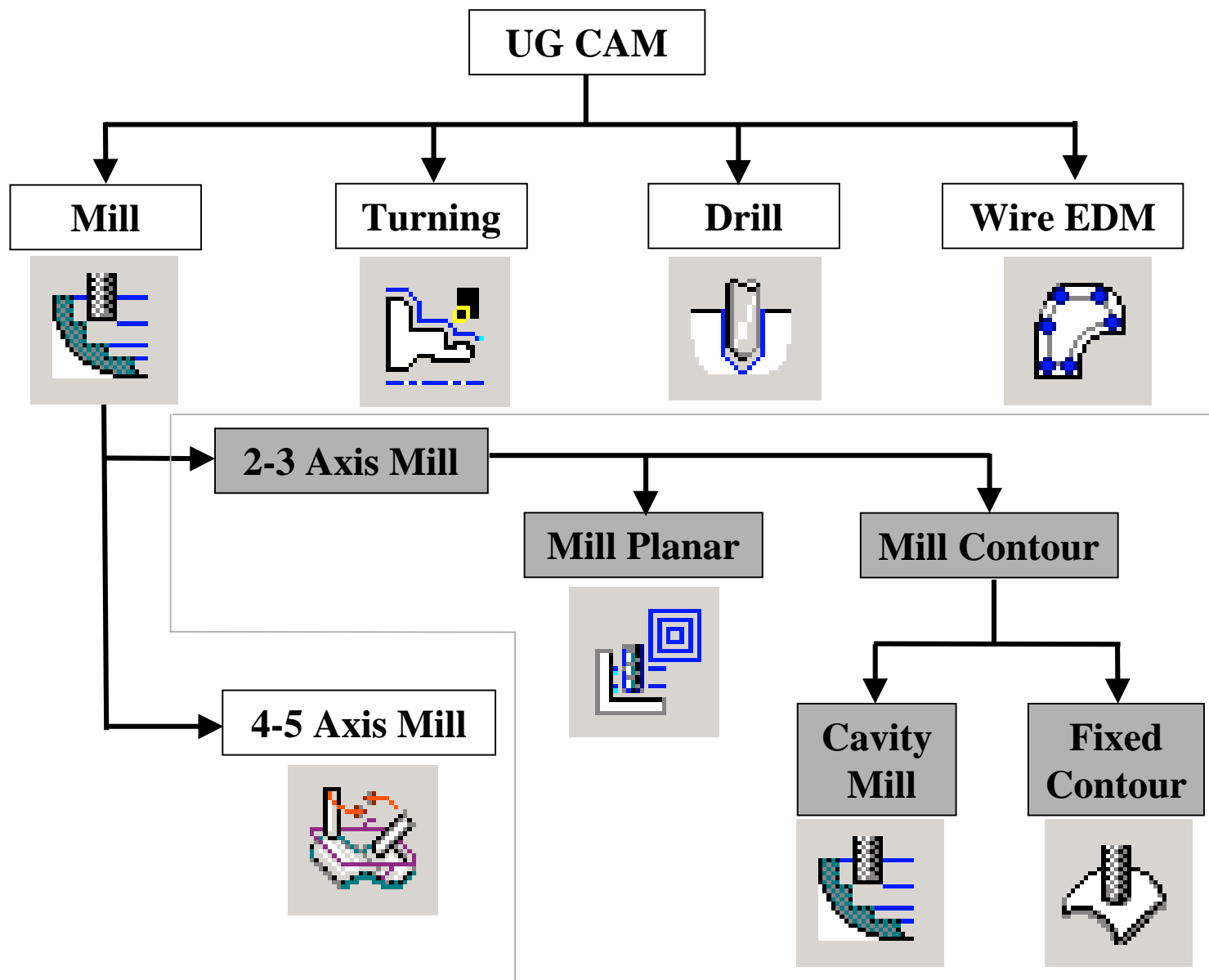


UG V18 Training Manufacturing



- Lesson 1 : UG加工概述
- Lesson 2 :主模型方法 (Master Model)
- Lesson 3 : 进入Manufacturing
- Lesson 4 : 加工操作管理 (Create Operation & Operation Navigator)
- Lesson 5 : 创建Object
- Lesson 6 : 边界管理器 (Boundary Manager)
- Lesson 7 : 平面铣 (Mill_Planar)
- Lesson 8 : 型腔铣 (Mill_Contour/Cavity_Mill)
- Lesson 9 : 固定轴轮廓铣 (Mill_Contour/ Fixed_Contour)
- Lesson 10 : 后处理 (Post Processing)
- Lesson 11 : 机床后处理文件 (TCL、DEF)
- Lesson 12 : 加工刀路模拟 (Verify)
- Lesson 13 : 加工刀路编辑器 (Graphics Editor)

Lesson 1 : UG加工概述

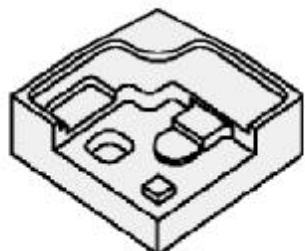


Lesson 1 : UG加工概述

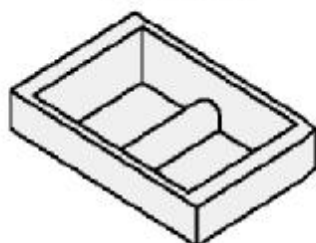
铣削加工的种类:

Fixed Axis Operations

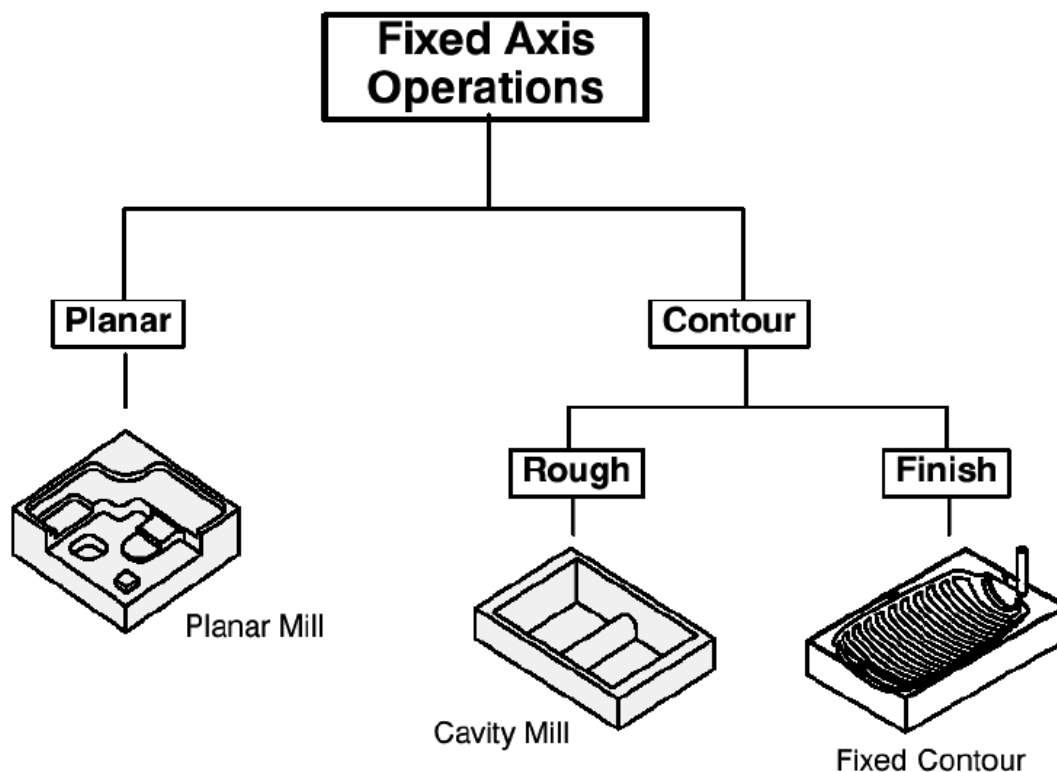
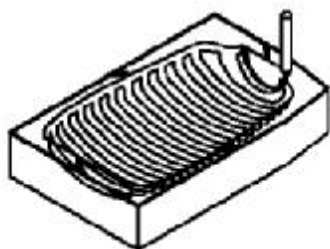
Planar Mill



Cavity Mill

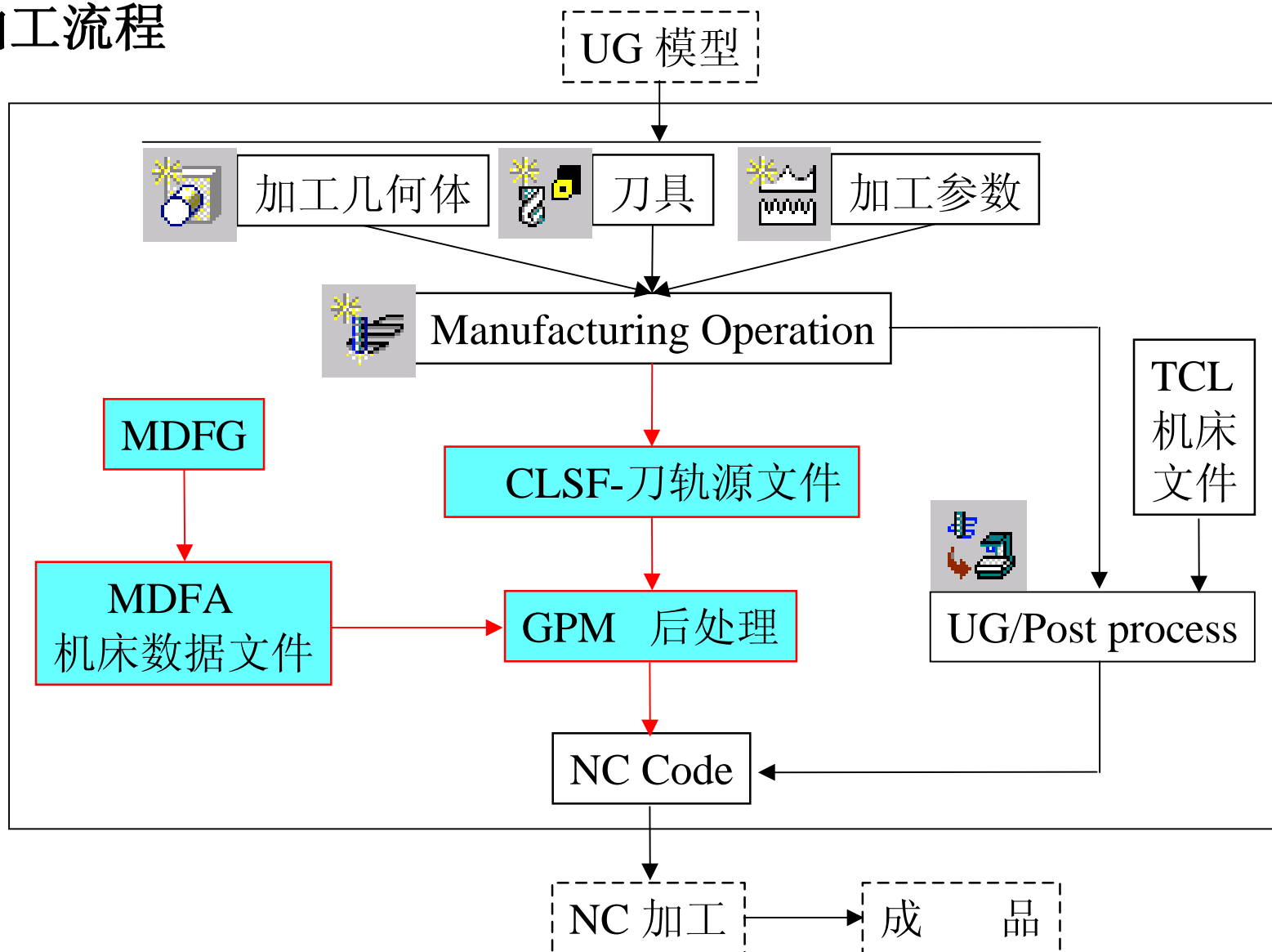


Fixed Contour



Planar Mill	主要用于加工垂直面、平面	平面层切削	用于粗、精加工
Cavity Mill	主要用于加工曲面	平面层切削	主要用于粗加工
Fixed Contour	主要用于加工曲面	曲面3D切削	主要用于精加工

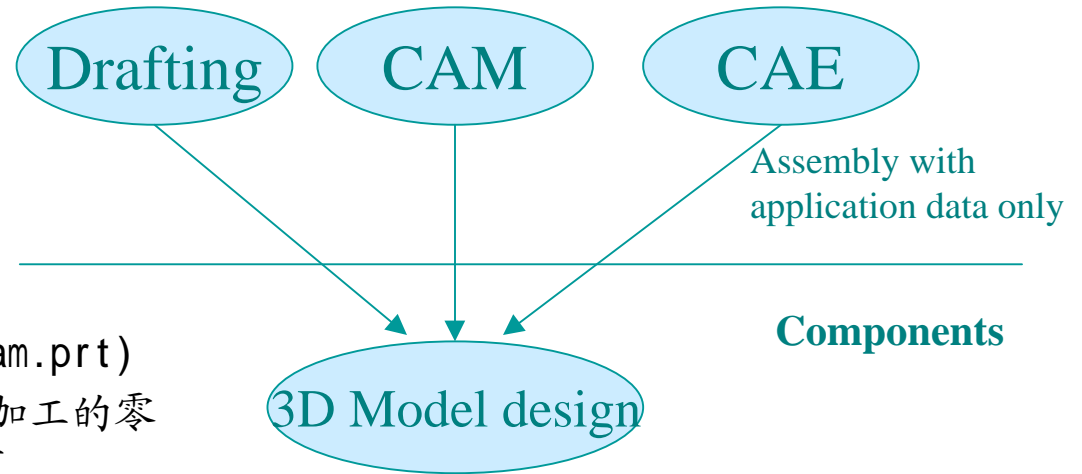
UG加工流程



Lesson 2 : 主模型方法 (Master Model)

6

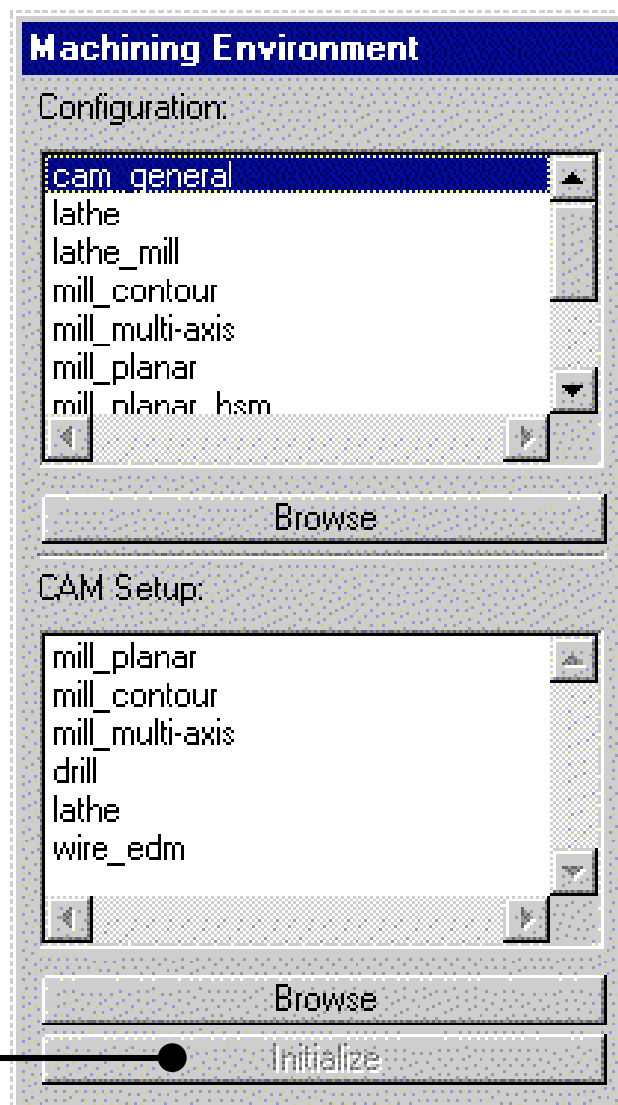
- 什麼是主模型方法?
 - 用装配结构将三维设计模型与加工数据分开
 - 保持数据相关
- 主模型方法的好处
 - 并行工程
 - 减少数据量; 提高效率。
- 主模型方法的一般步骤
 - 建立一个新的UG零件(假设为: my_cam.prt)
 - 用UG装配功能的Add component将要加工的零件(或装配件)加入到新建的零件下。
 - 以新建零件为工作零件, 进行正常的加工程编。。。
 - 用FILE-SAVE存储my_cam.prt



Lesson 3 : 进入Manufacturing

7

- 进入UG加工模块
Application -> Manufacturing
- 选择加工环境 (Machining Environment)
在选择一个操作类型并生成刀路之前，
必须选择合适的加工环境。加工环境
的不同，可供选择的操作类型也不同
- 对加工环境进行初始化



Lesson 4 : 加工操作管理(Create Operation & Operation Navigator)

- Create Operation 是加工编程的主要部分
View---> Operation Navigator

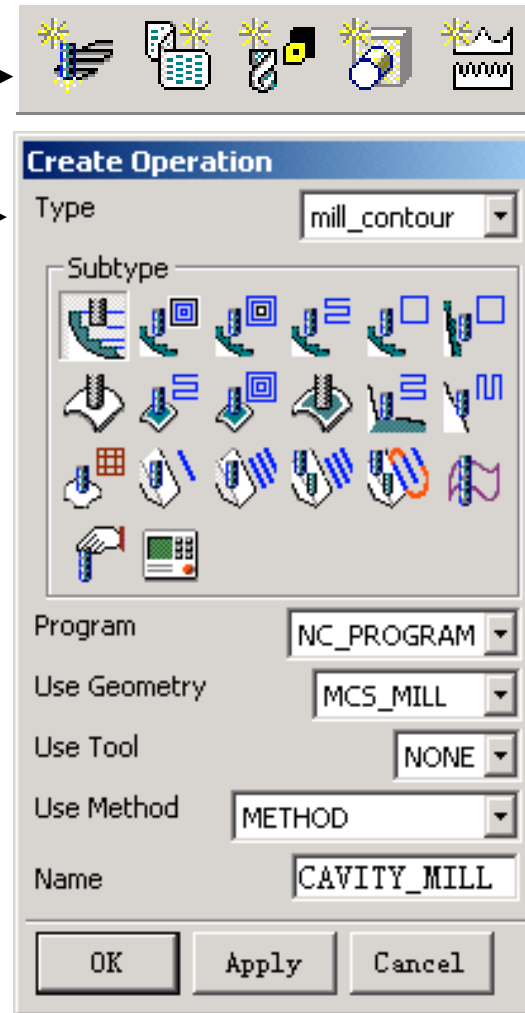
- Create 对象(Objects)

选择加工方式及加工参数

- 创建 程序组 (Program)
- 创建 刀具 (Tools)
- 创建 几何体 (Geometry)
- 创建 切削工艺(Method)
- 创建 加工操作(Operation)

- Create Operation Type

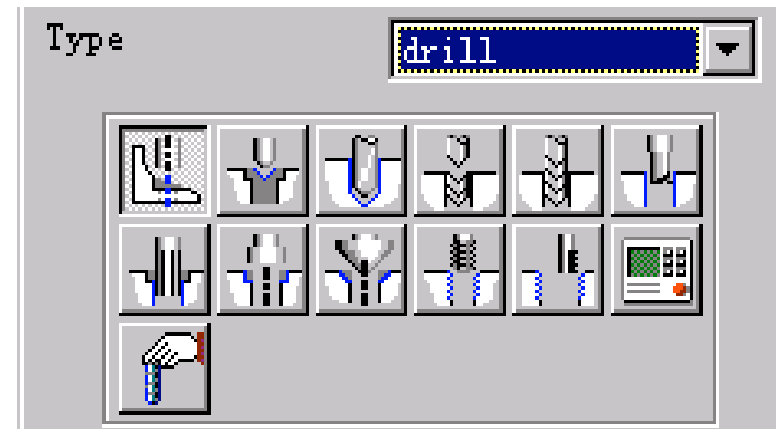
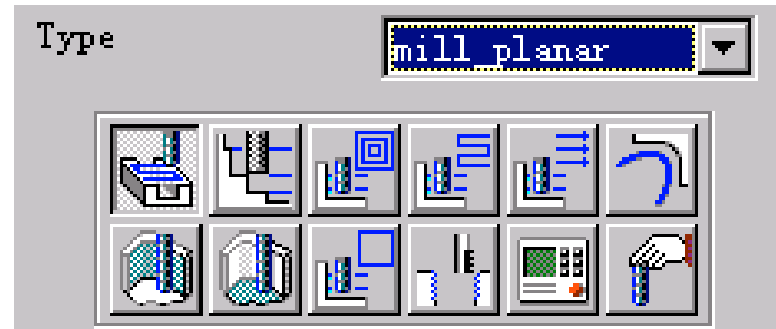
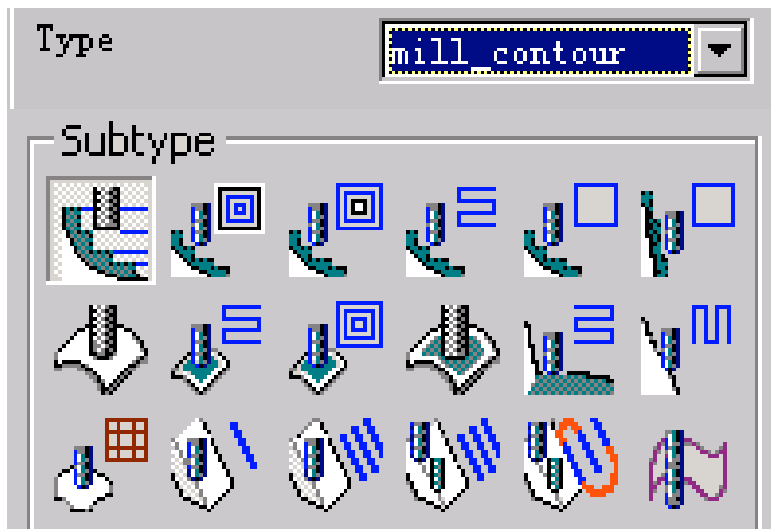
- Mill planar 平面铣
- Mill Contour 轮廓铣
- Mill multi-axis 多轴铣
- Drill 钻孔加工
- Lathe 车削加工
- Wire Edm 线切割加工



Lesson 4 : 加工操作管理(Create Operation & Operation Navigator)

- Sub Operation Type

对于不同的Machine type,
相应的有不同的子加工方法



Lesson 4 : 加工操作管理(Create Operation & Operation Navigator)

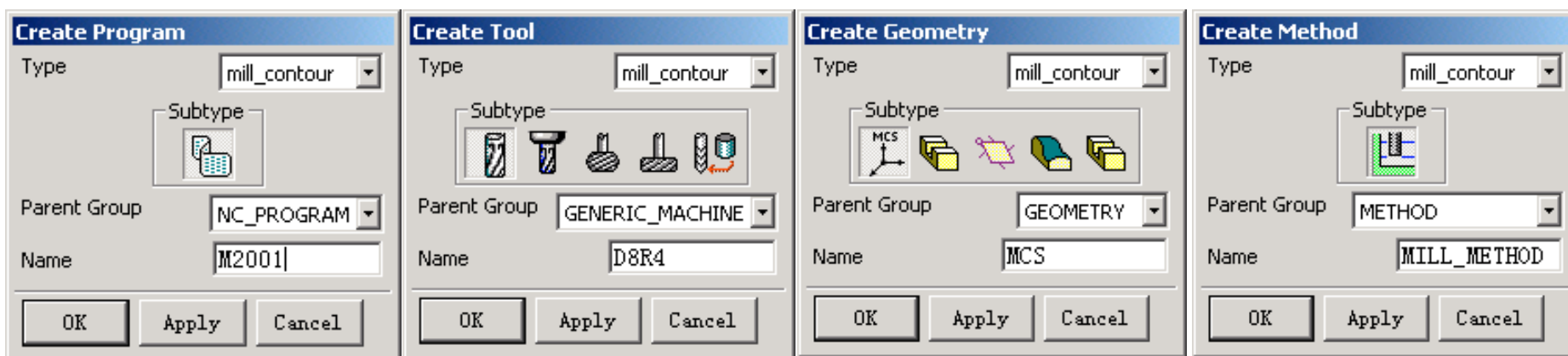
10

Program----用于创建程序组，来管理各种不同的加工操作对象(Operation Object)。类似于文件夹

Tool ----用于创建各种类型的刀具，并以刀具来对操作对象(Operation Object)进行分类。

Geometry--用于创建要加工的几何体或加工坐标系(MCS)，并以这些Geometry分类
操作对象(Operation Object)。

Method----用于创建加工方法(定义加工余量、进给速率等工艺参数)，并以Method
来对操作对象(Operation Object)进行分类管理。



Lesson 4 : 加工操作管理(Create Operation & Operation Navigator)

11

- Operation navigator

View---> Operation Navigator

Operation Navigator 的界面与Model Navigator、Assembly Navigator的界面很相似。

- Operation Navigator 的功能

Operation 的编辑和管理

Toolpath 的生成、编辑和管理

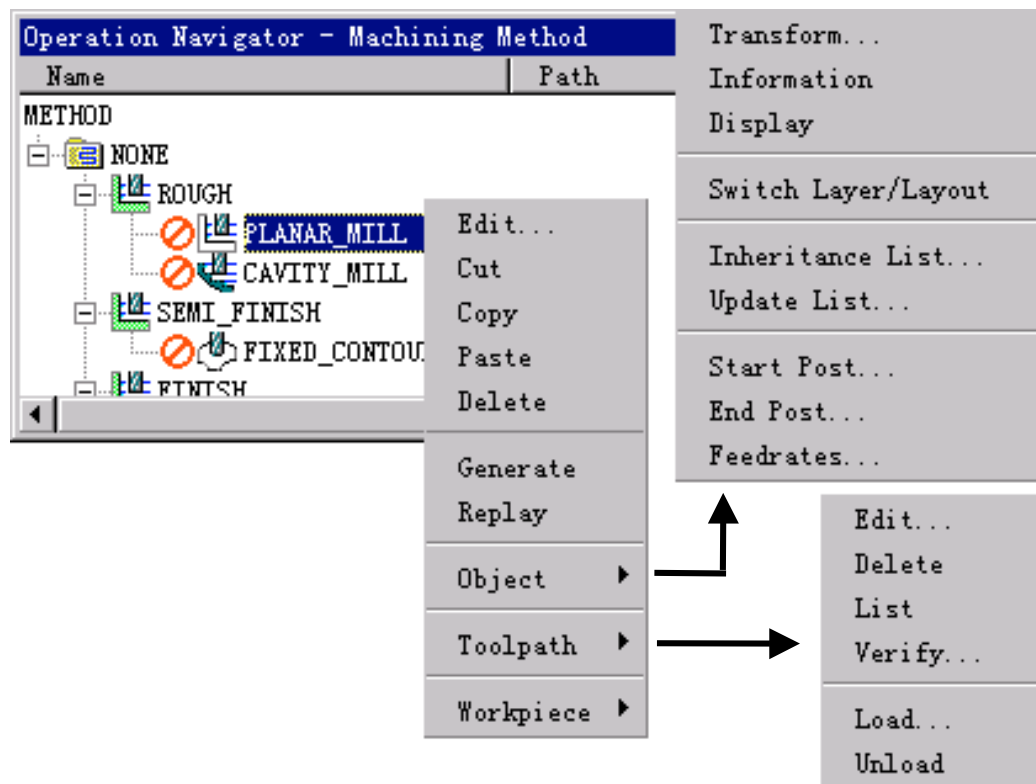
- Operation Navigator 的四种组织方式:

Program Order

Machine Tool

Geometry

Machining Method



Lesson 4 : 加工操作管理(Create Operation & Operation Navigator)



Program Order

Name	Tool	Geometry	Method
NC_PROGRAM			
NONE			
ROUGH_MILL			
PLANAR_MILL	D32	BOUNDARY	MILL_ROUGH
CAVITY_MILL_1	D32	CORE	MILL_ROUGH
CAVITY_MILL_2	D25	CORE	MILL_ROUGH
FINISH_MILL			
FIXED_CONTOUR	R4	CORE_SURF	MILL_FINISH
DRILL			
DRILLING	DRILL_D12	WORK_CORD	DRILL_METHOD

Machine Tool

Name	Geometry	Method	Order Group
GENERIC_MACHINE			
NONE			
D32			
PLANAR_MILL	BOUNDARY	MILL_ROUGH	ROUGH_MILL
CAVITY_MILL_1	CORE	MILL_ROUGH	ROUGH_MILL
D25			
CAVITY_MILL_2	CORE	MILL_ROUGH	ROUGH_MILL
R4			
FIXED_CONTOUR	CORE_SURF	MILL_FINISH	FINISH_MILL
DRILL_D12			
DRILLING	WORK_CORD	DRILL_METHOD	DRILL

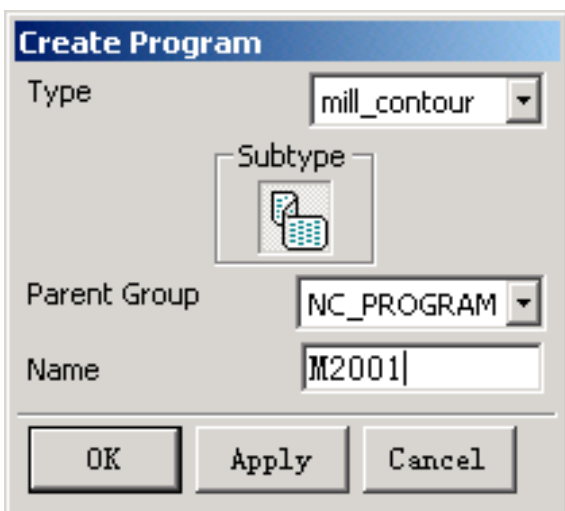
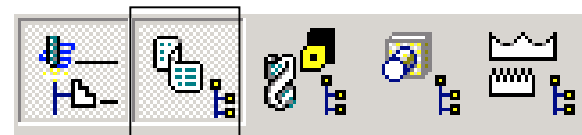
Geometry

Name	Tool	Method	Order Group
GEOMETRY			
NONE			
BOUNDARY			
PLANAR_MILL	D32	MILL_ROUGH	ROUGH_MILL
CORE			
CAVITY_MILL_1	D32	MILL_ROUGH	ROUGH_MILL
CAVITY_MILL_2	D25	MILL_ROUGH	ROUGH_MILL
WORK_CORD			
DRILLING	DRILL_D12	DRILL_METHOD	DRILL
CORE_SURF			
FIXED_CONTOUR	R4	MILL_FINISH	FINISH_MILL

Machining Method

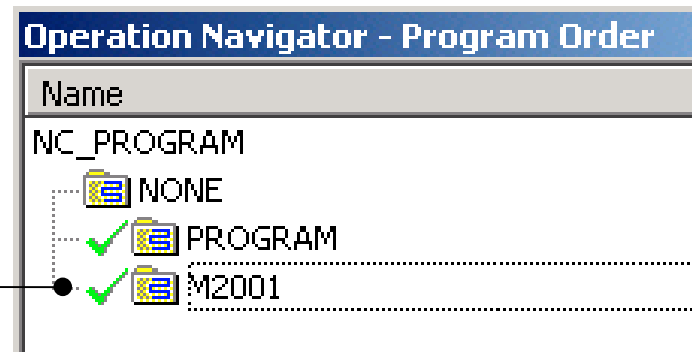
Name	Tool	Geometry	Order Group
METHOD			
NONE			
MILL_ROUGH			
PLANAR_MILL	D32	BOUNDARY	ROUGH_MILL
CAVITY_MILL_2	D25	CORE	ROUGH_MILL
CAVITY_MILL_1	D32	CORE	ROUGH_MILL
MILL_FINISH			
FIXED_CONTOUR	R4	CORE_SURF	FINISH_MILL
DRILL_METHOD			
DRILLING	DRILL_D12	WORK_CORD	DRILL

Lesson 5 : 创建Object (Program)



以Program来组织operations

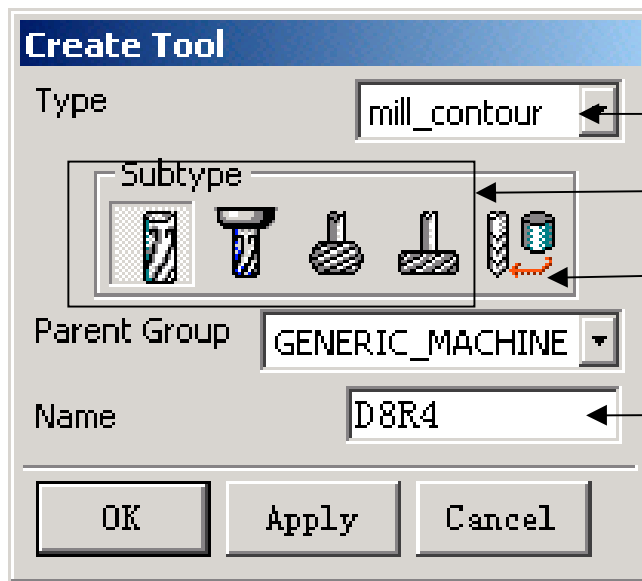
Program 名字



Lesson 5 : 创建Object (Tool)



- 刀具管理器的基本功能
 - 新建/编辑刀具
 - 从刀具库调用刀具
- 进入刀具管理器
 - 选择“TOOL” Icons



加工类型

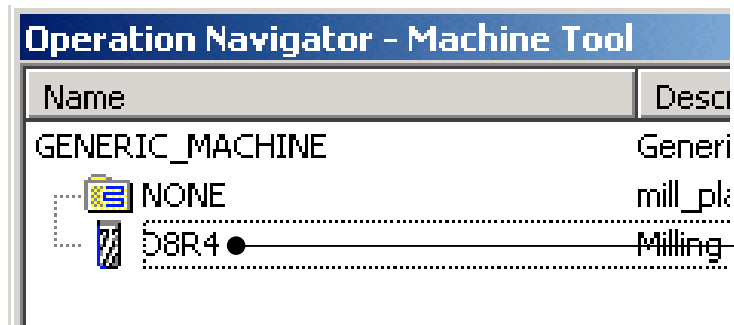
刀具类型 (刀具类型随加工类型的不同而不同)

刀具调用

刀具名



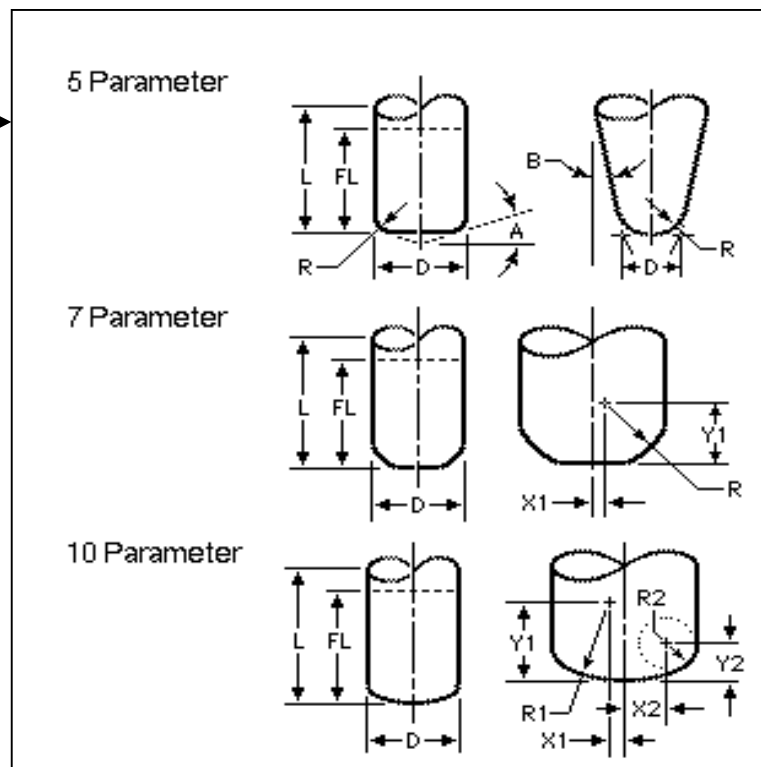
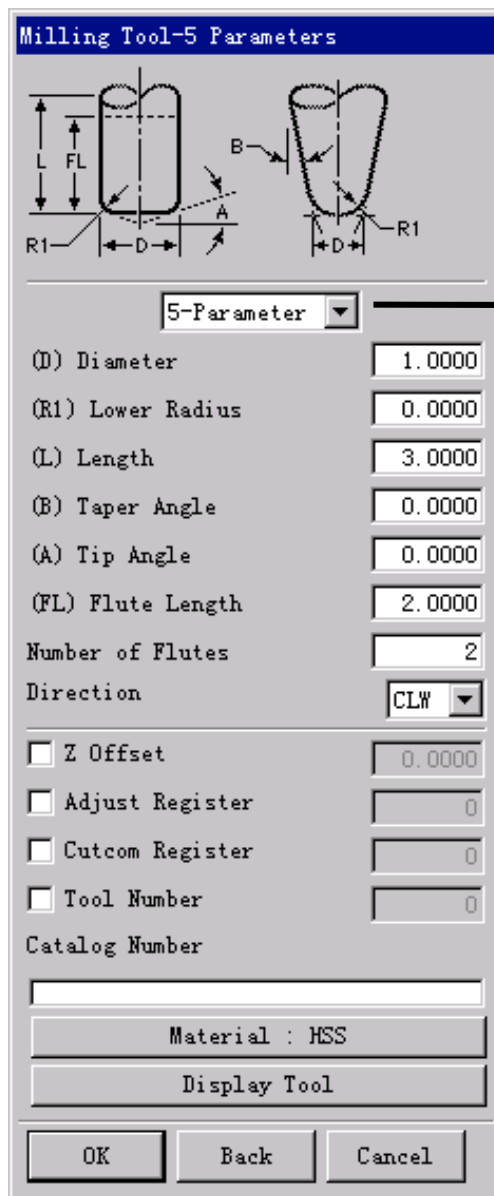
以刀具组织operations



- 建立新刀具
 - 选择“Create”

刀具参数定义

- 按图标提示定义参数



Lesson 5 : 创建Object (Tool)

- 调用刀具

- 选择 “Retrieve Tool”
- 选择刀具库
- 输入搜索条件（如刀具直径等）
- 搜索 (Count Matches)
- 查看结果(Result Info)
- OK,选择刀具

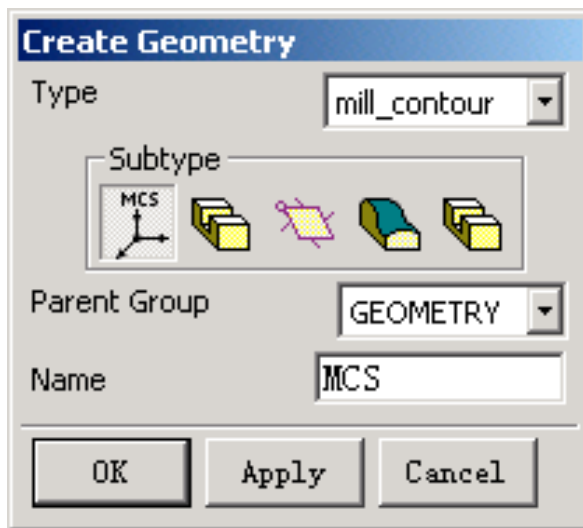
The screenshot illustrates the 'Retrieve Tool' process. It starts with a 'Library Class Selection' dialog where the 'Milling' category is expanded, and 'End Mill (indexable)' is selected. This leads to the 'Search Criteria' dialog, which is configured for an 'End Mill (indexable)' with a diameter of 16 mm, a flute length (FL) of 0, and a corner radius (R) of 0.8 mm. The search results are displayed in the 'Information' dialog, showing one match: 'ugt0202_005 Insert Cutter 16 mm 16.000000'.

libref	Descr	Diameter
ugt0202_005	Insert Cutter 16 mm	16.000000

Lesson 5 : 创建Object (Geometry)



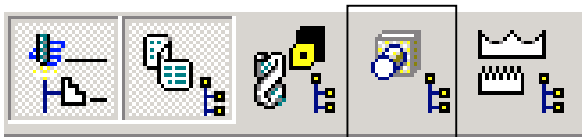
- Geometry的功能
 - 在已有的3D Model上选择曲线、曲面或实体等作为Operation的加工区域。
 - 定义新的加工坐标系。



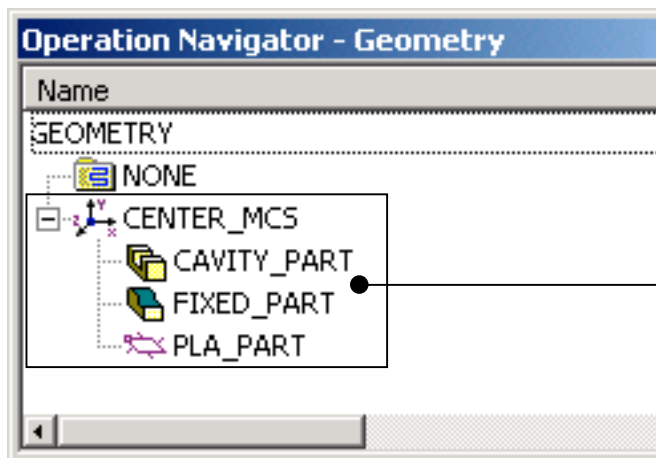
加工类型

Geometry类型
(随加工类型的不同而不同)

Geometry 名字

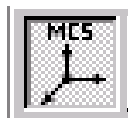


以Geometry组织operations

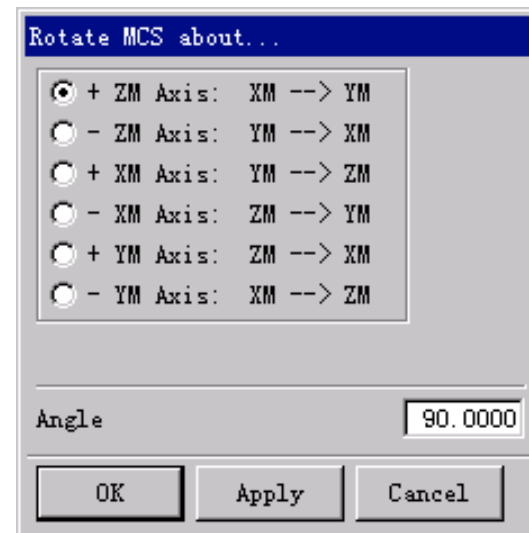
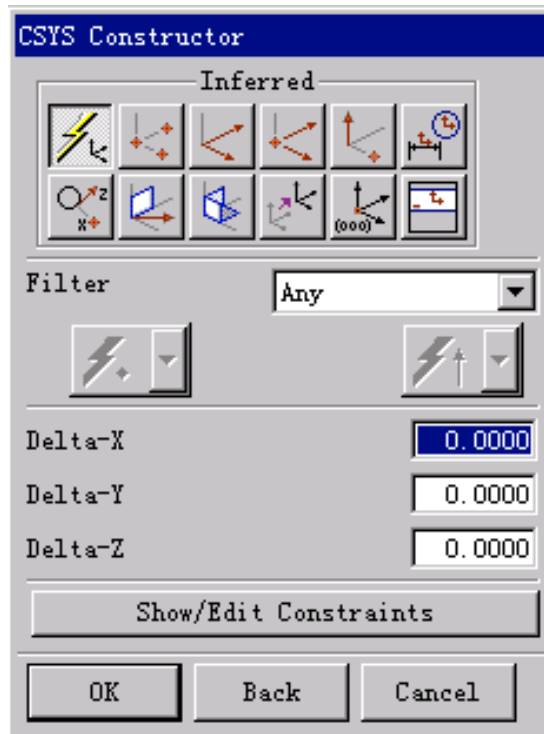
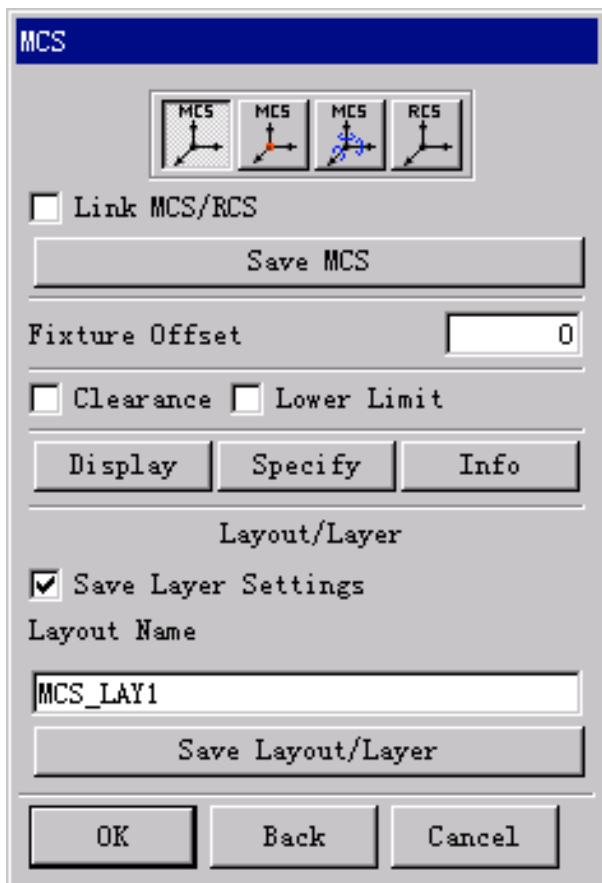


Lesson 5 : 创建Object (Geometry)

- Geometry ---坐标系(MCS)。



- 用于生成多个不同的加工参考坐标系与WCS的操作一样，可以旋转、重新定位等



Lesson 5 : 创建Object (Geometry)

19

- Geometry --- Mill Geom



- 用于选择曲面或实体等作为要加工的切削区域。
(如: Cavity Mill、Fixed Contour Mill等)
分为: 加工零件(Part)-----加工后形状
毛坯零件(Blank)
或 素材零件-----加工前形状
检查零件(Check)-----用于避免过切的
检查物体

- Geometry --- Mill Bnd



- 用于选择Curve或Edge等作为要加工的切削区域。
(用于Planar Mill)

分为：加工零件(Part)-----加工后的外形边界
毛坯零件(Blank)

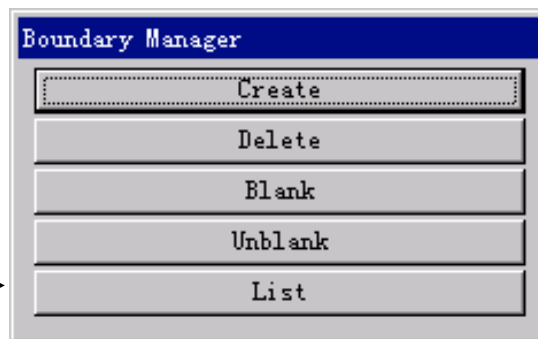
或 素材零件-----加工前的外形边界
检查零件(Check)-----用于避免过切的
检查边界

修剪零件(Trim)-----用于加工刀路的修剪
底平面(Floor)-----用于确定加工深度



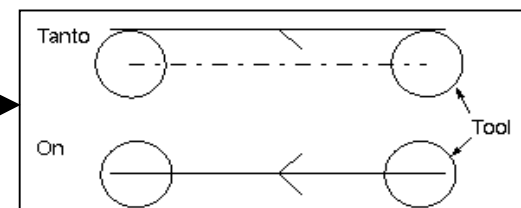
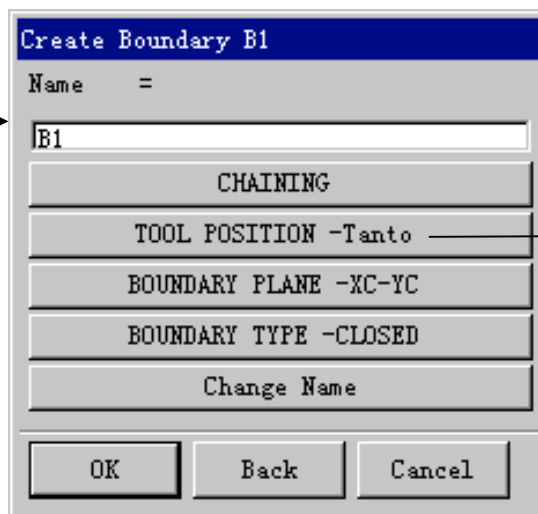
Lesson 6 : 边界管理器 Boundary Manager

- 什么是边界?
边界用于定义切削区域



- 进入边界管理器
– Tools --> Boundary...

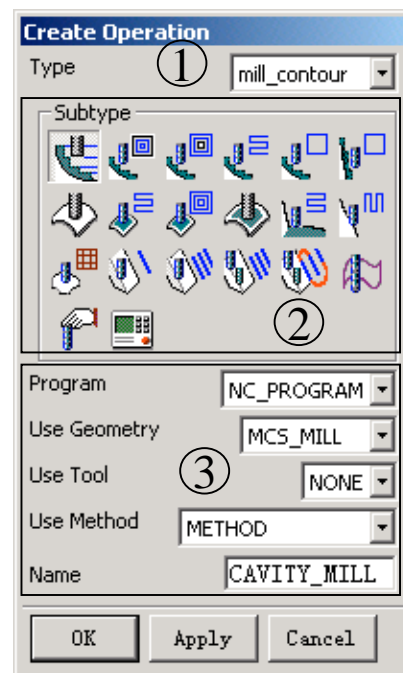
- 边界定义
– Tool Position
– Boundary Plane
– Boundary Type



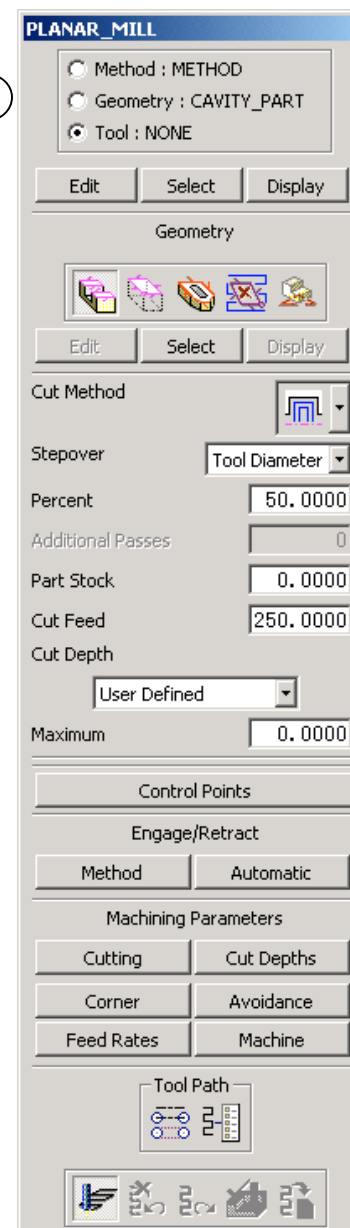
• 一般过程:

- 选择Operation图标
- 选择加工类型(Type--mill_planar)
- 选择子加工类型
- 选择该操作所在的程序组(Program)
- 选择加工几何体(Geometry)
- 选择刀具(Tool)
- 选择加工工艺(Method)
- 输入operation的名字 (Name)
- Create, 进行具体的参数设置
- 生成刀轨
- 后处理

注: *Geometry*、*Tool*、*Method* 也可以在 Operation 的参数设置里面选择。
(*Geometry*、*Method*、*Program* 的生成见Lesson 5: 创建对象Object)



④



- 子加工类型

Face_Milling

Planar_Mill

Rough_Follow

Rough_Zigzag

Rough_Zig

Cleanup_Corners

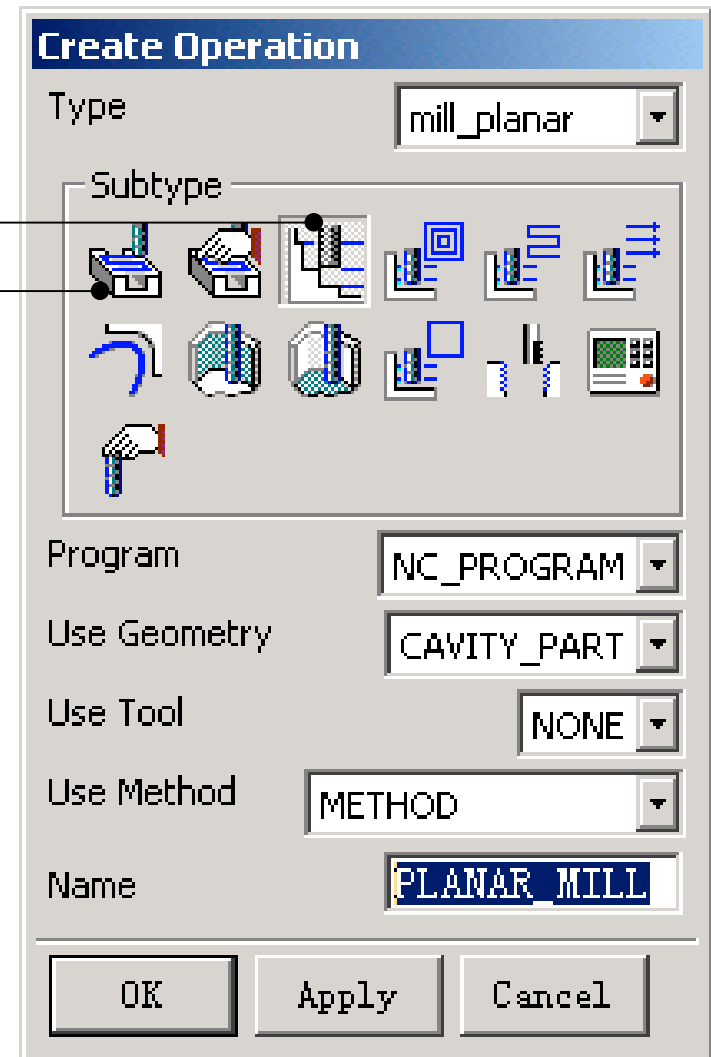
Finish_Walls

Finish_Profile

Thread_Milling

Mill_Control

Mill_User



注：平面铣的其他加工方法，如Rough_Follow、Finish_Walls等都是在Planar_Mill加工方法的基础上演变而来的。

- 平面铣 Planar_mill

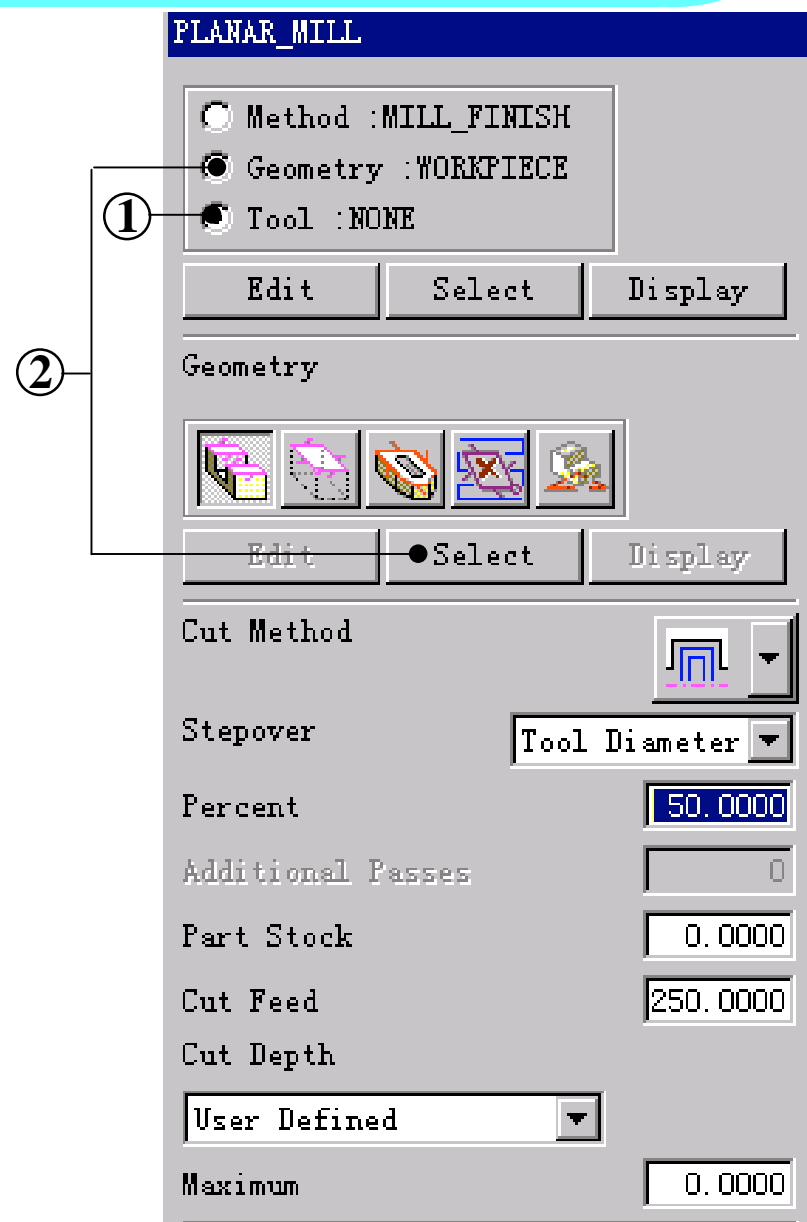
1. 选择刀具 (Tool Select)

可以选用已建立的刀具或选用新刀具

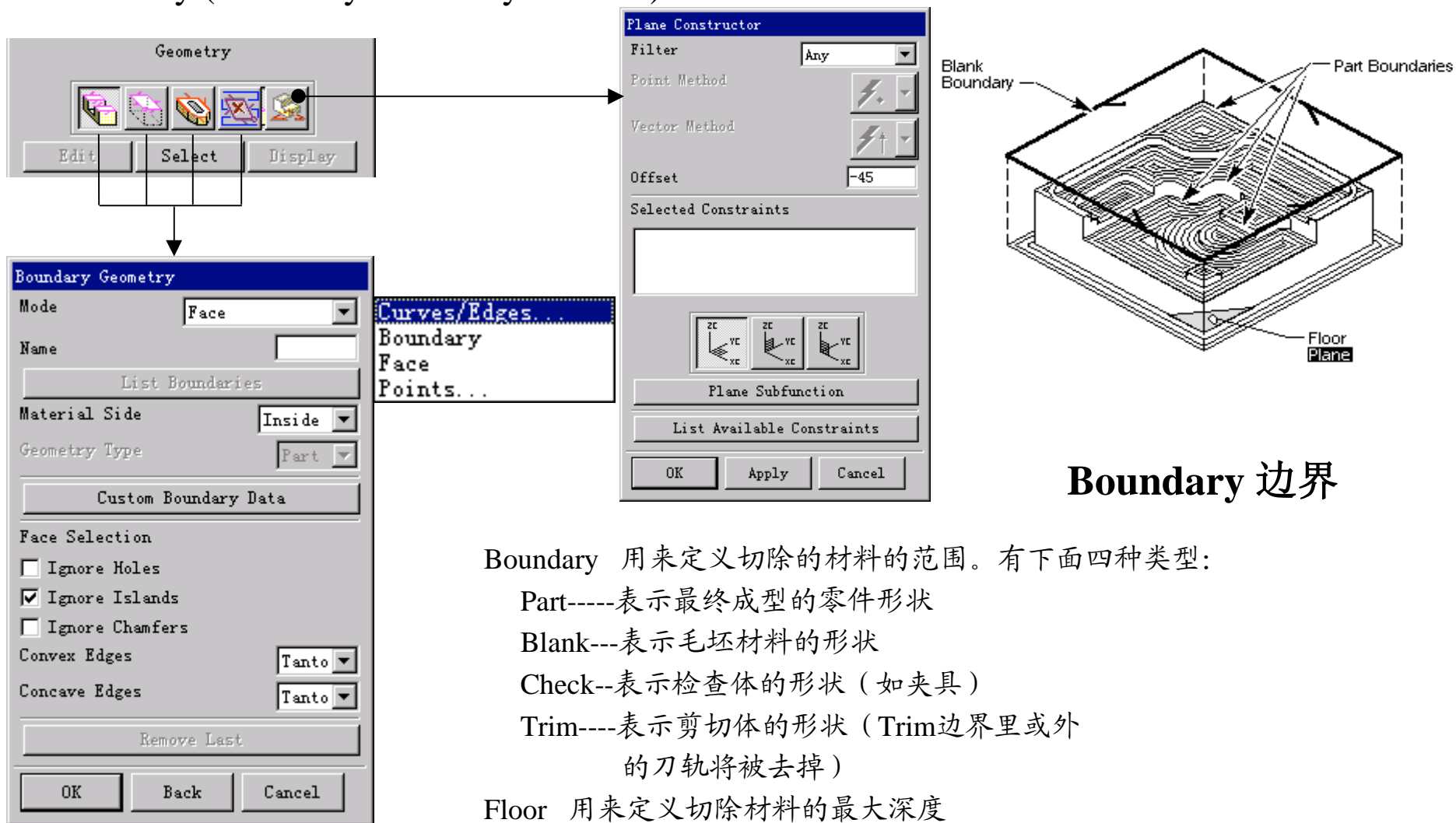
2. 选择加工几何体 (Geometry Select)

可以选用已建立的Geometry对象或者选择新的Geometry

注：在planar_mill (或其他子加工方法)里新建立的刀具可以在其他加工方法里调用。而新选择的Geometry只能在本加工方法里使用。其他加工方法里的Geometry要重新选择或调用已建立的Geometry对象



Geometry (Boundary Geometry & Floor)



The image displays the software interface for defining geometry in a milling operation. On the left, the 'Geometry' toolbar includes icons for 'Edit', 'Select', and 'Display'. Below it, the 'Boundary Geometry' dialog box is open, showing 'Mode' set to 'Face', 'Material Side' set to 'Inside', and 'Geometry Type' set to 'Part'. The 'Face Selection' section includes checkboxes for 'Ignore Holes', 'Ignore Islands' (checked), and 'Ignore Chamfers'. 'Convex Edges' and 'Concave Edges' are both set to 'Tanto'. A 'Remove Last' button is also present. In the center, the 'Plane Constructor' dialog box is shown, with 'Filter' set to 'Any', 'Offset' set to '-45', and 'Plane Subfunction' buttons. A dropdown menu is open over the 'Plane Constructor' dialog, listing 'Curves/Edges...', 'Boundary', 'Face', and 'Points...'. On the right, a 3D model of a milled part is shown with annotations: 'Blank Boundary' pointing to the outer edge of the blank, 'Part Boundaries' pointing to the inner edges of the part, and 'Floor Plane' pointing to the bottom surface of the part.

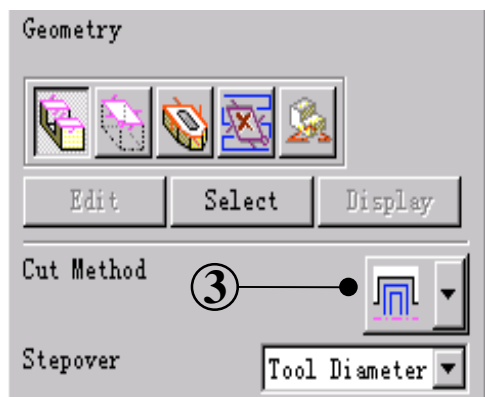
Boundary 边界

Boundary 用来定义切除的材料范围。有下面四种类型：

- Part----表示最终成型的零件形状
- Blank---表示毛坯材料的形状
- Check--表示检查体的形状（如夹具）
- Trim----表示剪切体的形状（Trim边界里或外的刀轨将被去掉）

Floor 用来定义切除材料的最大深度

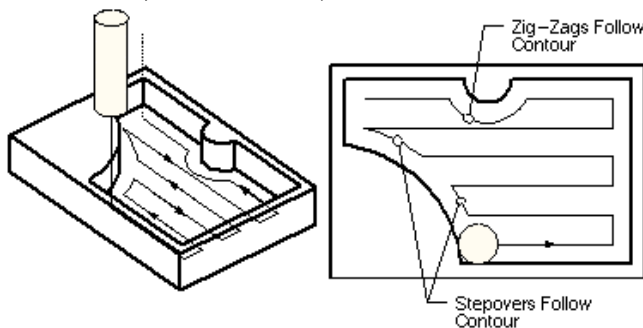
3. 选择切削方式 (Cut Method)



Zig-Zag



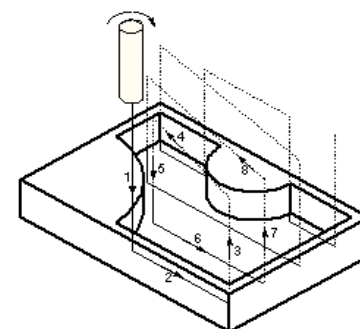
产生往返式平行路径，进行双向切削



Zig



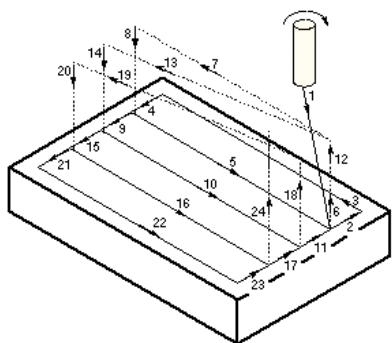
产生单向式平行路径，进行单向切削



Zig with contour



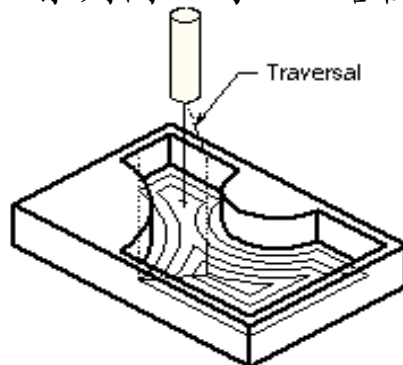
进行单向切削，并在相邻zig刀轨间加轮廓铣



Follow



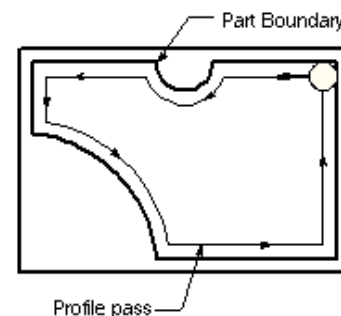
沿切削区域的轮廓生成一系列同心的加工路径



Profile



沿切削区域的轮廓生成单个或指定数目的加工路径



Lesson 7 : 平面铣 Mill_Planar

4. 选择步距 (Stepover)

步距为定值

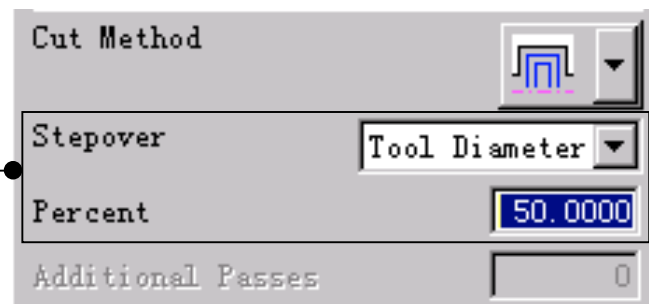
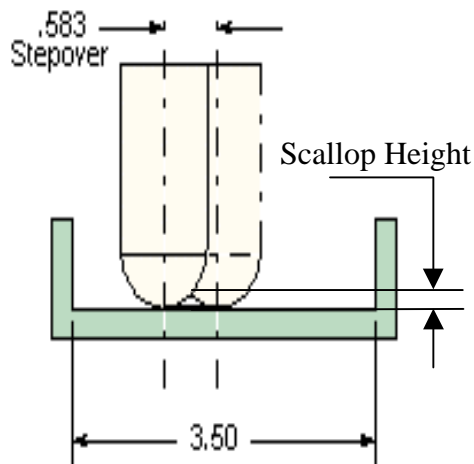
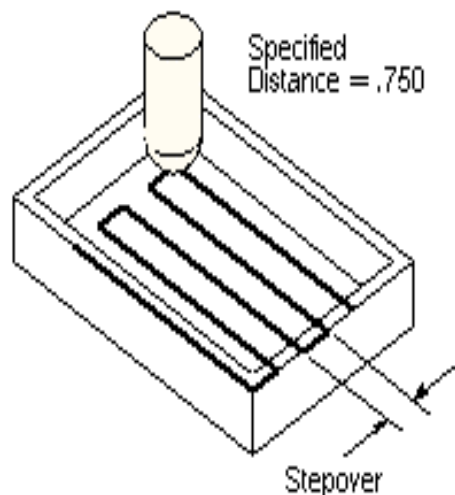
步距由粗糙度决定

步距为刀具直径的百分比

步距为变值



④



5. 定加工余量 (Stock)

定加工余量有两种方法:

⑤

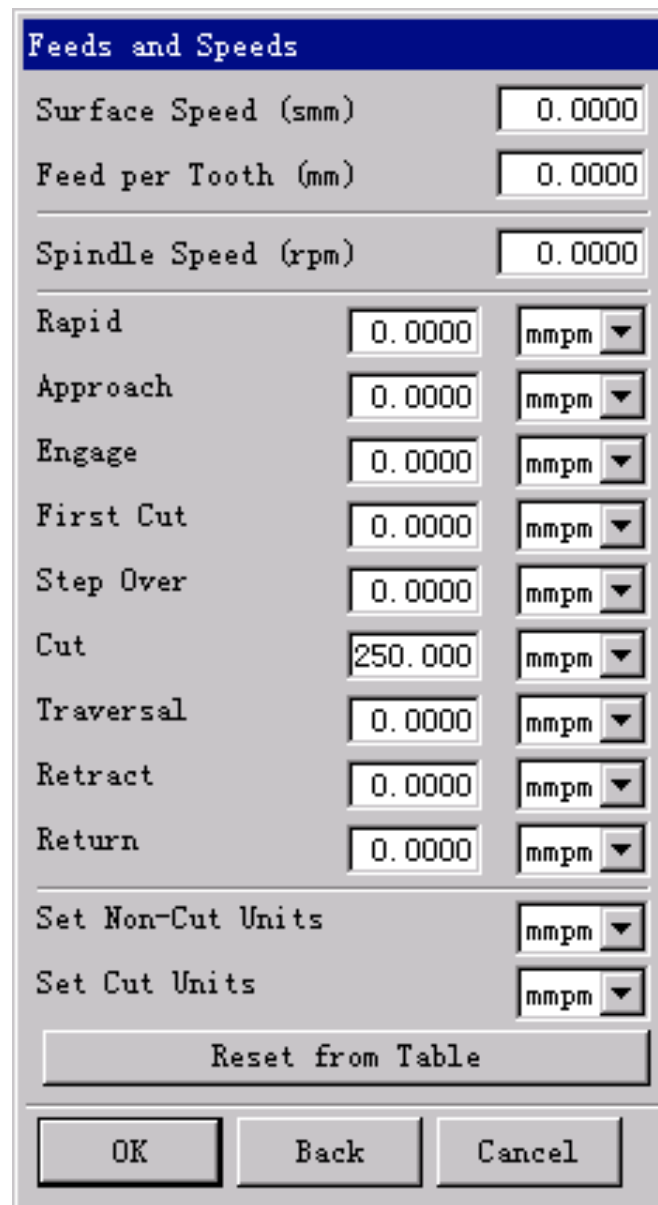
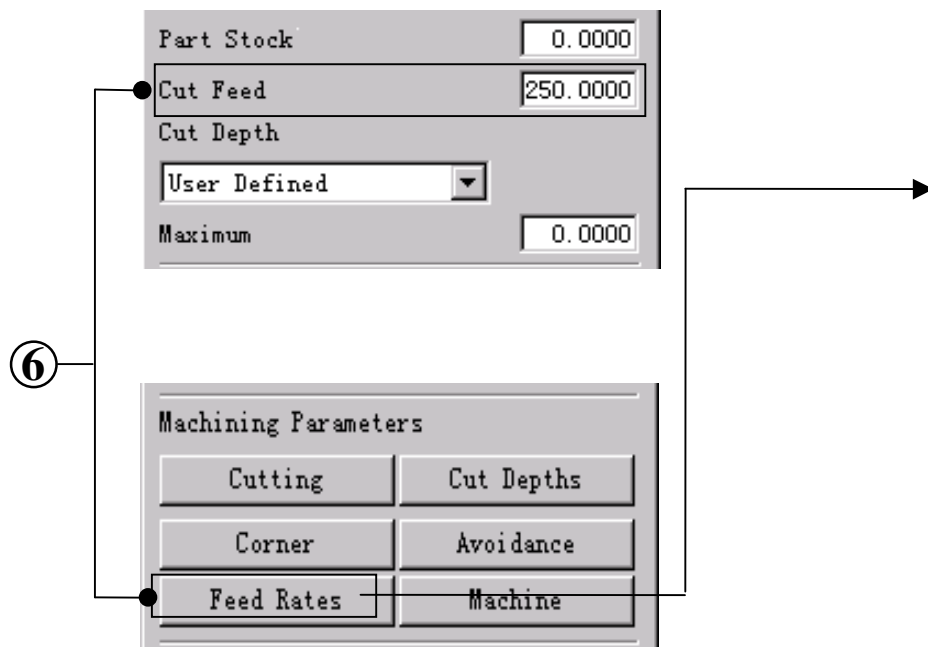
Part Stock	0.0000
Cut Feed	250.0000
Cut Depth	User Defined
Maximum	0.0000

Part Stock	0.0000
Final Floor Stock	0.0000
Blank Stock	0.0000
Blank Distance	0.0000
Check Stock	0.0000
Trim Stock	0.0000

注: 第二种方法比较详细地定零件、毛坯及检查等余量 (两种方法定的零件余量相互影响, 修改其中一个另一个自动更正)

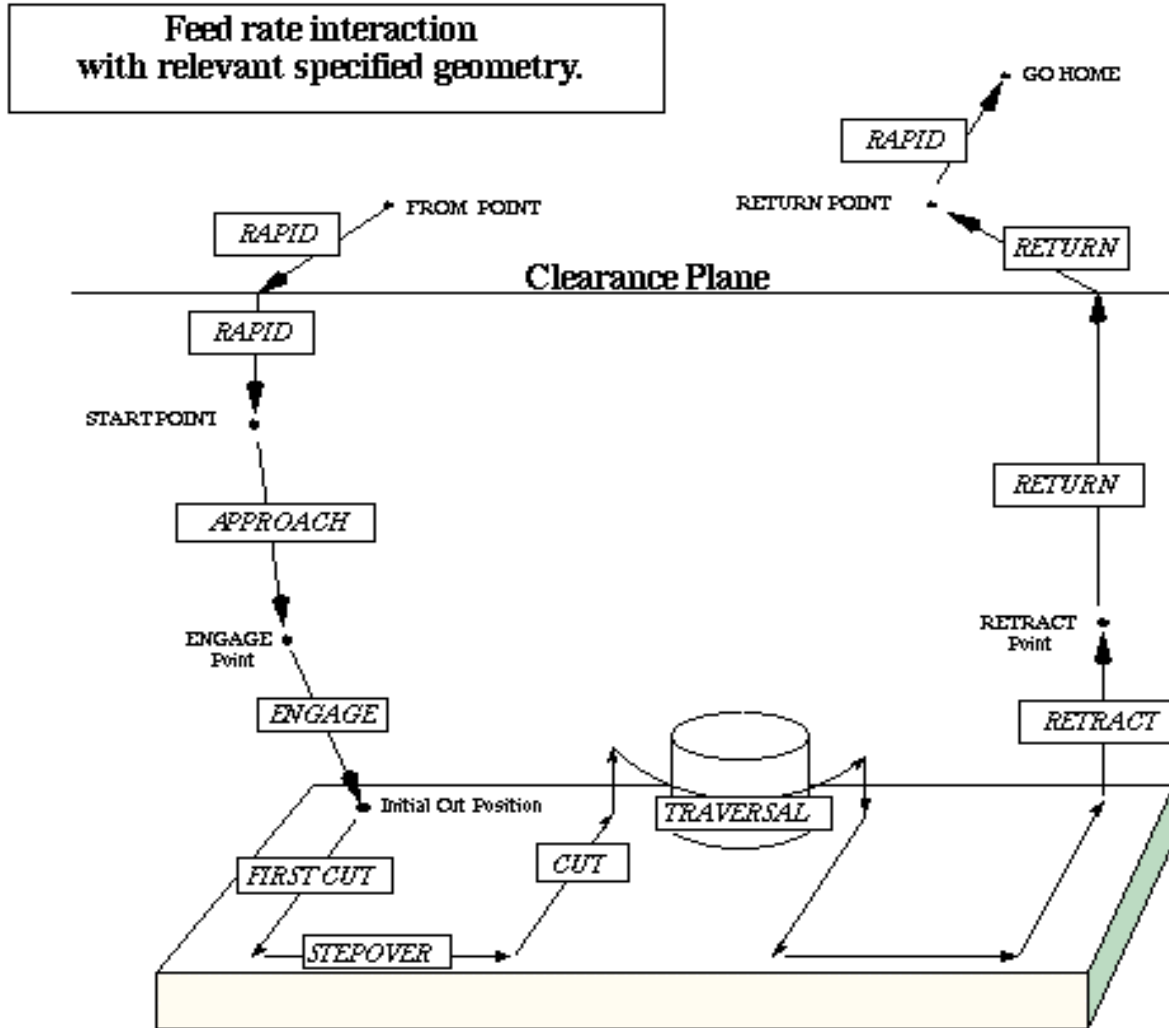
Lesson 7 : 平面铣 Mill_Planar

6. 选择进给速度/主轴速度
(Feed Rates/Spindle Speed)



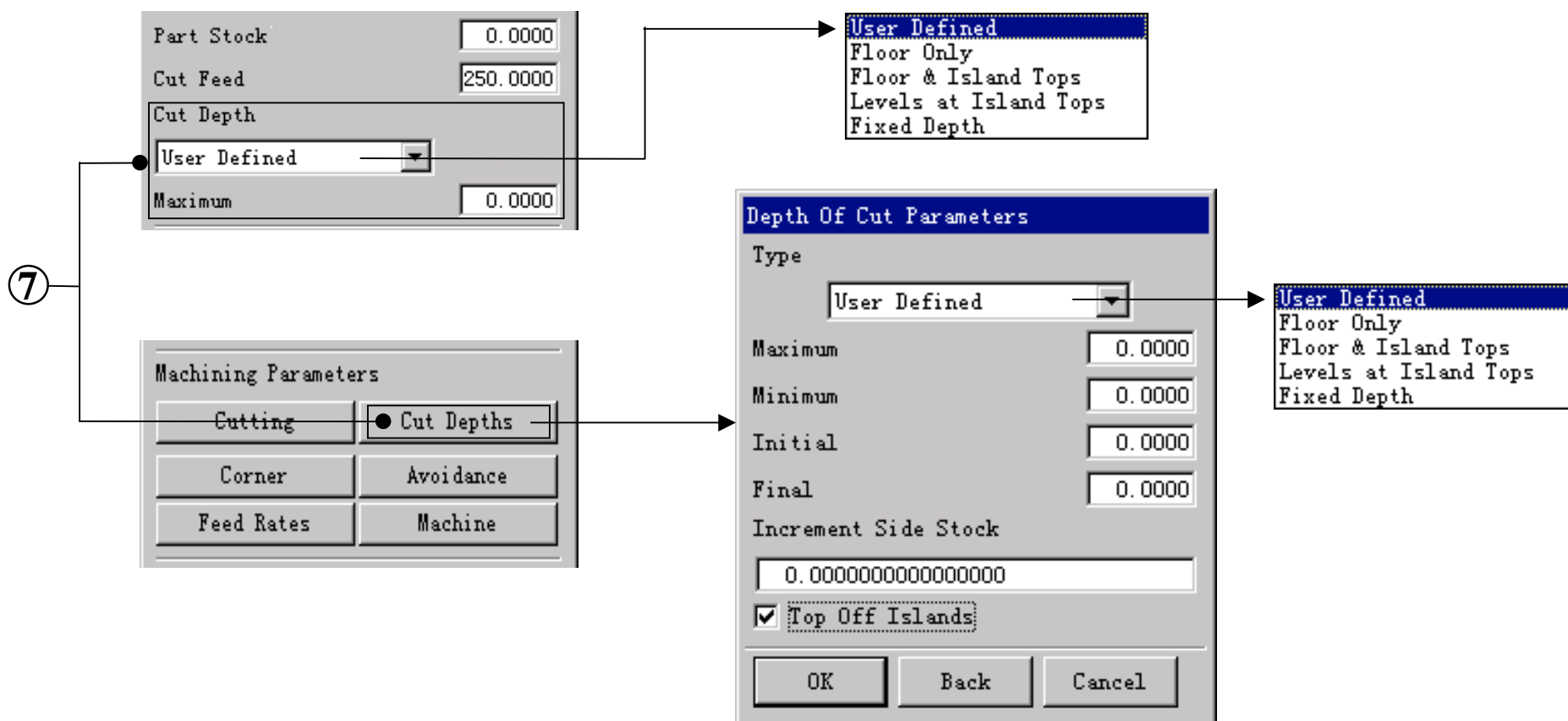
Feedrate 进给率定义

6. 选择进给速度/主轴速度 (Feed Rates/Spindle Speed)



Feedrate 进给率定义

7. 选择切削深度 (Cut Depth)

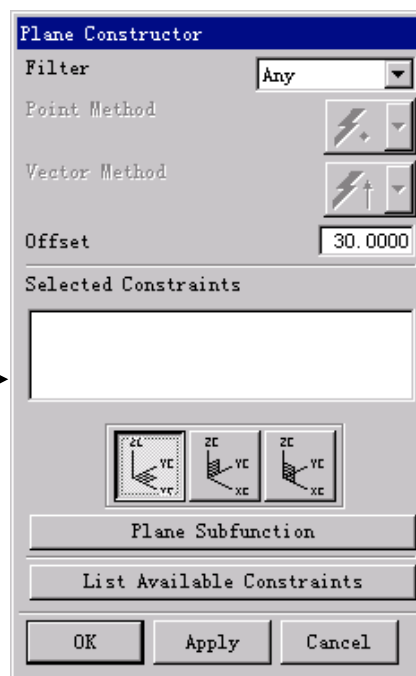
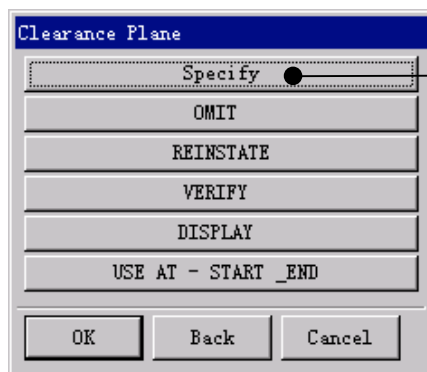
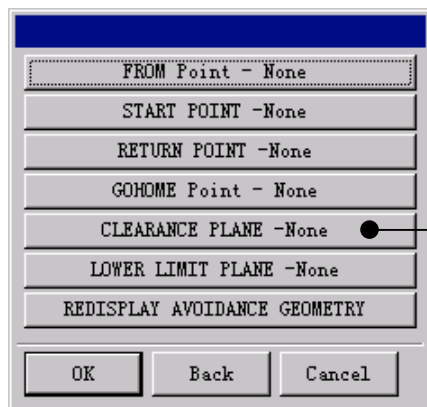
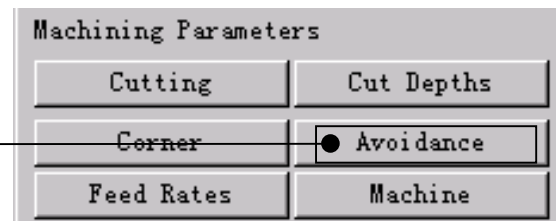


Lesson 7 : 平面铣 Mill_Planar

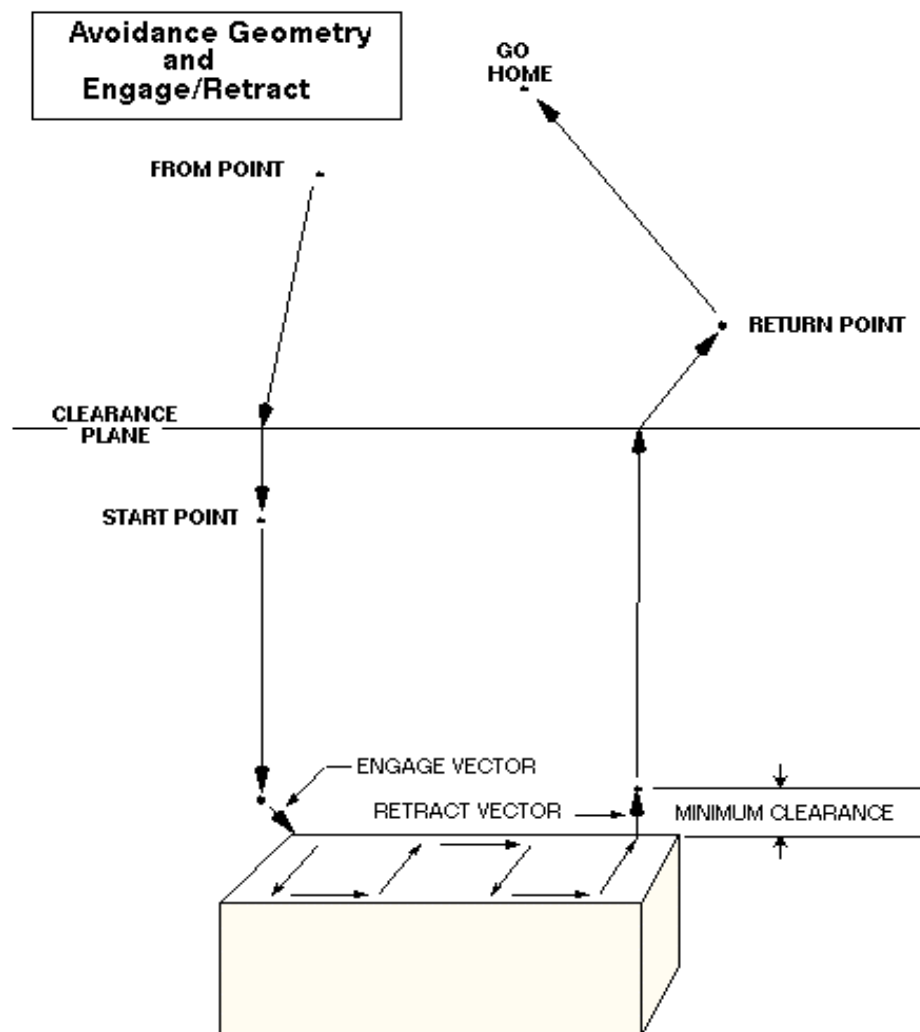
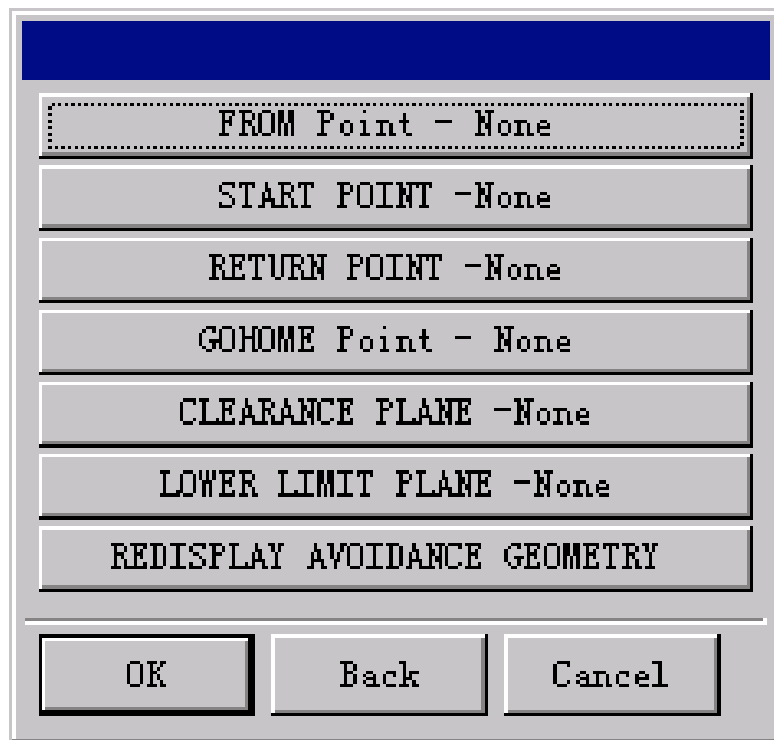
8. 避让 (Avoidance)

用于激活 (或取消) 用于刀具路径切削以前或切削以后的非切削移动的位置和方向。

(如: 刀具路径起始位置、加工安全平面等)



8. 避让 (Avoidance)



9. 切削参数 (Cutting)

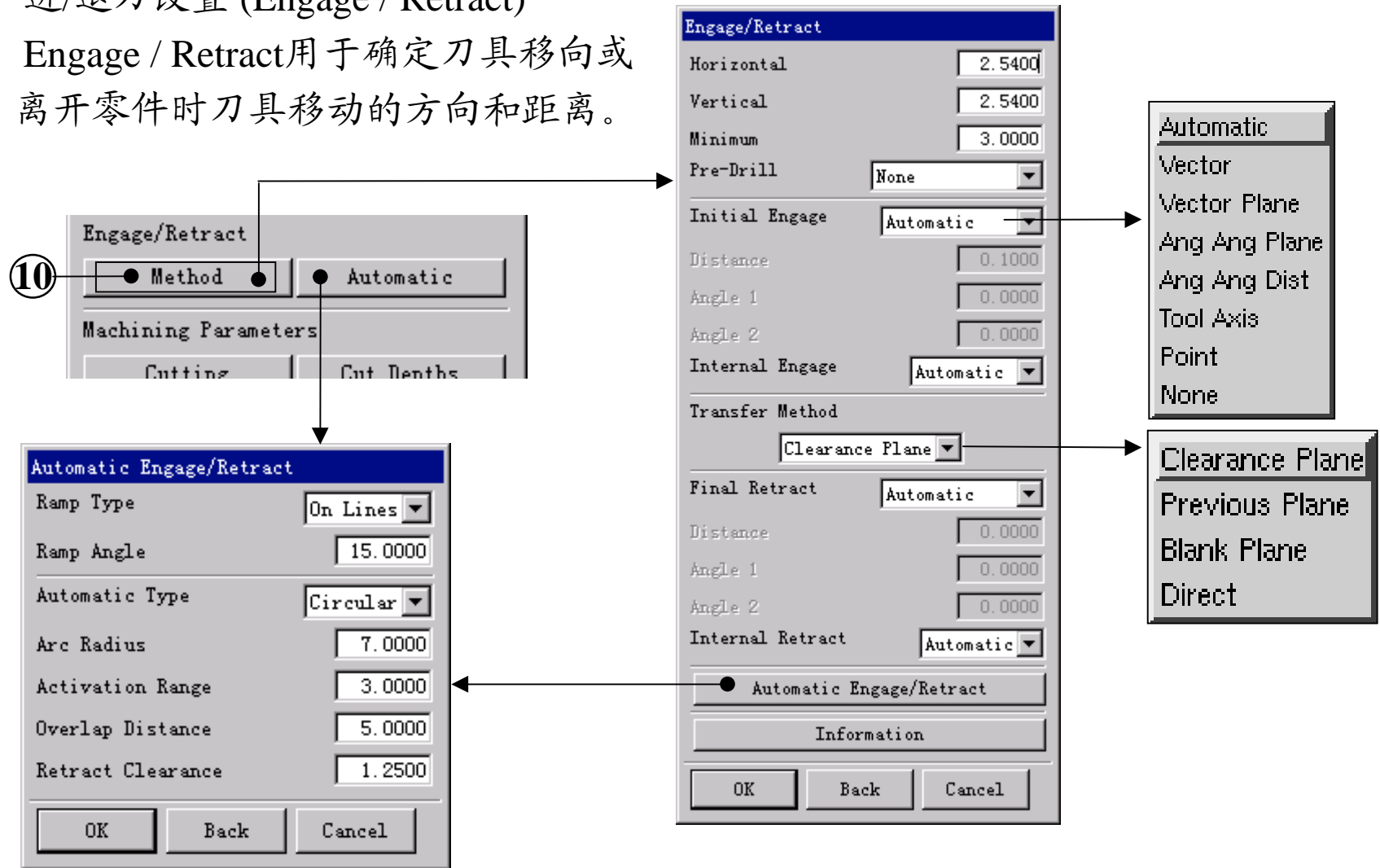
The image shows a software interface for setting milling parameters. On the left, a 'Machining Parameters' menu has 'Cutting' selected. The main dialog box is titled 'Cut Parameters' and contains several sections:

- Cut Order:** A dropdown menu set to 'Level First'. A callout box shows 'Level First' and 'Depth First' options.
- Region Sequencing:** A dropdown menu set to 'Optimize'. A callout box shows 'CLIMB' and 'CONVENTIONAL' options with diagrams for '顺铣、逆铣' (Forward, Reverse) and 'Forward, Reverse'.
- Checkboxes:** 'Region Connection', 'Boundary Approximation', and 'Follow Check Geometry' are checked. 'Traverse Pattern' is set to 'Zig'.
- Stock Settings:** 'Intol' (0.0300), 'Outtol' (0.1200), 'Part Stock' (1.0000), 'Final Floor Stock' (0.0000), 'Blank Stock' (0.0000), 'Blank Distance' (0.0000), 'Check Stock' (0.0000), and 'Trim Stock' (0.0000). A callout box points to these values with the text '加工内外公差' (Machining internal/external tolerances) and '加工余量设定' (Machining allowance setting).
- Uncut Regions:** 'Overlap Distance' is set to 2.0000. A callout box points to this value with the text '残留(未切)材料设定' (Residual (uncut) material setting).

At the bottom are 'OK', 'Back', and 'Cancel' buttons.

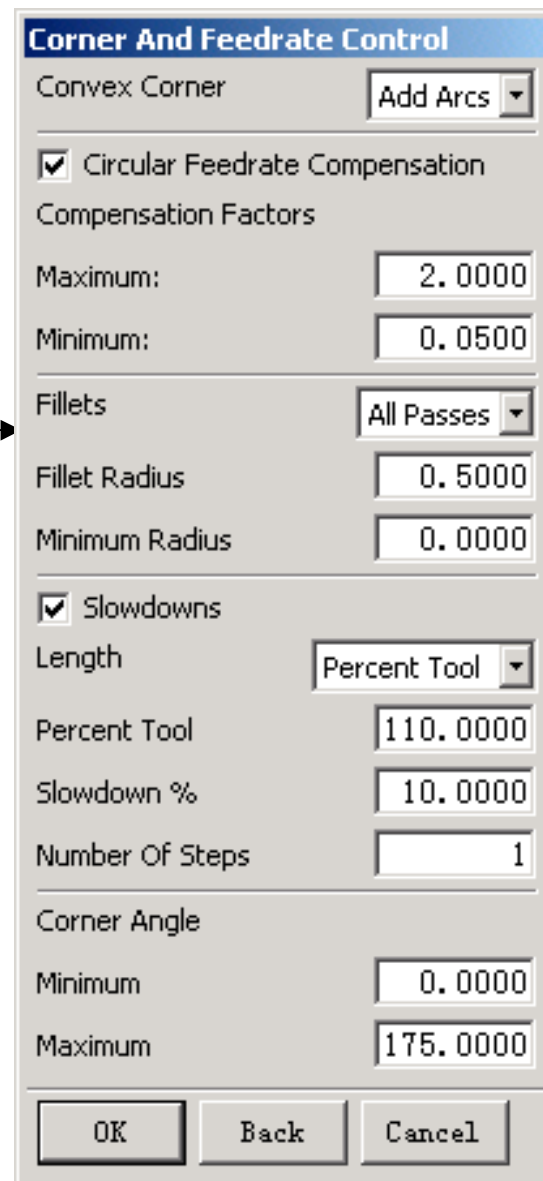
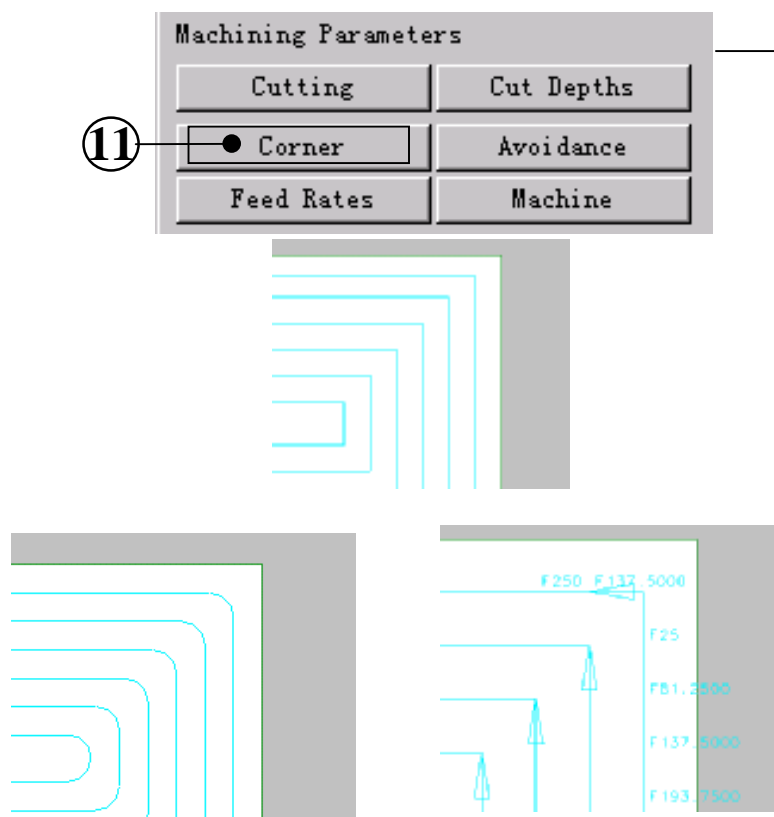
10. 进/退刀设置 (Engage / Retract)

Engage / Retract用于确定刀具移向或离开零件时刀具移动的方向和距离。



11. 拐角速度优化 (Corner)

为了避免刀具在拐角处由于惯性而造成过切，UG使用了拐角优化功能，在零件拐角处切入时自动减低速度，而在离开时自动加速。



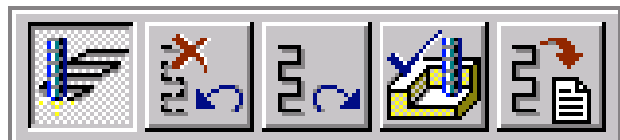
12. 加工控制 (Machine)

Machine Control用于定义换刀、主轴控制、冷却液控制等前后置指令。

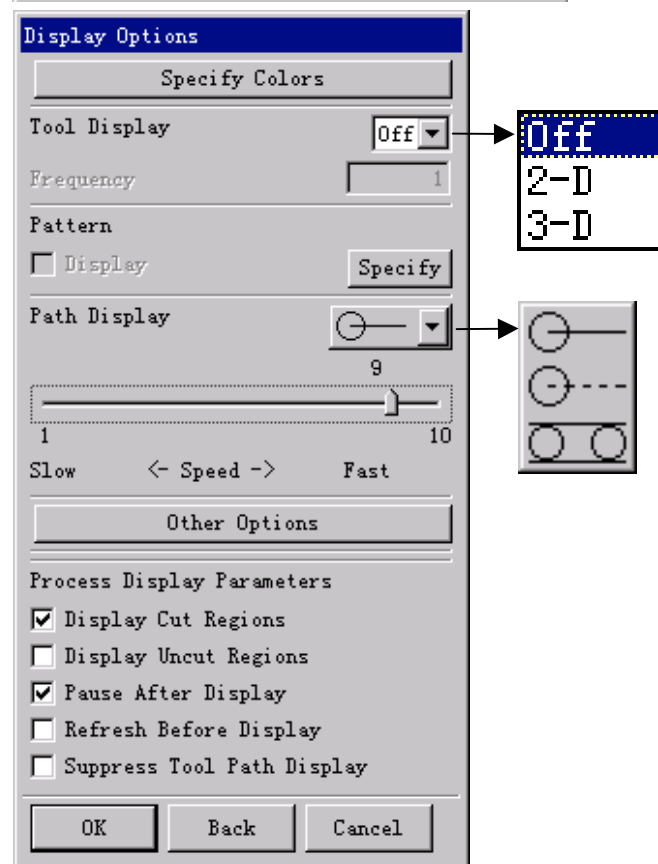
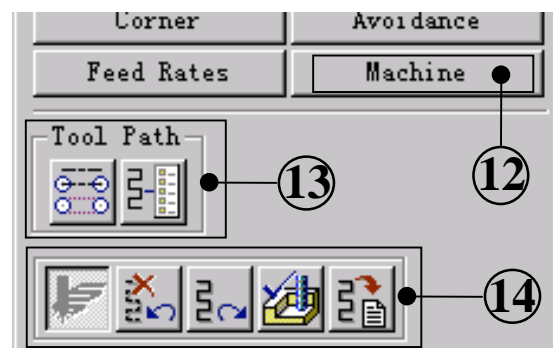
13. 刀轨显示选项 (Tool Path Display Option)

用于设定刀轨(Tool Path)的显示方法(如: 刀轨显示颜色、刀具显示方式、刀轨显示速度等)

14. 刀路生成、显示/刀路模拟校验/显示刀轨源文件



Generate Reject Replay Verify List



Lesson 7 : 平面铣 Mill_Planar (Face Milling)

- **Face Milling**

主要用于多平面加工

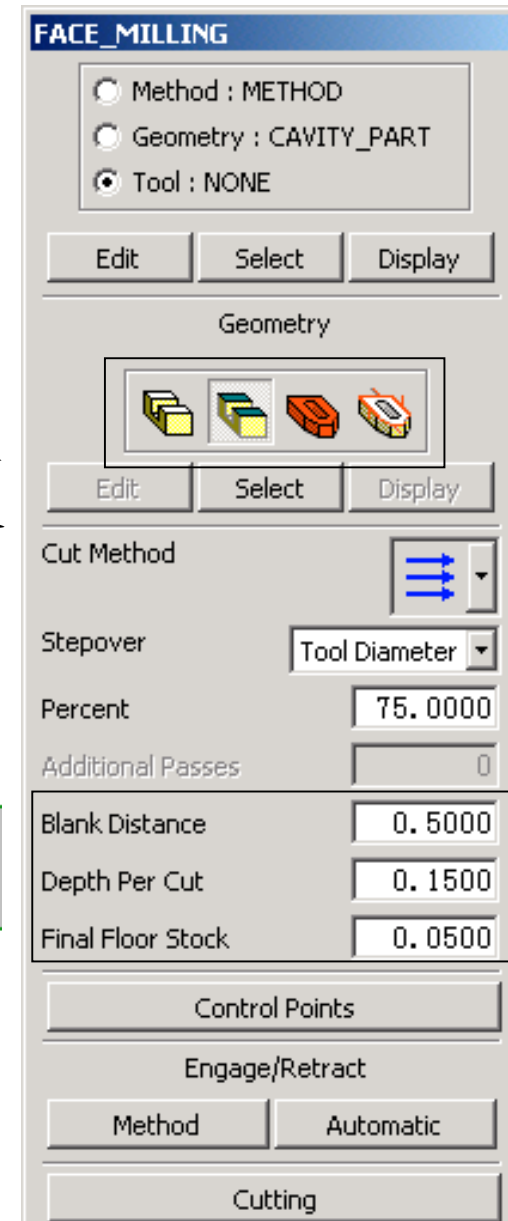
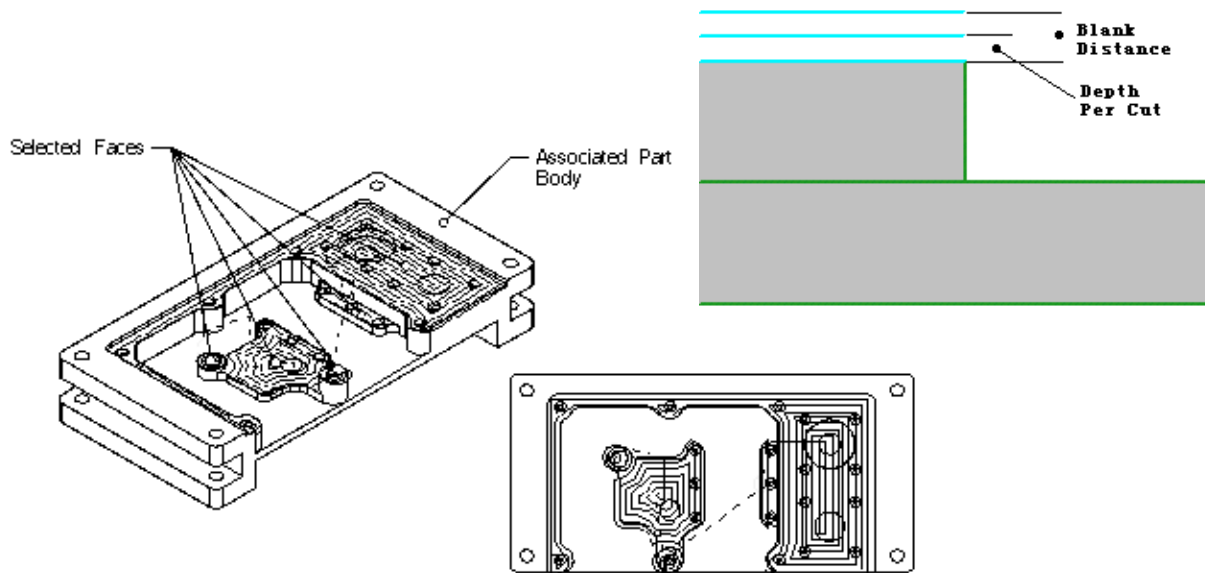
Geometry

加工零件(Part)-----要加工的实体(进行过切检查)

加工面(Face)-----要加工的面 (确定加工位置)

检查零件(Check Body)-----用于避免过切的检查物体

(Check Boundary)-----用于避免过切的检查边界



Lesson 8 : 型腔铣 Mill_Contour/Cavity_Mill

39

Cavity Milling 的特点是等高线走刀，主要用于带拔模斜度或曲面零件的粗加工。

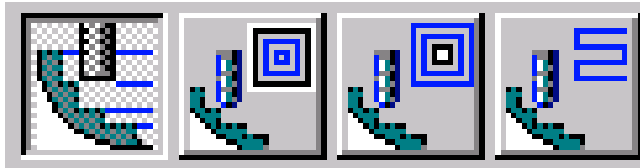
- 子加工类型

Cavity_Mill

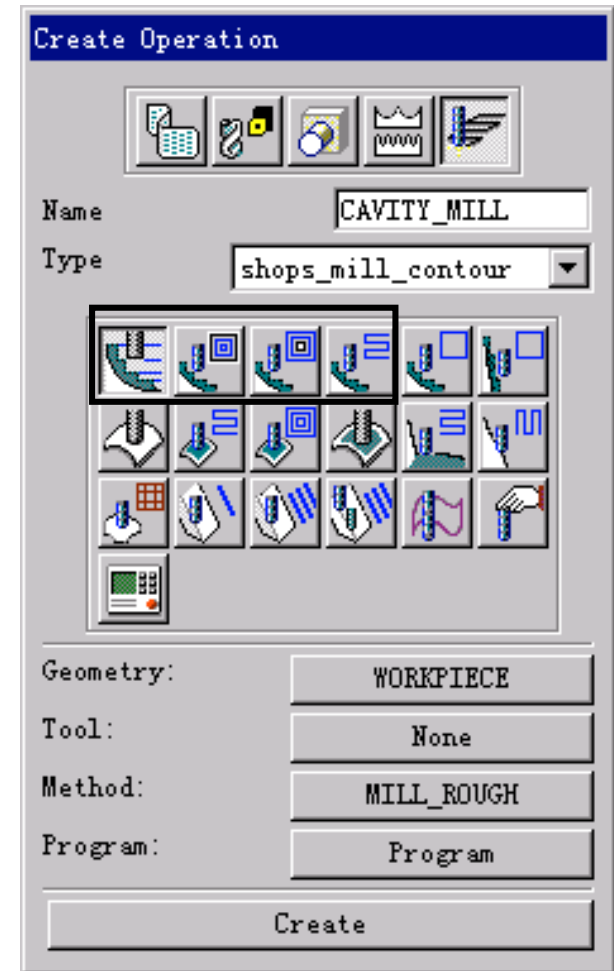
Zlevel_Follow_Cavity

Zlevel_Follow_Core

Zlevel_Zigzag

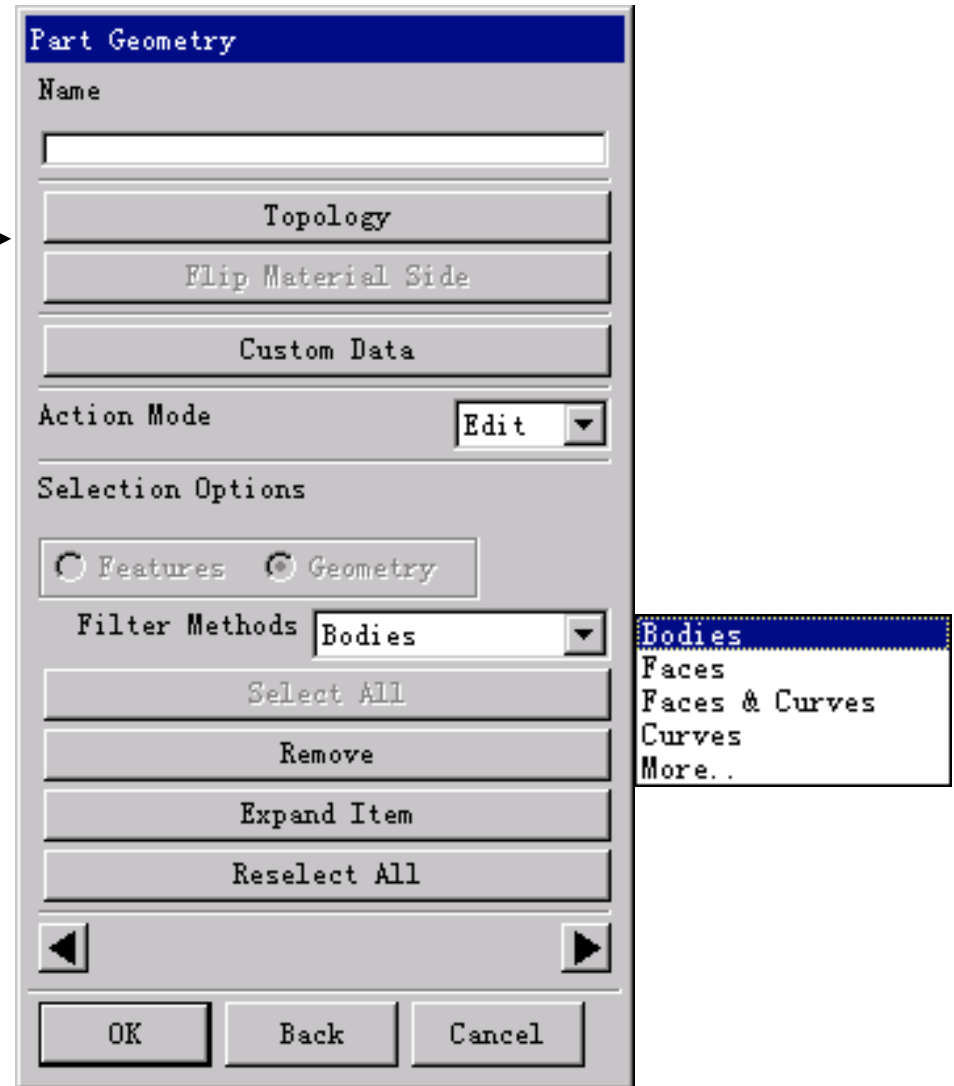
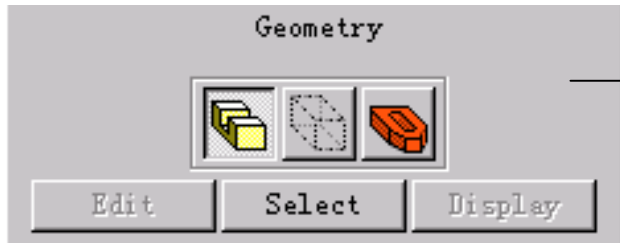


注：型腔铣的其他加工方法，如Zlevel_Zigzag、Zlevel_Follow_Cavity等都是在Cavity_Mill加工方法的基础上演变而来的。



Lesson 8 : 型腔铣 Mill_Contour/Cavity_Mill

选择加工几何体 (Geometry Select)



型腔铣可以选择实体或曲面作为Geometry，由实体或曲面所形成的空间体积来定义切除的材料范围。Geometry有下面三种：

Part Geometry-----表示最终成型的零件形状

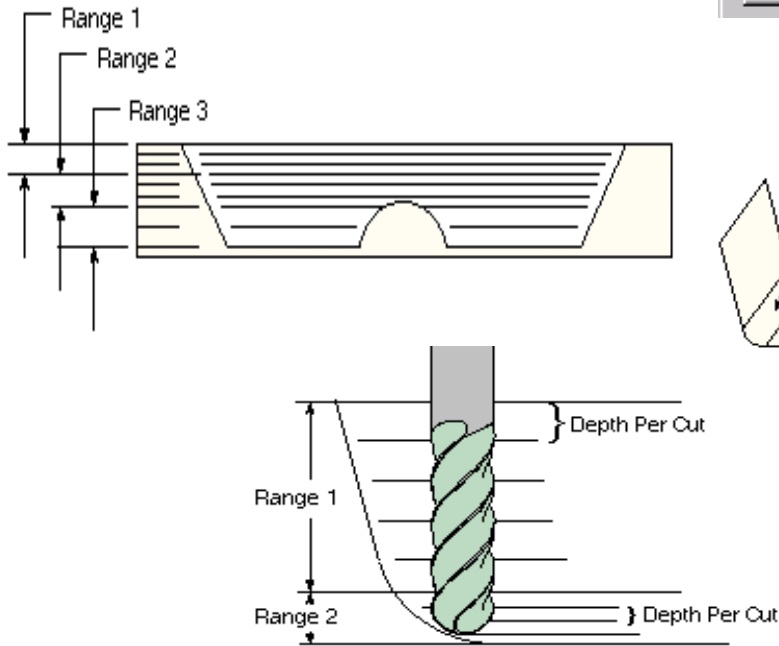
Blank Geometry---表示毛坯材料的形状

Check Geometry--表示检查体的形状(如夹具)

Lesson 8 : 型腔铣 Mill_Contour/Cavity_Mill

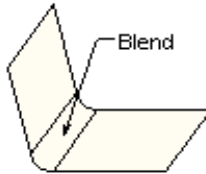
切深控制 (Cut Levels)

在作型腔铣时，可以控制切削深度，还可把深度分成几个范围 (Range)，然后在每个范围里定义不同的切削深度 (Depth Per Cut)。



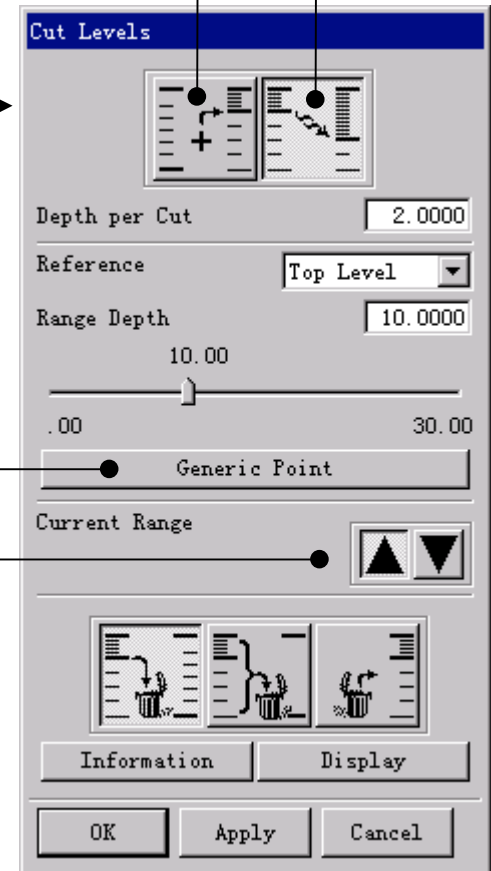
Depth Per Cut (Range 1) 2.0000

Control Geometry
Points Cut Levels



通过捕捉点来确定加工深度
切换切削层

增加Range 修改Range



定义若干Range，控制Depth Per Cut，得到需要的疏密程度。

Lesson 8 : 型腔铣 Mill_Contour/Cavity_Mill

切削参数 (Cutting)

The image shows the 'Cut Parameters' dialog box with several sections and annotations:

- Top Panel:** Includes buttons for 'Cutting', 'Corner', 'Avoidance', 'Feed Rates', and 'Machine'.
- Left Panel (Cutting):** Features a 'Cutting' button, 'Display Cut Direction', and checkboxes for 'Wall Cleanup', 'Tolerant Machining', and 'Undercut Handling'. The 'Trim by' is set to 'Silhouette'.
- Middle Panel (Region Sequencing):** Shows 'Cut Order' set to 'Level First', 'Climb Cut' selected, and 'Region Sequencing' set to 'Optimize'. It also has 'Outward' selected for 'Region Connection' and 'Boundary Approximation' checked.
- Right Panel (Tolerances):** Contains 'Intol' and 'Outtol' both set to 0.0300, and 'Use Floor Same As Side' checked. Below are 'Part Side Stock', 'Part Floor Stock', 'Blank Stock', 'Check Stock', 'Trim Stock', and 'Blank Distance', all set to 0.0000.
- Bottom Panel:** Includes 'OK', 'Back', and 'Cancel' buttons.

Annotations:

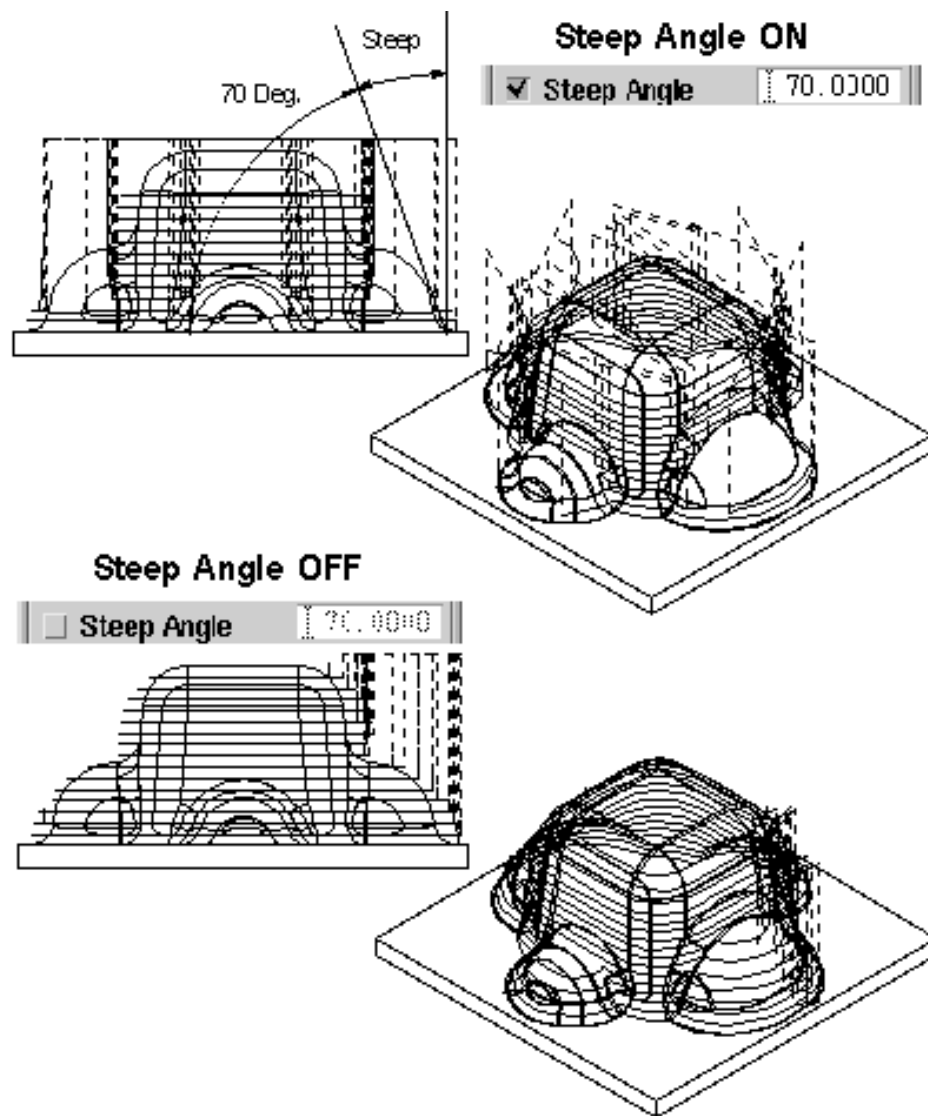
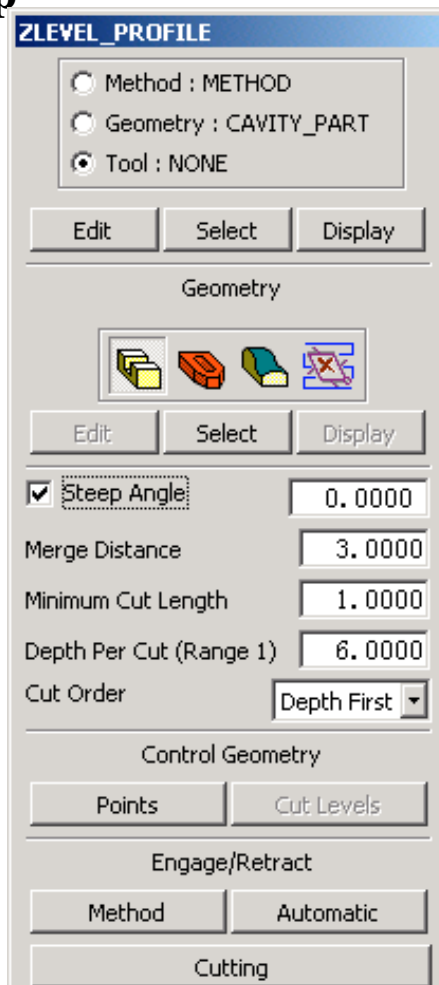
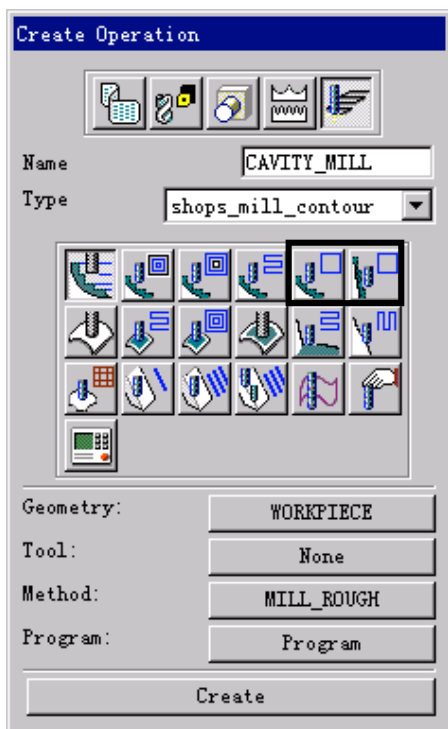
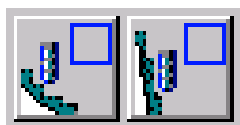
- 'Level First' and 'Depth First' are shown as options for 'Cut Order'.
- 'CLIMB' and 'CONVENTIONAL' are shown as options for 'Climb Cut', with diagrams illustrating '顺铣、逆铣' (Forward, Reverse) and 'Forward, Reverse'.
- '加工内外公差' (Processing internal and external tolerances) points to the 'Intol' and 'Outtol' fields.
- '加工余量设定' (Processing allowance setting) points to the 'Check Stock' field.

Lesson 8 : 型腔铣 Mill_Contour/Zlevel_Profile_(Steep)

- 子加工类型

Zlevel_Profile

Zlevel_Profile_Steep

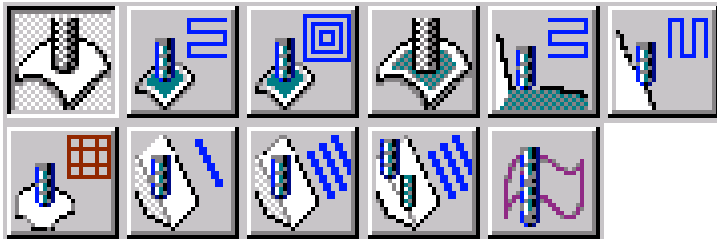


Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

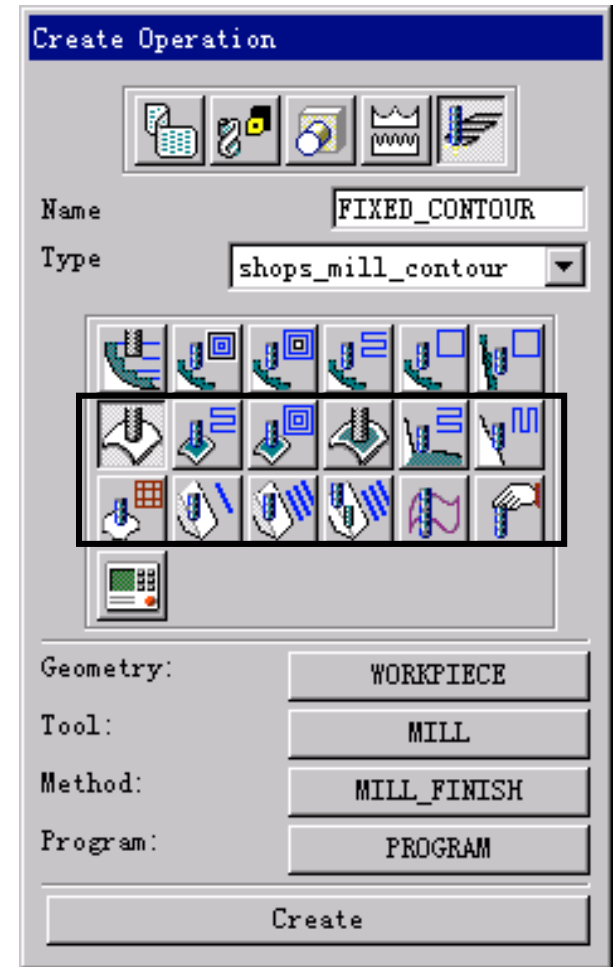
Fixed Contour由驱动几何体(Drive Geometry)产生驱动点 (Drive Point)，驱动点通过设定的投影方向 (Projection Vector)投影到加工面 (Part Surface)上，计算出刀位点，生成刀轨。主要应用于零件的精加工。

- 子加工类型

Fixed_Contour Contour_ZigZag Contour_Follow
Contour_Area Contour_Area_Non_Steep
Contour_Area_Dir_Steep Contour_Surface_Area
Flowcut_Single Flowcut_Multiple
Flowcut_Ref_Tool Profile_3D



注：固定轴轮廓铣的其他加工方法，如Contour_ZigZag、Contour_Follow等都是**在Fixed_Contour加工方法的基础上演变而来的。**



Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

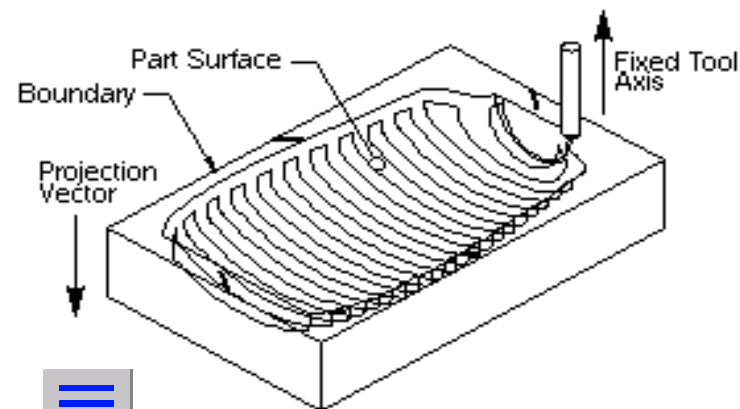
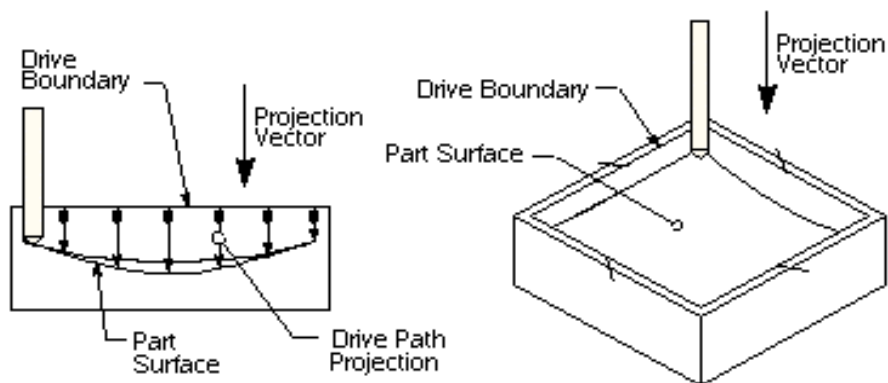
45

驱动方式 (Drive Method 指确定驱动几何体 (Drive Geometry) 的方法)

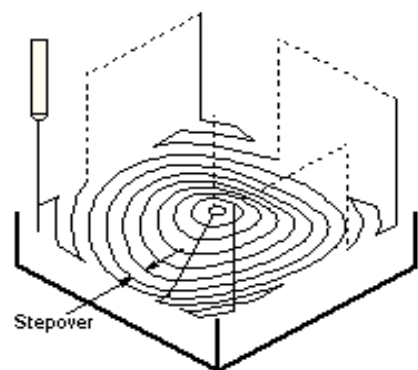
Drive Method 及其原理

驱动方法	原 理
Point / Curve (点/曲线)	用一系列点或曲线为驱动几何体产生驱动点投影到被加工零件。
Spiral (螺旋线)	通过定义中心点、半径和螺距产生螺旋线形驱动点，然后投影到 Part Geometry 产生刀轨。
Boundary (边界)	通过选择一个或多个边界，在边界之内(或之外)的区域内产生一系列驱动点(驱动点的排列图案由 Cut Type 决定)，从而投影产生刀路。
Area Milling(区域铣)	通过选择要加工的切削面(Cut Area)，以 Cut Area 的外边为 Boundary 产生驱动点。(利用此驱动方法，可以很安全地将 Cut Area 切削，又不会对 Part Geometry 上的非 Cut Area 曲面造成过切。)
Surface Area(曲面)	通过选择一系列曲面，以这些曲面的 UV 参数线产生驱动点。
Tool Path(刀轨)	以已存在的刀具轨迹为驱动，沿着 ToolPath 产生驱动点。
Radial Cut(射线切削)	沿着所选的边界产生垂直于边界的往复射线来形成驱动点。
Follow Cut(清根)	根据上一把刀具加工的余量，沿着零件曲面的凹角产生驱动点，将其进行清根

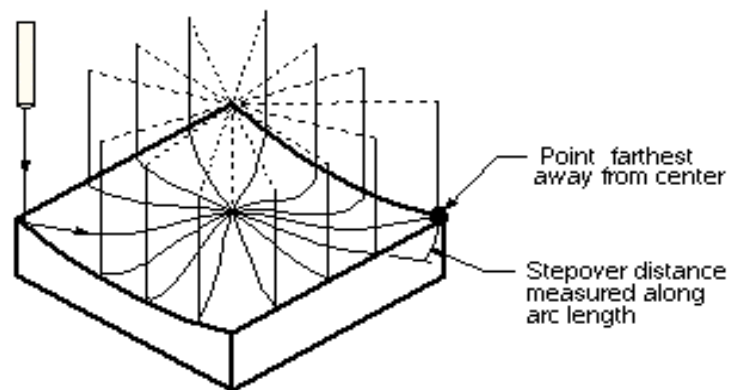
驱动方式 (Drive Method)



Boundary Drive/parallel lines



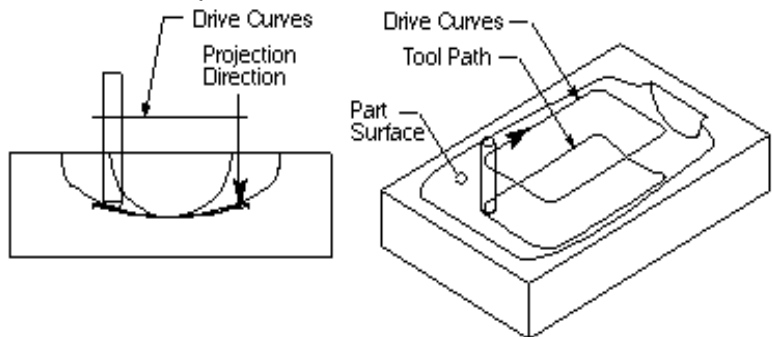
Boundary Drive /Concentric Arc



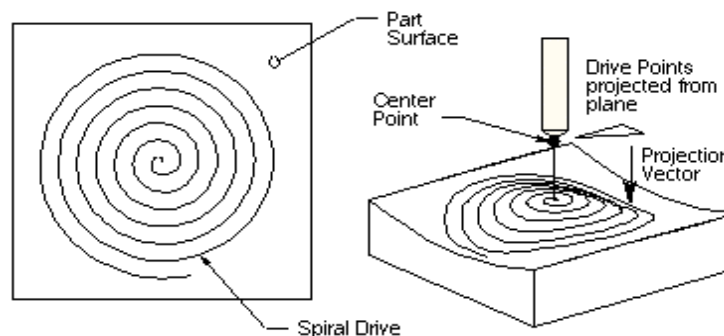
Boundary Drive /Radial Line

Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

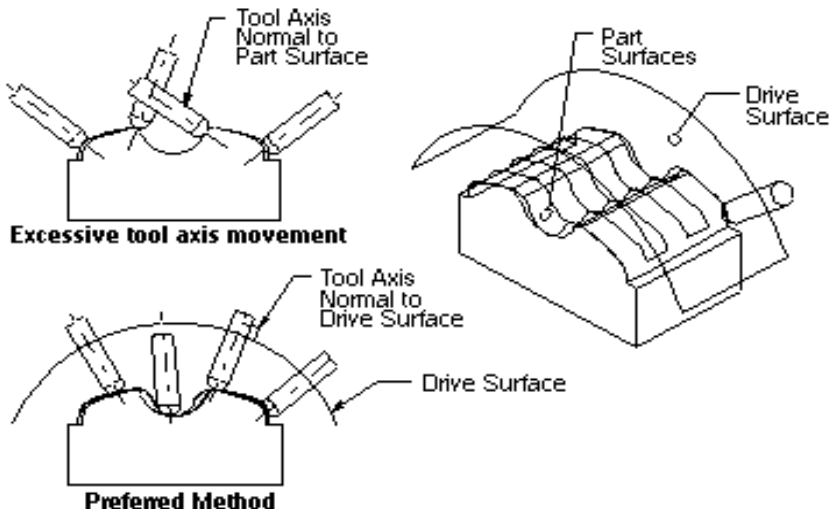
驱动方式 (Drive Method)



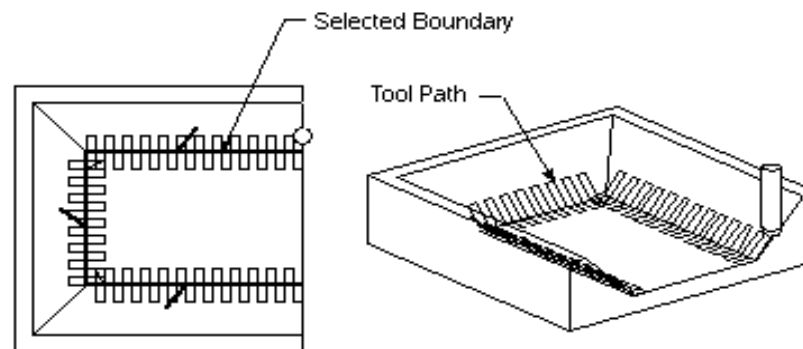
Point/ Curve



Spiral Drive



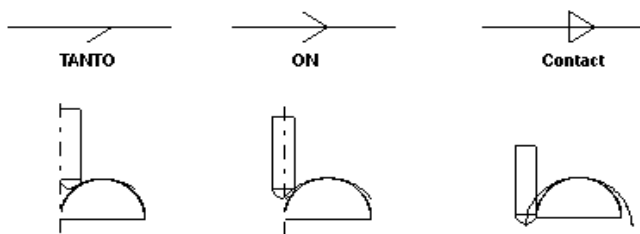
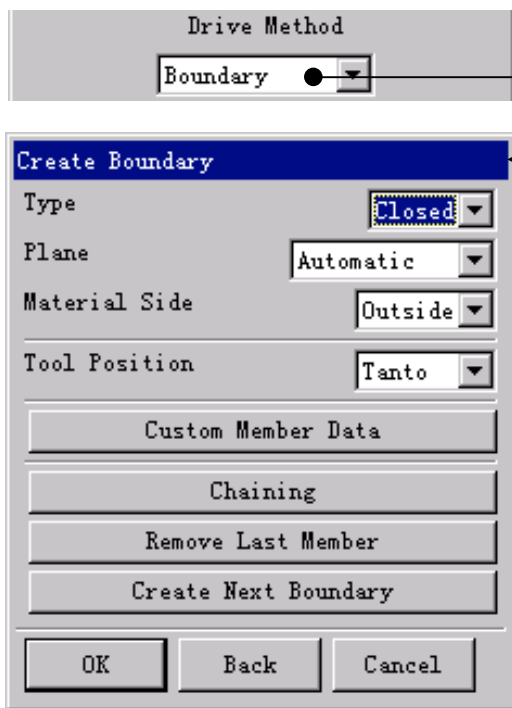
Surface Area



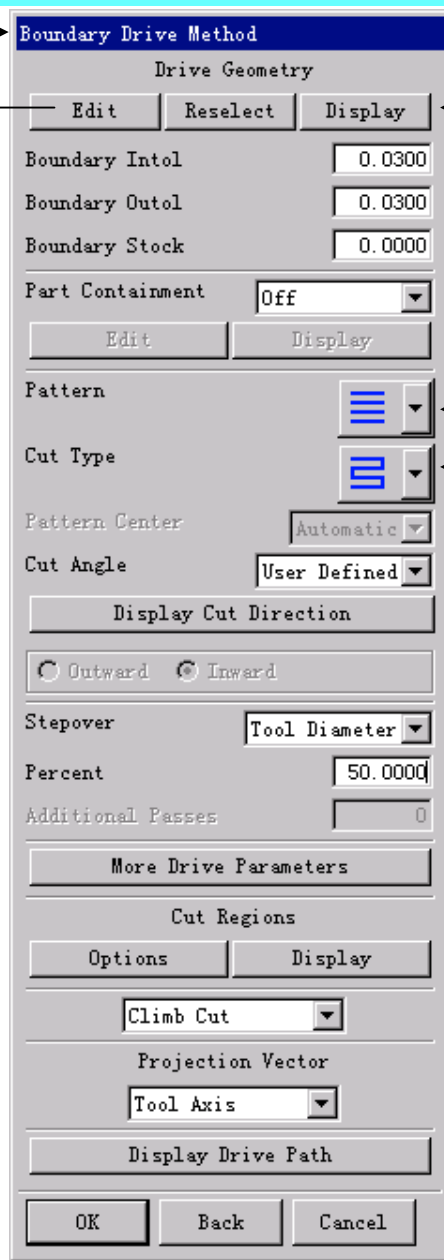
Radial Cut

Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

驱动方式 (Drive Method)
Boundary (边界)



Tool Position



选择驱动边界

选择刀轨图案

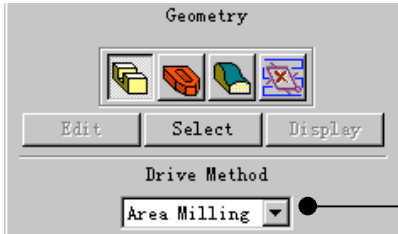
选择切削类型



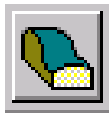
Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

驱动方式 (Drive Method)

Area Milling (区域切削)

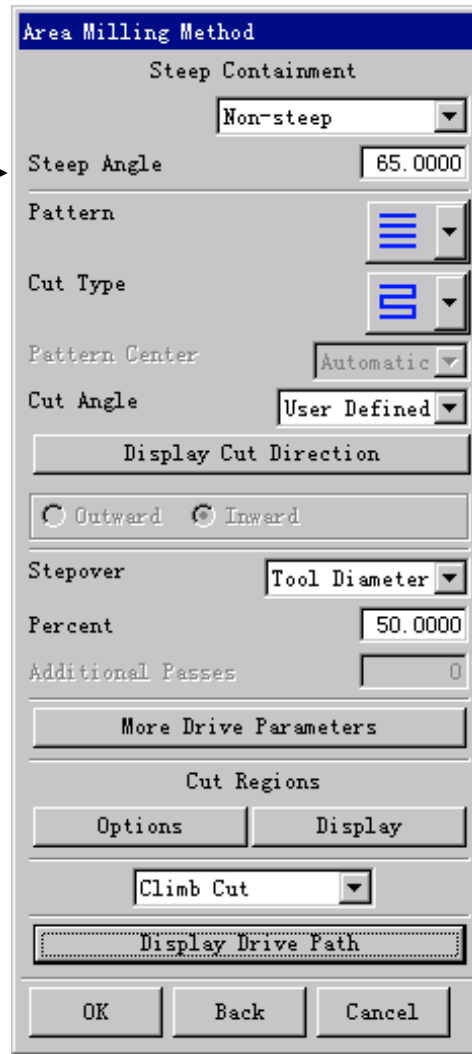


Part



Cut Area

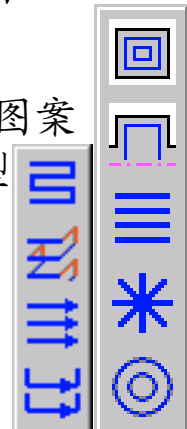
Area Milling驱动方法先选择一个加工零件(Part), 再选择该零件上要加工的区域(Cut Area)。UG在计算Cut Area上的刀路时, 自动考虑Part上的其他Area, 以避免过切。另外还可以定义陡峭角, 对大于陡峭角的区域不进行切削。



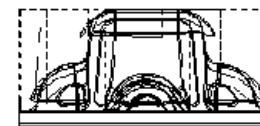
定义陡峭范围

选择刀轨图案

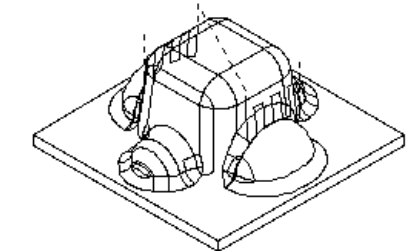
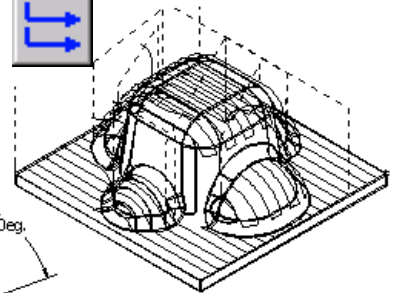
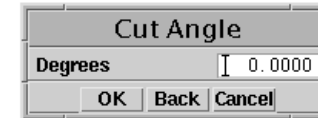
选择切削类型



Non-steep



Directional Step



Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

驱动方式 (Drive Method)

Flowcut (清根)

The image displays two dialog boxes from a CAD application. The top dialog, titled 'Drive Method', has 'Flow Cut' selected. The bottom dialog, titled 'Flow Cut', has 'Steep' selected for 'Containment', '65.0000' for 'Angle', and 'Mixed' for 'Cut Direction'. Below these are 'Max Concavity' (179.0000), 'Min Cut Length' (0.0000), and 'Hookup Distance' (0.0000). The 'Reference Tool Offsets' dialog below it has 'Reference Tool Offsets' selected, with 'Stepover Distance' (3.0000), 'Sequencing' (a specific pattern), 'Number of Offsets' (1), 'Ref. Tool Diameter' (1.0000), and 'Overlap Distance' (0.0000). A text box on the right contains the Chinese text: '最大清根角度' (Maximum chamfering angle), '最小清根长度' (Minimum chamfering length), and '连接距离' (Connection distance). To the right of the dialog boxes is a vertical diagram showing a tool path with blue arrows and dashed lines, illustrating the 'Flow Cut' operation.

Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

切削参数 (Cutting)

Machining Parameters

Cutting Non-Cutting

Feed Rates

Machine Control

Cutting Parameters

Part Intol

Part Outol

Part Stock

Part Stock Offset

Multi-Depth Cut

Incremental Stock

Increment

Passes

Part Safe Clearance

Check Safe Clearance

Check Stock

When Gouging

Boundary Intol

Boundary Outol

Boundary Stock

Use Tool Holder

Remove Edge Traces

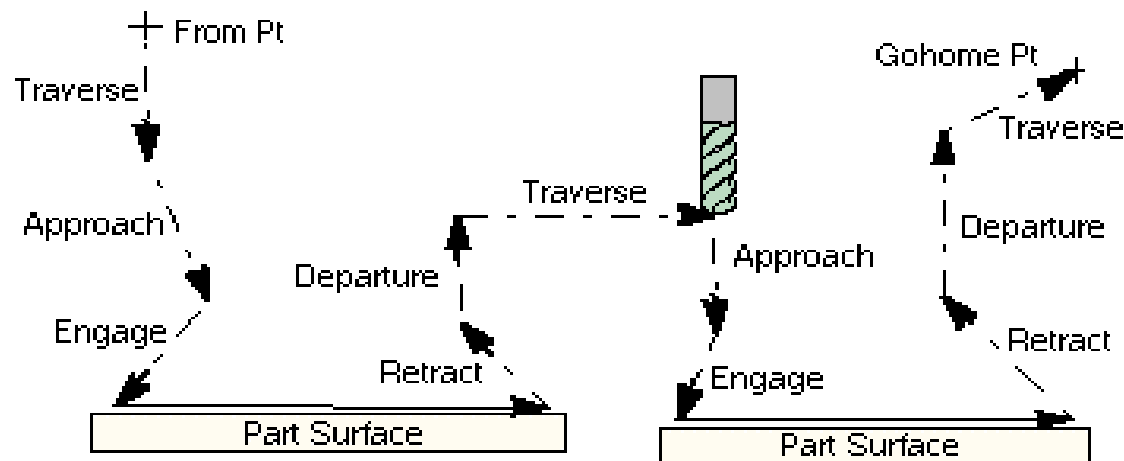
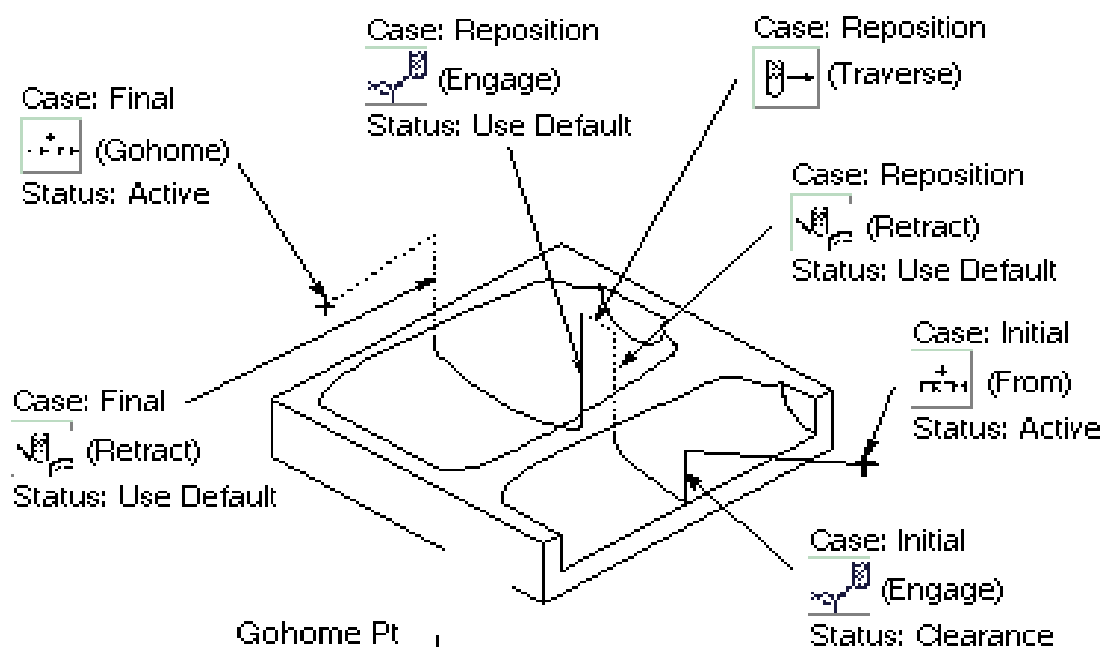
Cleanup Geometry

OK Back Cancel

Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

非切削参数 (Non_Cutting)

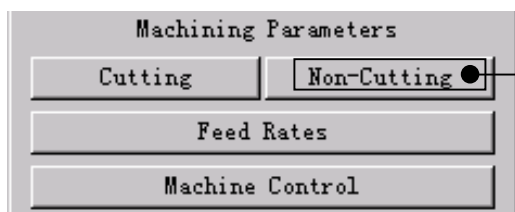
Non_Cutting是刀具在切削移动以前、以后及切削移动中间刀具的移动



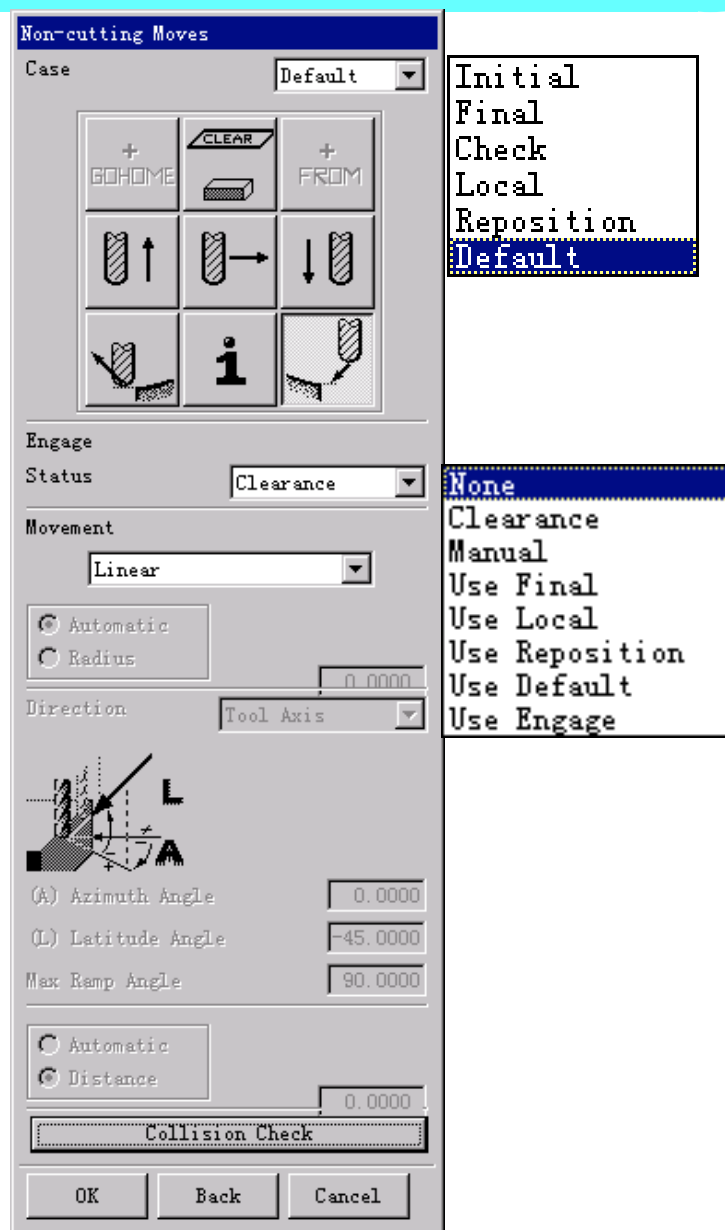
Lesson 9 : 固定轴轮廓铣 Mill_Contour/Fixed Contour

53

非切削参数 (Non_Cutting)



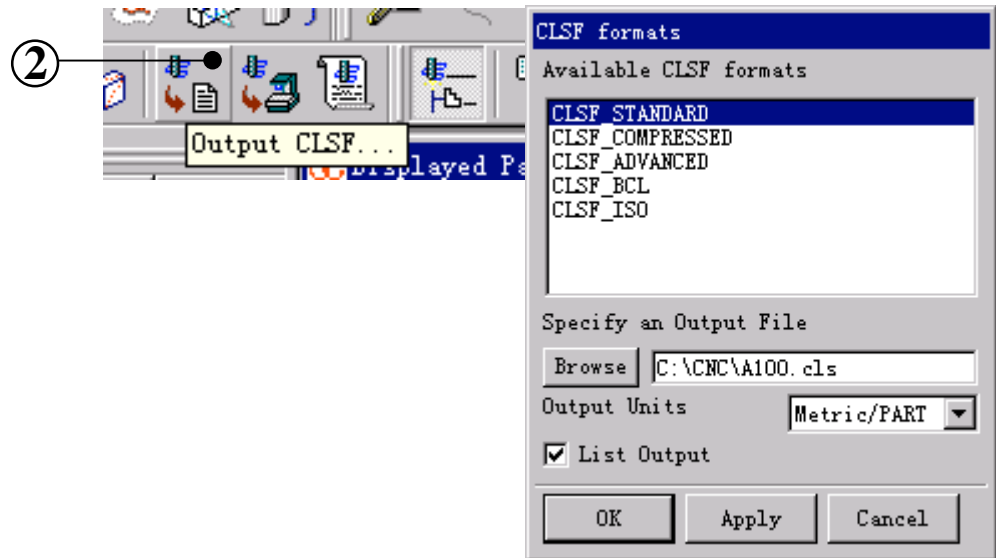
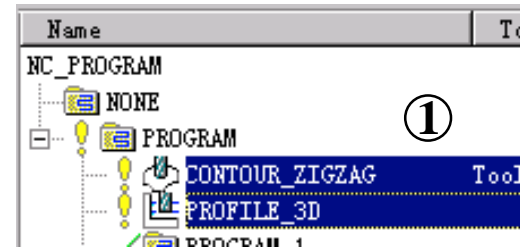
- Initial---初始进给移动
- Final----最后退刀移动
- Check---刀具遇到检查面时的移动
- Local---当刀具离开切削表面，跳到另一加工表面时的移动
- Reposition---当刀具由一个切削表面移到另一个表面时的移动
- Default--当以上cases没有定参数时使用此设定



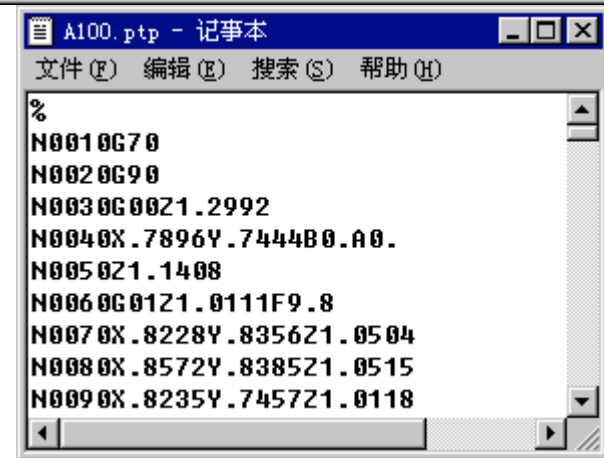
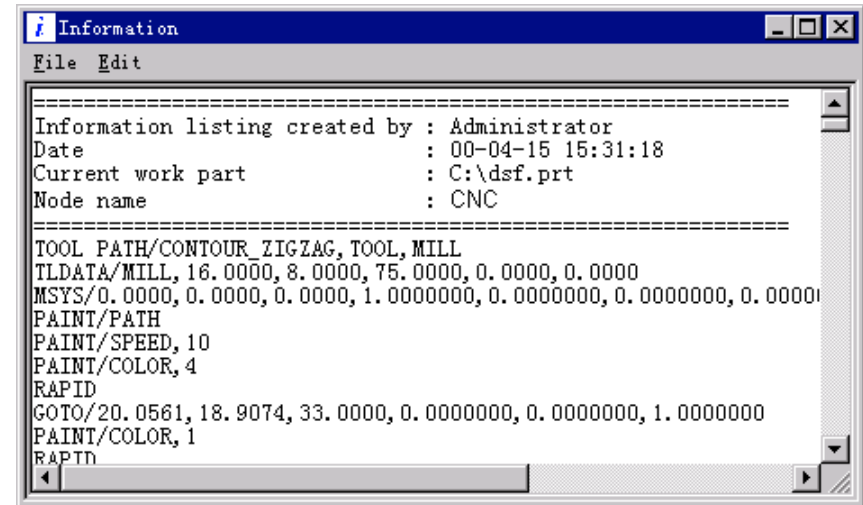
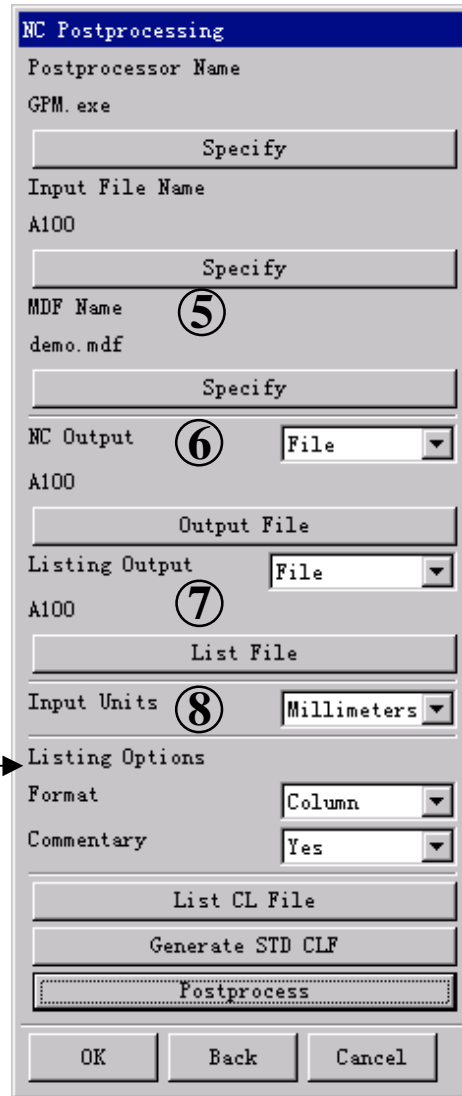
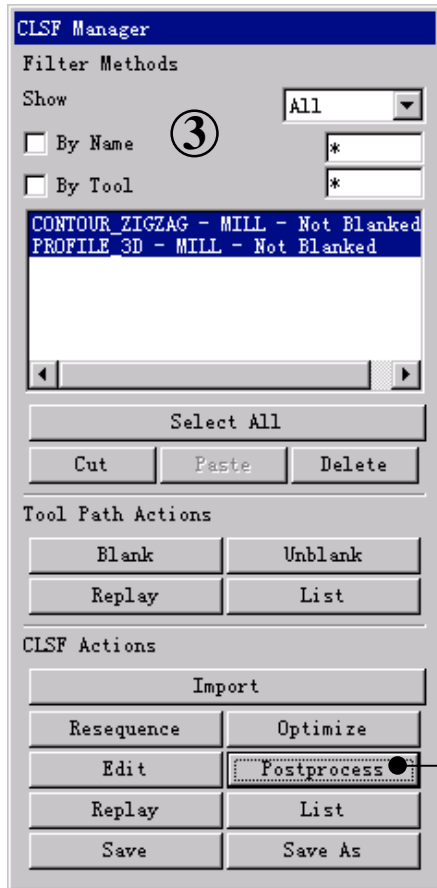
Lesson 10 : 后处理 Post Processing

后处理的一般操作步骤（方法一）：

- 1、在 Operation Navigator里选择需要输出CLS文件的操作（Operation）
- 2、选择“Output CLS”图标。定义输出文件名(如: A100.cls)
OK，生成CLS文件
- 3、选择菜单Tools →CLSF 进入 CSLF Manager
- 4、选 Postprocess 进入数控后处理菜单 NC Postprocessing
- 5、指定机床数据文件 MDFA Specify
- 6、设置 NC Output 成为 File
- 7、指定输出的NC文件名 Output File
- 8、设定单位
- 9、后处理，生成 NC 代码 *.ptp 文件



Lesson 10 : 后处理 Post Processing



CLS和PTP文件格式

Lesson 10 : 后处理 Post Processing

后处理的一般操作步骤（方法二）：

- 1、在 Operation Navigator里选择需要输出PTP文件的操作（Operation）
- 2、选择“UG/Post Postprocess”图标。
- 3、选择机床后处理文件（如：MILL_3_AXIS）
- 4、定义要输出的NC代码文件*.ptp(如：A100.PTP)

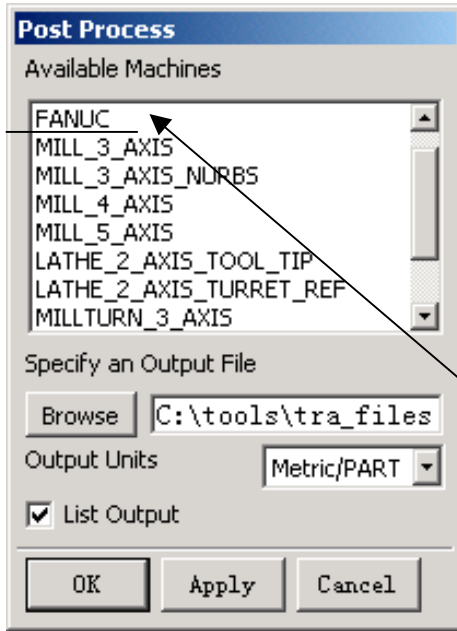
OK，生成PTP文件

The first screenshot shows the Operation Navigator tree with 'MILL_3_AXIS' selected under the 'PROGRAM' folder, marked with a circled 1. The second screenshot shows the 'UG/Post Postprocess...' icon on the toolbar, marked with a circled 2. The third screenshot shows the 'Post Process' dialog box with 'MILL_3_AXIS' selected in the 'Available Machines' list, marked with a circled 3. The 'Specify an Output File' field contains 'C:\CNC\A100.ptp', marked with a circled 4. The 'Output Units' are set to 'Metric/PART' and 'List Output' is checked. The 'OK', 'Apply', and 'Cancel' buttons are visible at the bottom. The fourth screenshot shows the content of the 'A100.ptp' file in a Notepad window, displaying the following G-code:

```
%  
N110 G70 G90  
N120 (-----  
N130 (Start path: CONTOUR_ZIGZAG with tool: MILL)  
N140 (-----  
N150 G28 G91 Z.  
N160 T00 M06  
N170 T00  
N180 G00 G90 X20.0561 Y18.9074  
N190 M03  
N200 G00 Z33. H00 M09  
N210 Z28.9773 H00 M09  
N220 G90 X20.0561 Y18.9074
```

PTP文件格式

Lesson 11 : 机床后处理文件TCL、DEF



C:\ugs180\MACH\resource\postprocessor\template_post.dat

```
template_post.dat - 记事本
文件(F) 编辑(E) 格式(O) 帮助(H)

#####
# template_post config file - Event Handler and Definition files for
#
#           Generic Machine
#
#
#
#####
FANUC,${UGII_CAM_POST_DIR}\fanuc.tcl,${UGII_CAM_POST_DIR}\fanuc.def
MILL_3_AXIS,${UGII_CAM_POST_DIR}\mill3ax.tcl,${UGII_CAM_POST_DIR}\mill3ax.def
MILL_3_AXIS_NURBS,${UGII_CAM_POST_DIR}\mill3ax_nurbs.tcl,${UGII_CAM_POST_DIR}\mill3ax_nurbs.def
MILL_4_AXIS,${UGII_CAM_POST_DIR}\m4bh.tcl,${UGII_CAM_POST_DIR}\m4bh.def
MILL_5_AXIS,${UGII_CAM_POST_DIR}\m5ahtt.tcl,${UGII_CAM_POST_DIR}\m5ahtt.def
```

```
FANUC.tcl - 记事本
文件(F) 编辑(E) 格式(O) 帮助(H)

#####M code declaration

set mom_sys_program_stop_code      0
set mom_sys_optional_stop_code     1
set mom_sys_end_of_program_code    30

set mom_sys_spindle_direction_code(CLW)  3
set mom_sys_spindle_direction_code(CCLW) 4
set mom_sys_spindle_direction_code(OFF)  5

set mom_sys_tool_change_code       6

set mom_sys_coolant_code(MIST)      7
set mom_sys_coolant_code(FLOOD)    8
set mom_sys_coolant_code(TAP)      8
set mom_sys_coolant_code(OFF)      9
```

```
FANUC.def - 记事本
文件(F) 编辑(E) 格式(O) 帮助(H)

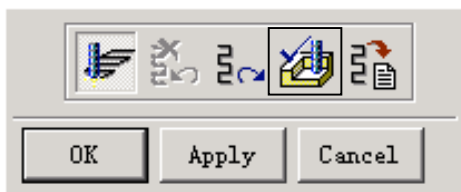
FORMATTING
{
WORD_SEPARATOR ""
END_OF_LINE ""
SEQUENCE Seq_no 100 5 1

FORMAT Coordinate "&_5.3_"
FORMAT Dwell_sec "&_3.3_"
FORMAT Spindle "&_5.00"
FORMAT Seqno "&_5.00"
FORMAT nurb_code "&_02.1_"
FORMAT Register_2 "&_02.00"
FORMAT Register_3 "&_03.00"
FORMAT Register_5 "&_05.00"
FORMAT T_Register "&_02.00"
FORMAT Feed_IPM "&_3.2_"
FORMAT Feed_IPR "&_4.2_"
```

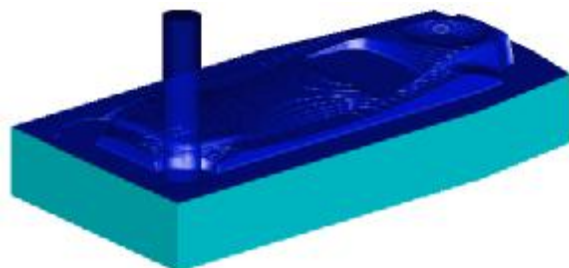
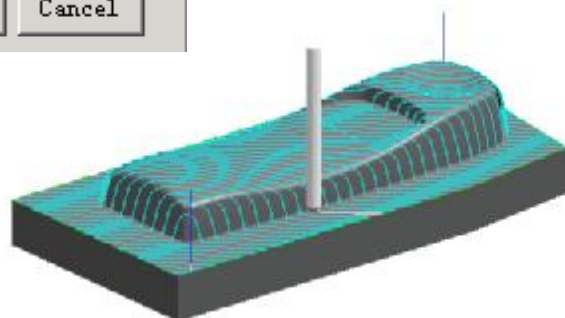
C:\ugs180\MACH\resource\postprocessor\fanuc.tcl (fanuc.def)

Lesson 12 :加工刀路模拟(Verify)

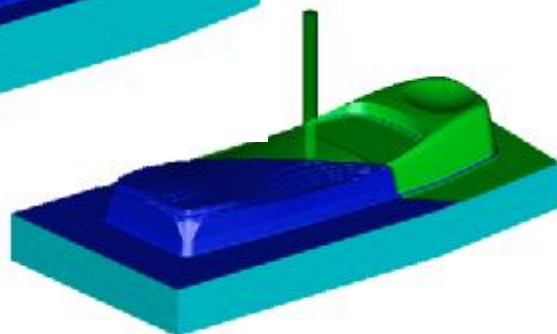
- 利用Verify功能可以对刀路进行模拟检查。



Replay



Dynamic



Toolpath Visualization

Replay | Dynamic | Static

```
GOTO/-5.680,-18.662,28.000
GOTO/-5.360,-18.765,27.910
GOTO/-3.641,-18.891,27.448
GOTO/-1.941,-18.606,26.986
GOTO/-0.356,-17.927,26.524
GOTO/1.022,-16.891,26.062
GOTO/2.117,-15.559,25.600
GOTO/2.865,-14.006,25.138
GOTO/3.223,-12.320,24.676
```

1
1 1086

Feed Rate (MMPM) 0.000000

Display Options

Tool Solid

2D Material Removal

Motion Display

Display All

Number of Motions 10

Check Options

Animation Speed 10

1 10

OK Back Cancel

Toolpath Visualization

Replay | Dynamic | Static

```
GOTO/-5.680,-18.662,28.000
GOTO/-5.360,-18.765,27.910
GOTO/-3.641,-18.891,27.448
GOTO/-1.941,-18.606,26.986
GOTO/-0.356,-17.927,26.524
GOTO/1.022,-16.891,26.062
GOTO/2.117,-15.559,25.600
GOTO/2.865,-14.006,25.138
GOTO/3.223,-12.320,24.676
```

1
1 1086

Feed Rate (IPM) 0.000000

Display Compare

Generate IPW None

Faceted Solid

IPW

Gouges

Excess

Create Delete

Reset

Animation Speed 10

1 10

OK Back Cancel

Lesson 13 : 加工刀路编辑器

- **刀路编辑器 (Tool Path Editor)**

进入刀路编辑器的两种方法:

- 1、 Tools -> Operation Navigator->Toolpath->Edit
- 2、 在Operation Navigator 上选择要编辑的Operation按右键
选Toolpath -> Edit

刀路编辑器的功能

运动模拟 (Animation)

干涉检查 (Gauge Check)

刀路数据的删除(cut), 插入(Insert)

刀路数据的裁剪(Trim), 延伸(Extend)

刀路反向(Reverse)

