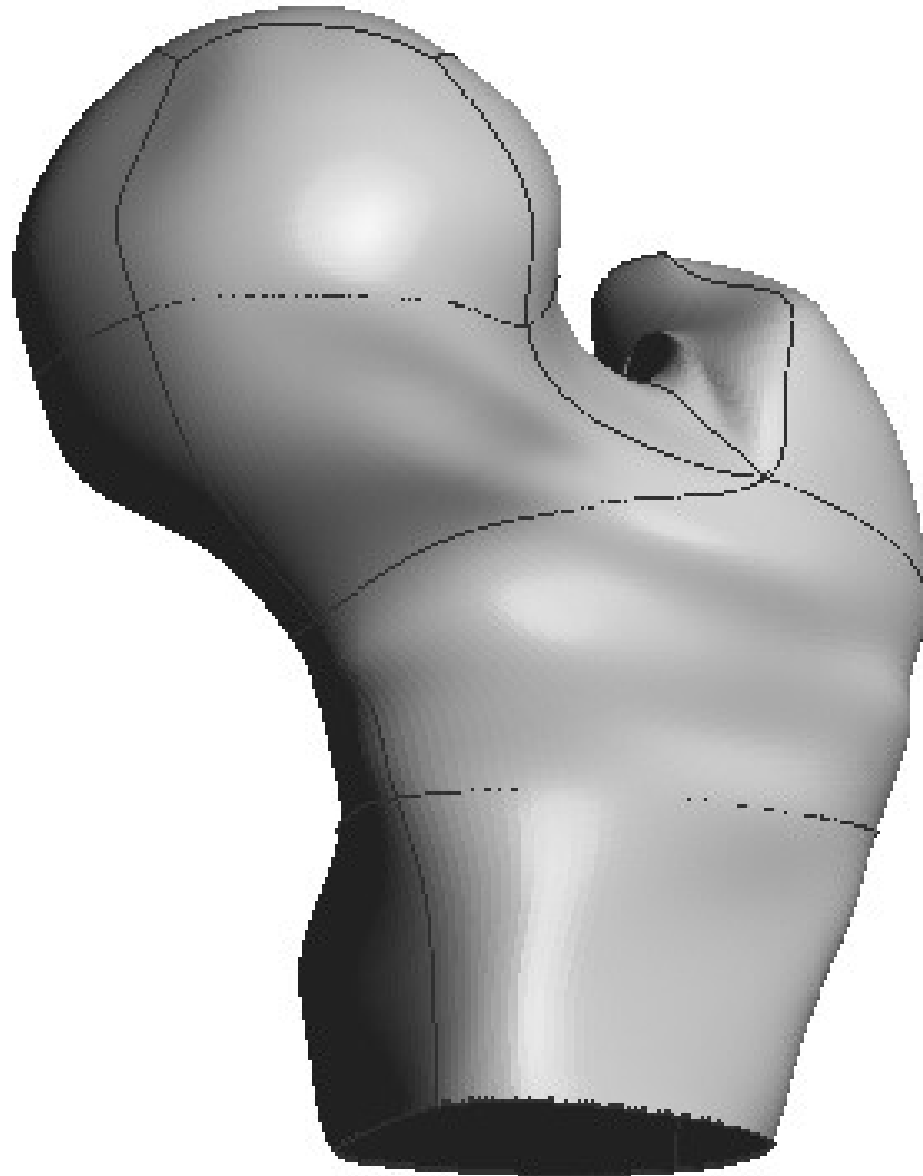


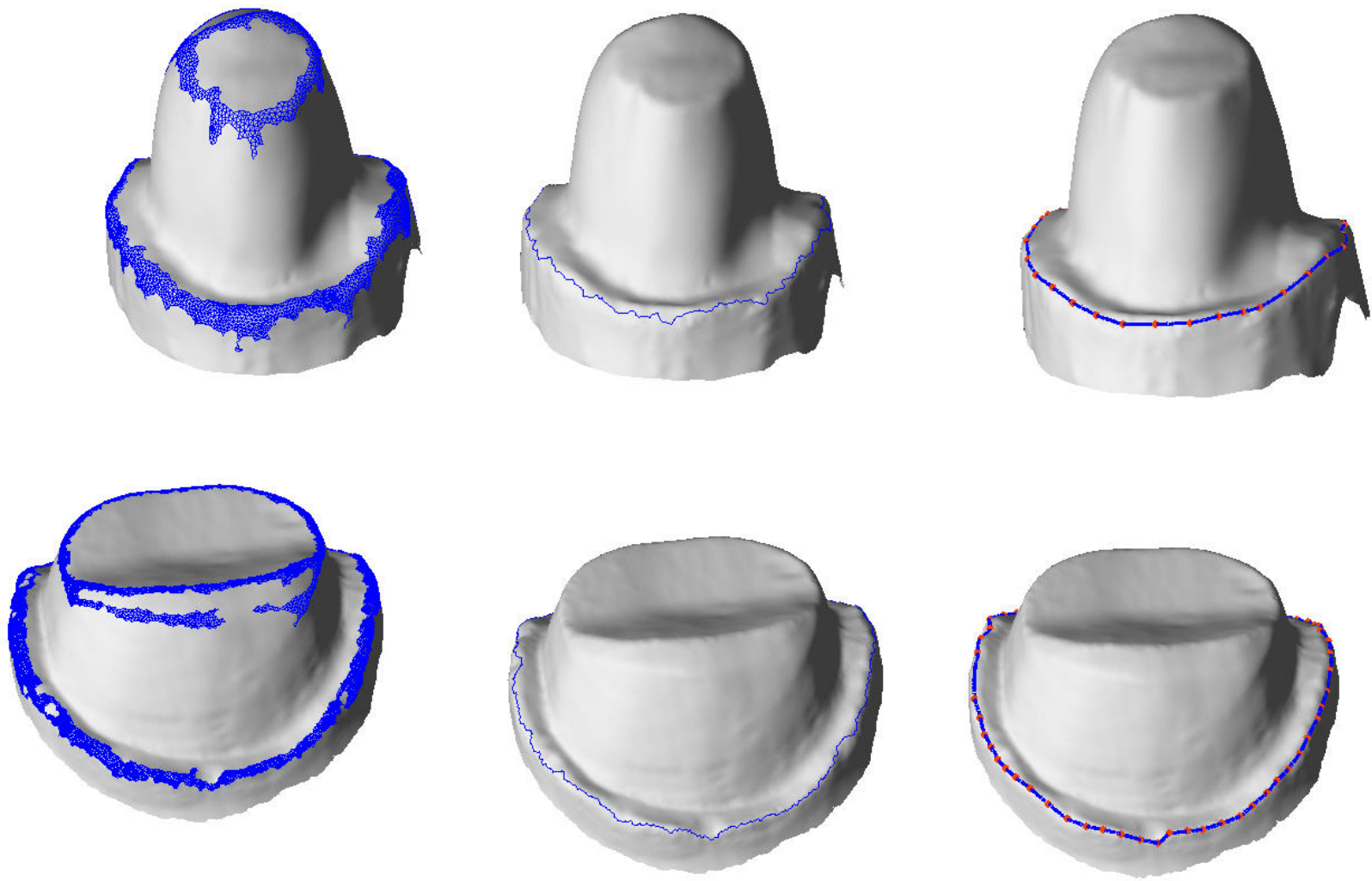
动画中的细分曲面——MPEG4标准

我构想的细分曲面解决方案

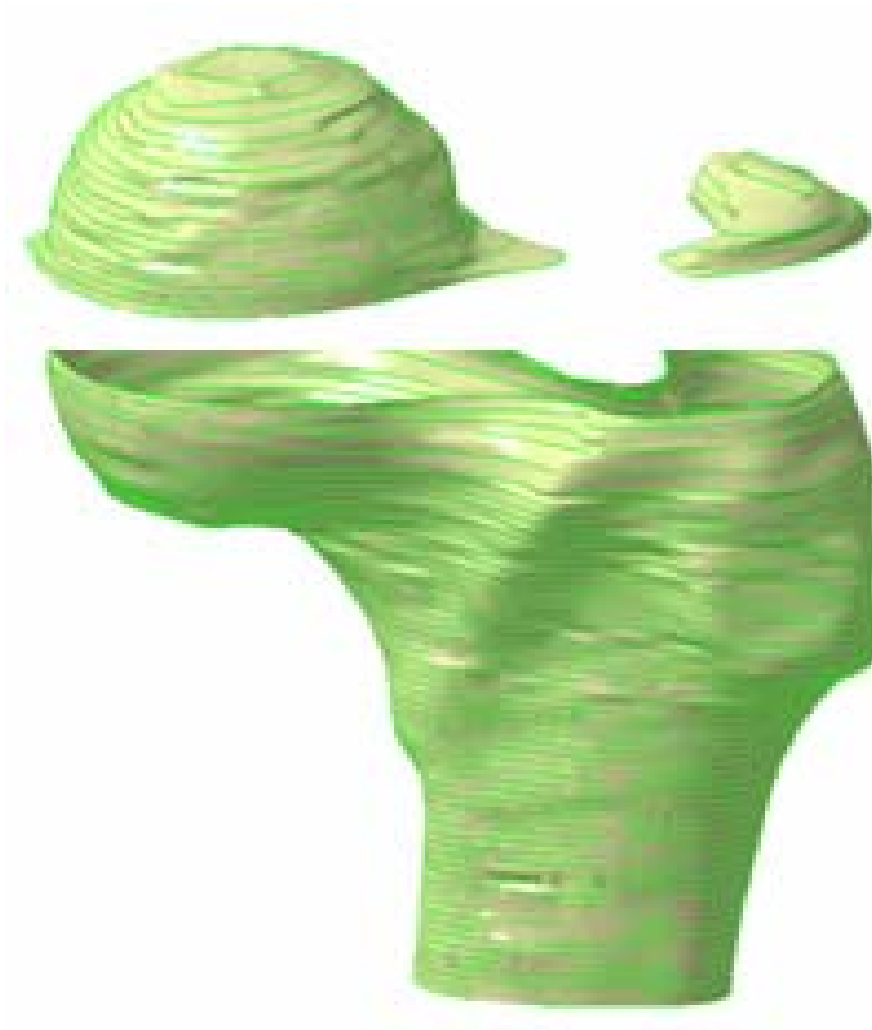


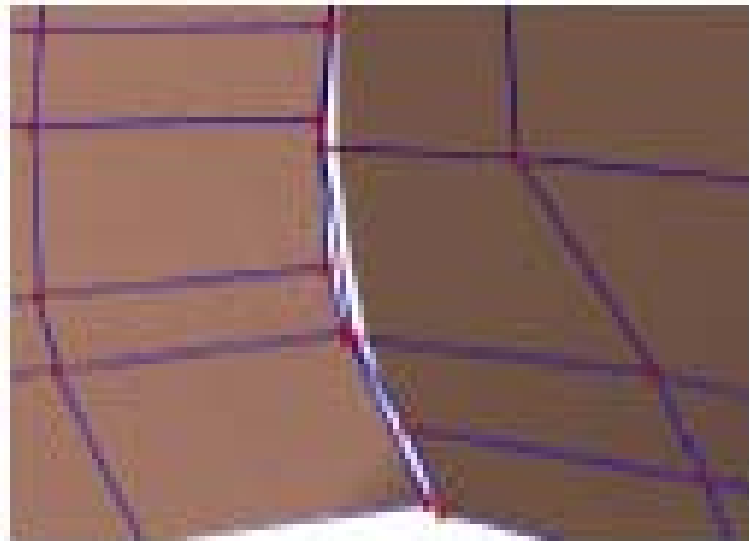
曲线网方案



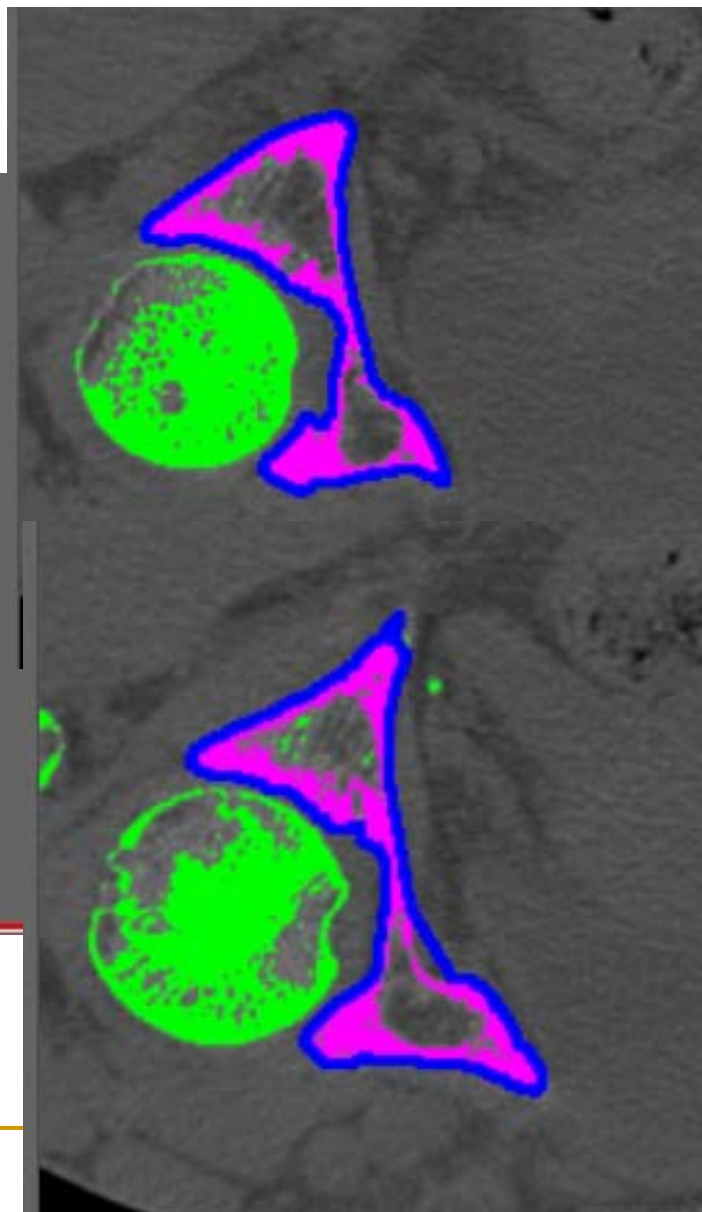
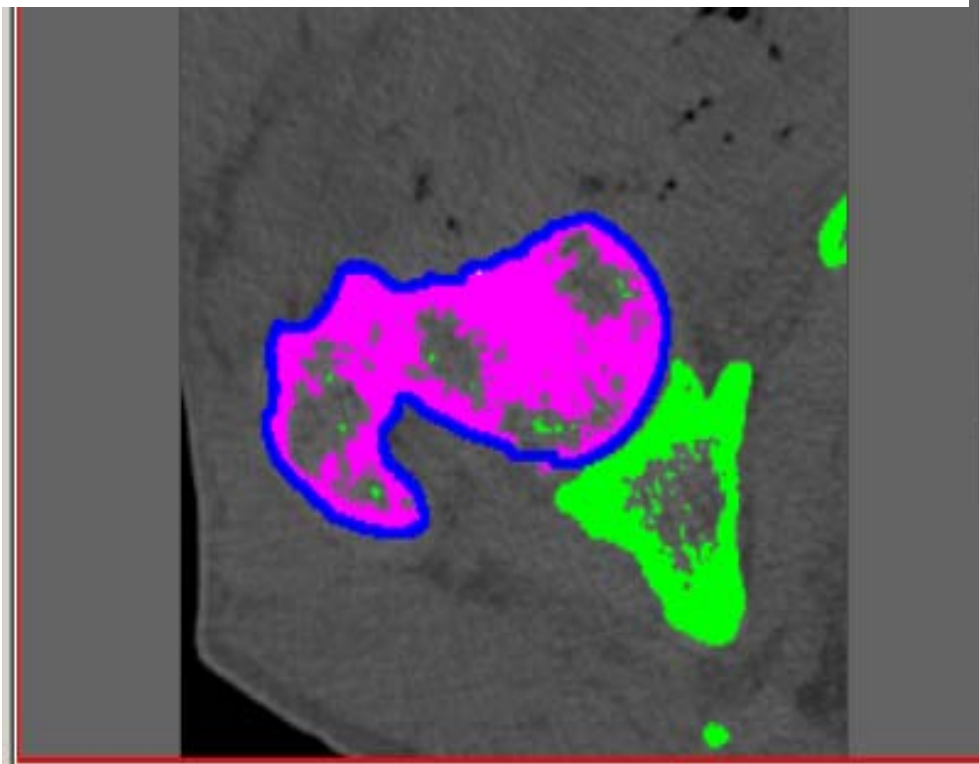


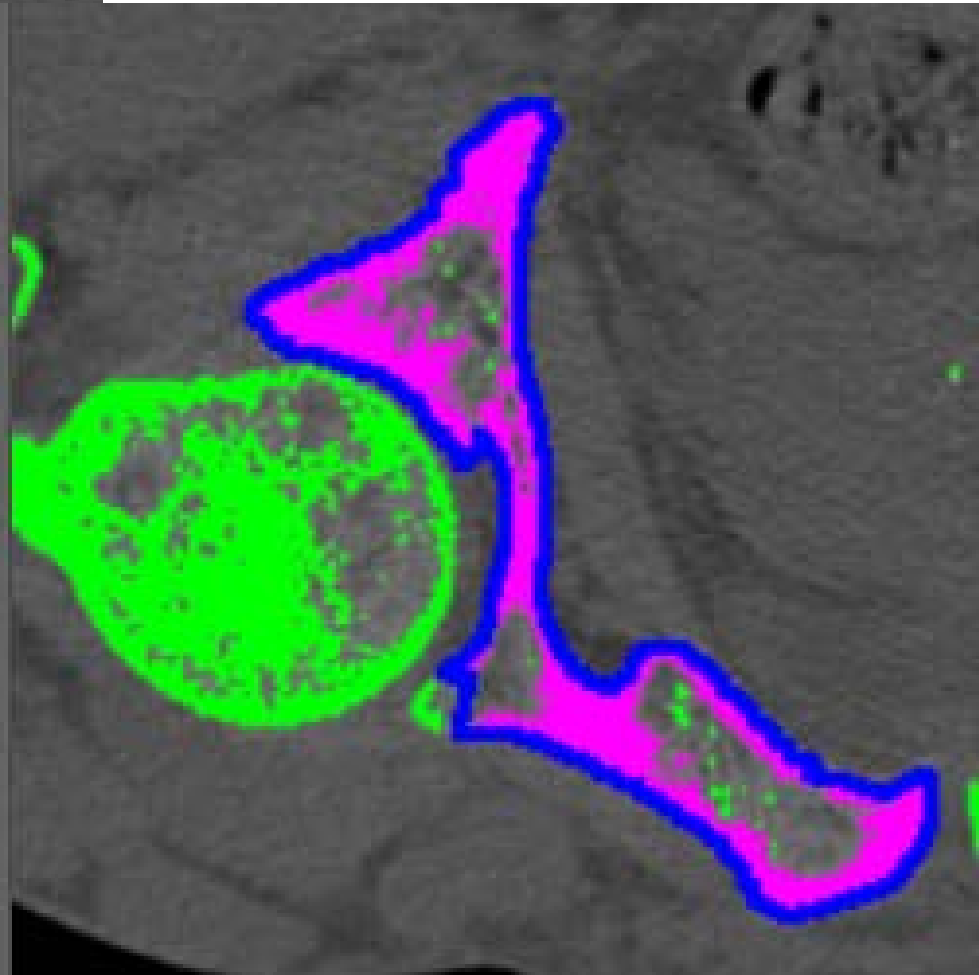
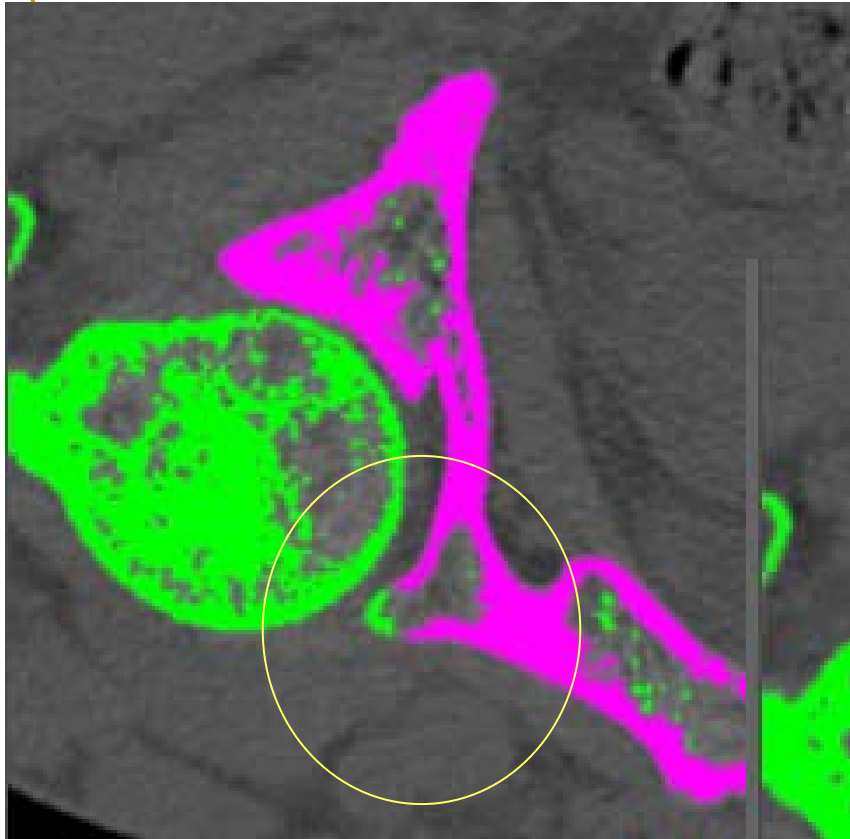
T网拼接方案



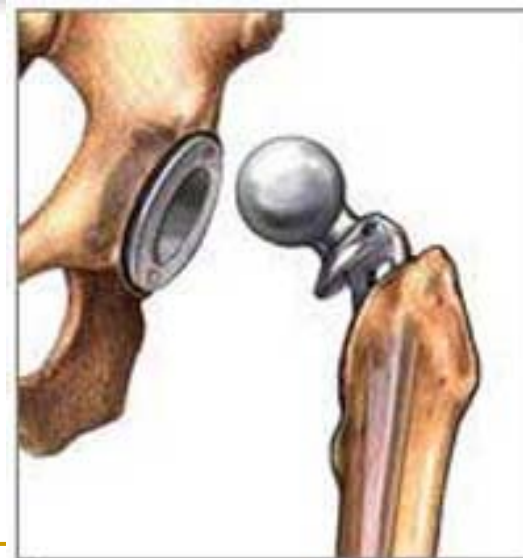
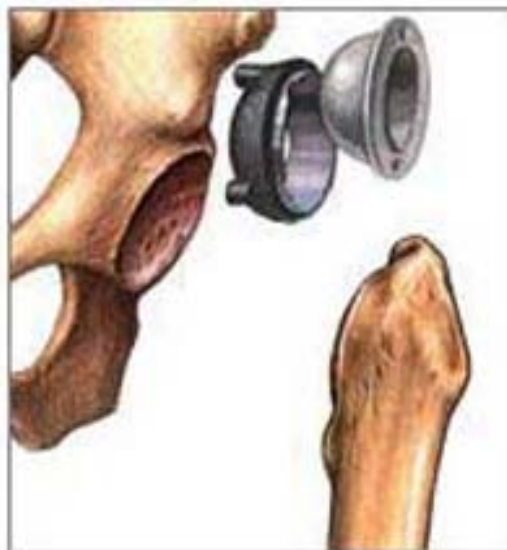
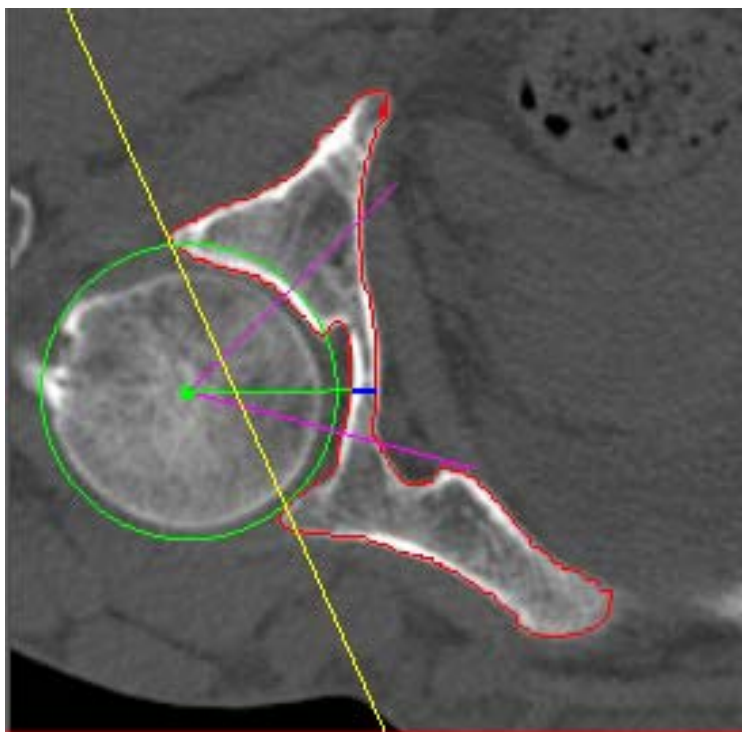


CAD建模中的数据预处理





数字化测量对几何模型的需求



敬请批评指导！

谢谢各位领导和专家！