Reengineering using LPX-250

Rhinoceros Version

3D LASER SCANNER

PICZA model: LPX-250

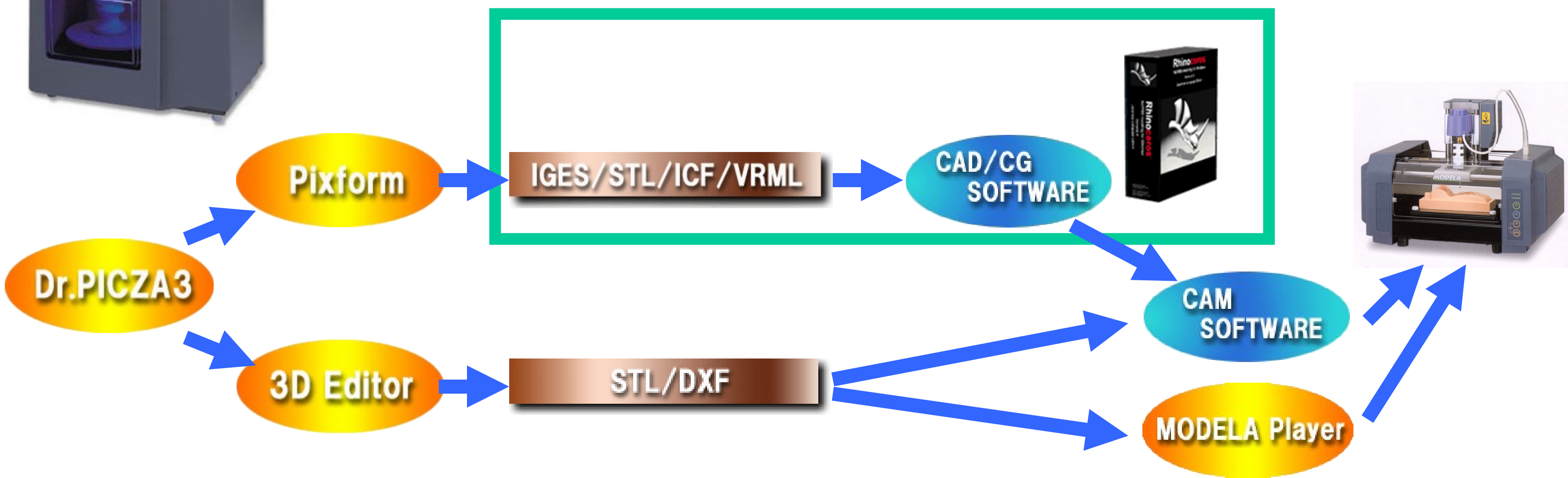
Procedure and Objective

- This section describes the procedure for segmenting the mouse data scanned on LPX-250 into individual parts and restructuring their curved surfaces by using Rhinoceros.
- By this procedure, the high-quality curved surface data segmented into individual parts is completed for use on solid CADs, such as Rhinoceros and SolidWorks.

Data Flow

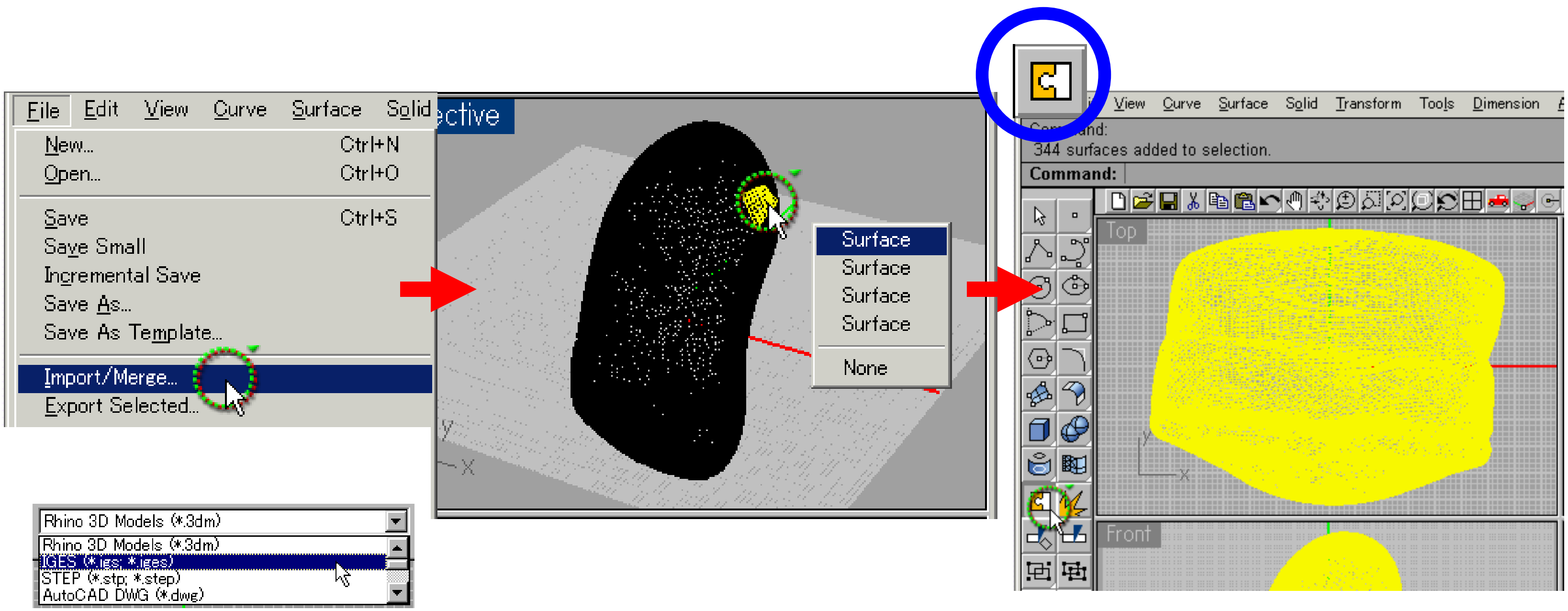
- **The data scanned on LPX-250 is captured into a 3D CAD software and restructured.**
  (The data captured by LPX-250 this time is stored in the IGES format by using the attached Pixform.)

- **In addition to the above format, LPX-250 can write the data in file formats of STL, ICF, DXF and VRML.**



Capturing Data in the IGES format

（1） Select the <Import> menu, and specify IGES as file format.
（2） The surface of the captured mouse data has been segmentalized.
（3） Select all segmentalized surface data, and join them all.
［Select <JOIN>.］



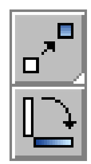
（1）　　（2）　　（3）

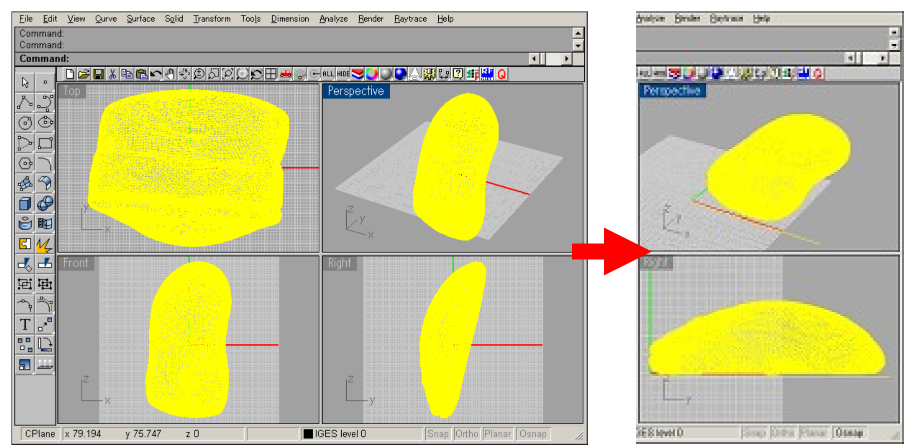
Correcting data layout

（1） Since the object to scan is set in such a way that it can be easily scanned, the captured data may be tilted.

（2） In such case, correct the tilt by using the <Move> tool and the <Rotate 2-D> tool on the CAD.

（1）



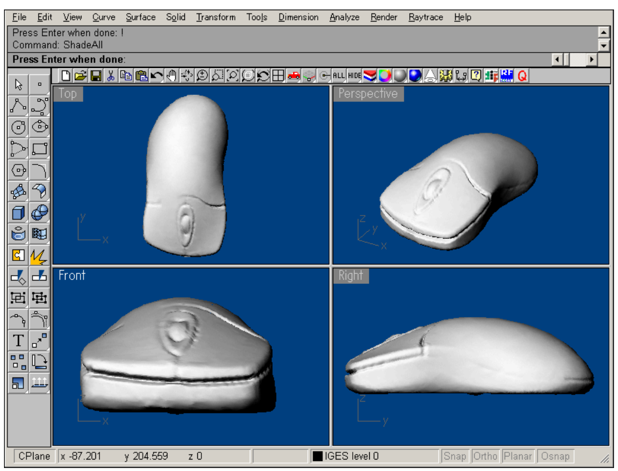


（2）

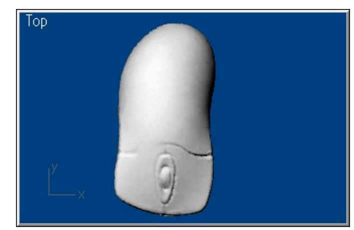
Shading the data and taking the necessary shots of the shaded screen

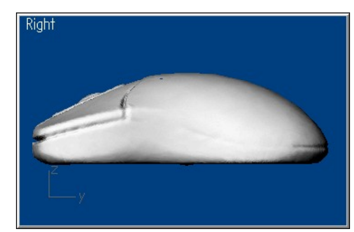
(1) Shade the data, and check the data shape.

(2) Take the necessary shots of the shaded screen.



(1)



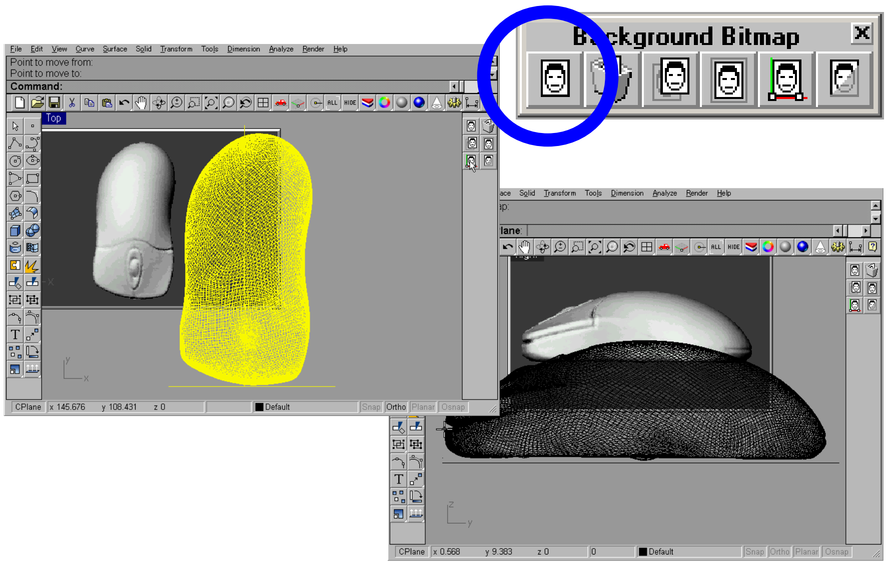


(2)

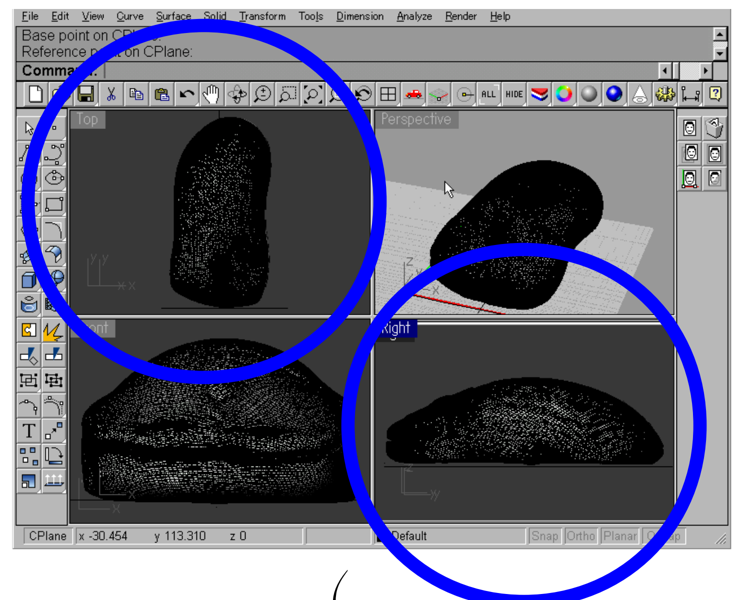
Matching the shot images with the 3D data in size

(1) Match the shot images with the 3D data in size by using the <Background Bitmap> tool.

(2) Lay out the shot images in the Top view and the Right view this time.



(1)

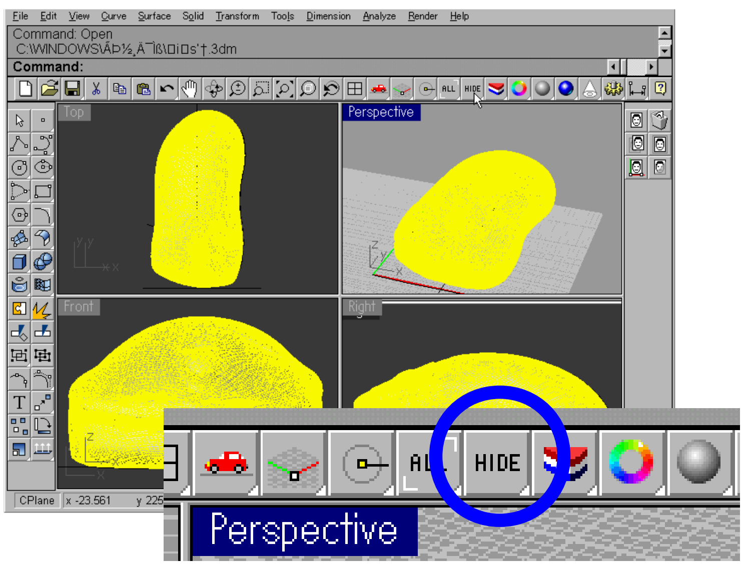


(2)

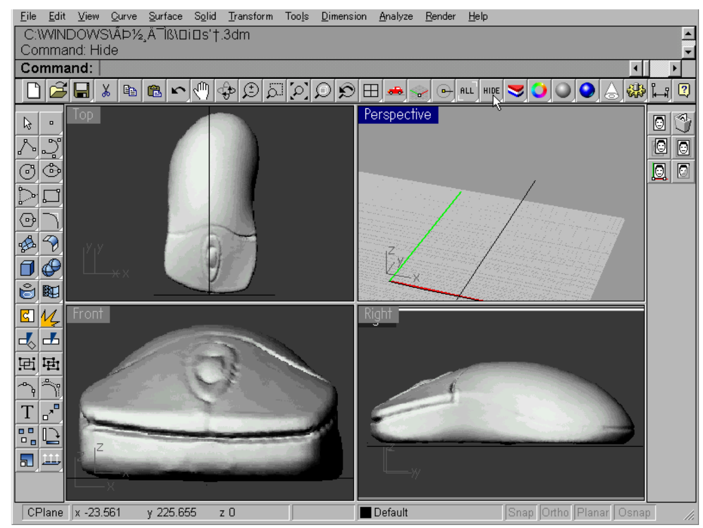
Hiding the 3D data

(1) Since the parting lines cannot be confirmed in the 3D data, select the 3D data and hide it by using the <HIDE> tool.

(2) When the 3D data is hidden, the shot images matched in size with the 3D data can be confirmed.



(1)

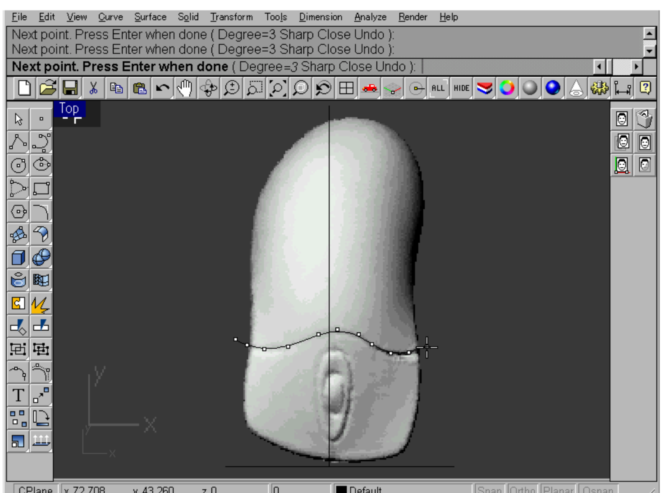


(2)

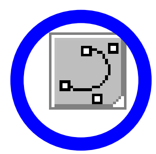
Drawing the parting lines

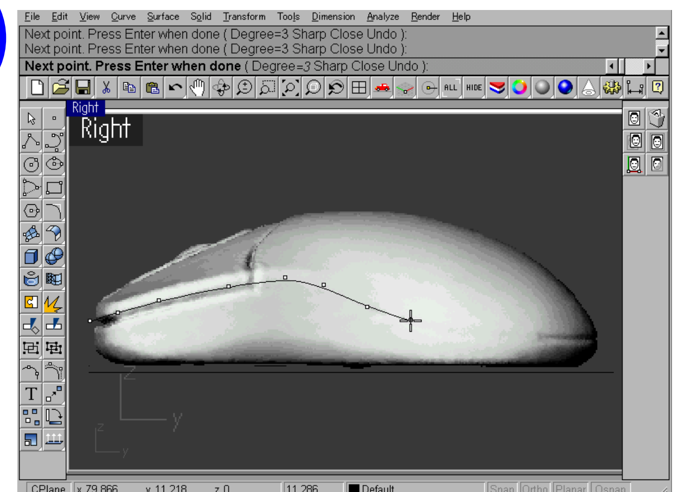
（1） Using the shot image in the Top view as an under drawing, draw a parting line to part the mouse into the anterior part and the posterior part by using the <Curve> tool.

（2） In the same way, draw a parting line in the Right view.



（1）



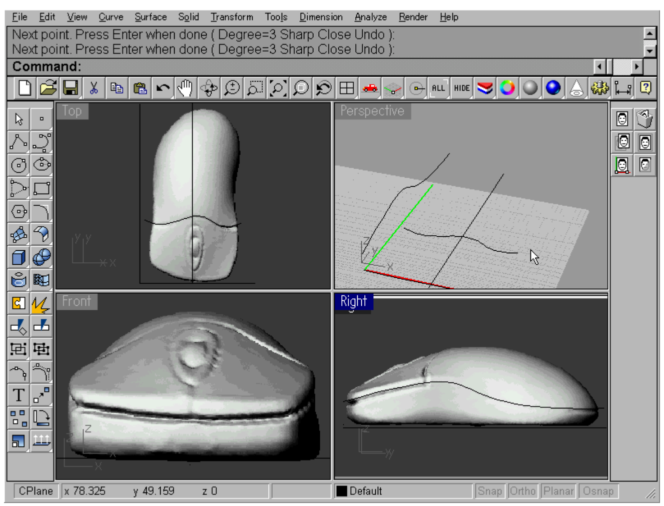


（2）

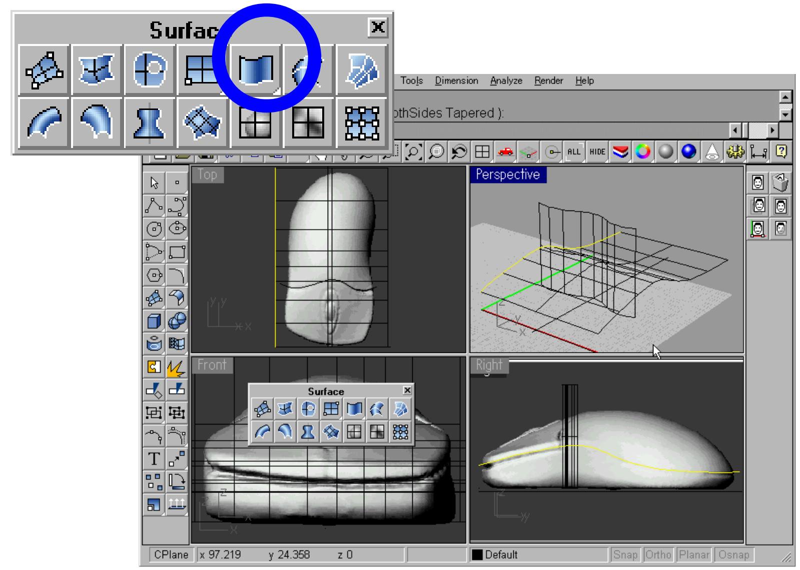
Creating cutting surfaces

（1） Check the curves (lines) drawn in the Top view and in the Right view.

（2） Along these 2 lines, create cutting surfaces by using the <Extrude> tool.



（1）

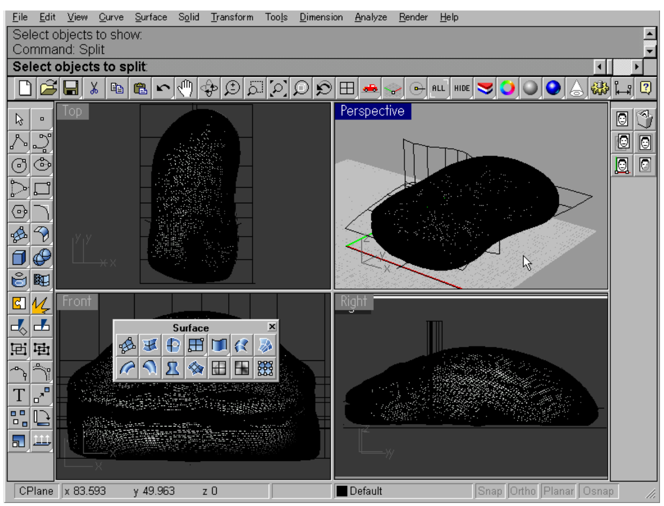


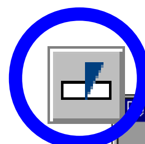
（2）

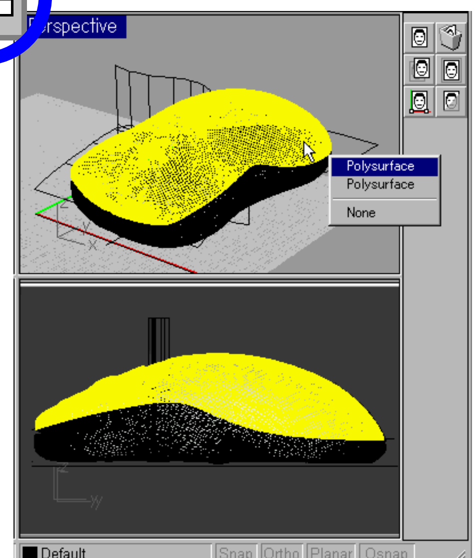
Dividing the object by using the cutting surfaces (1)

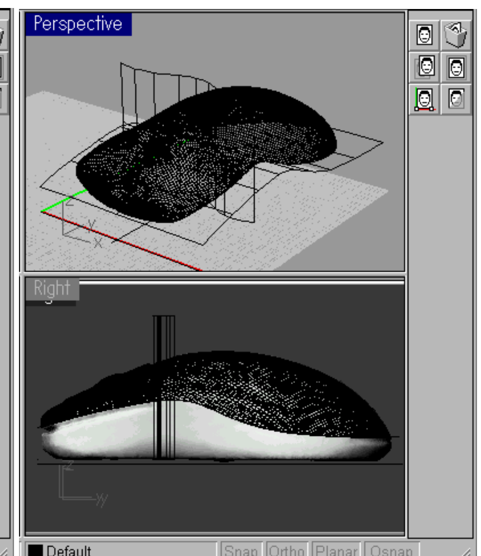
- **Display the 3D data left hidden.**

- **Divide the mouse into the upper side object and the lower side object by using the <Split> tool. (Then, hide the lower side object.)**





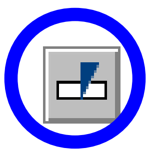


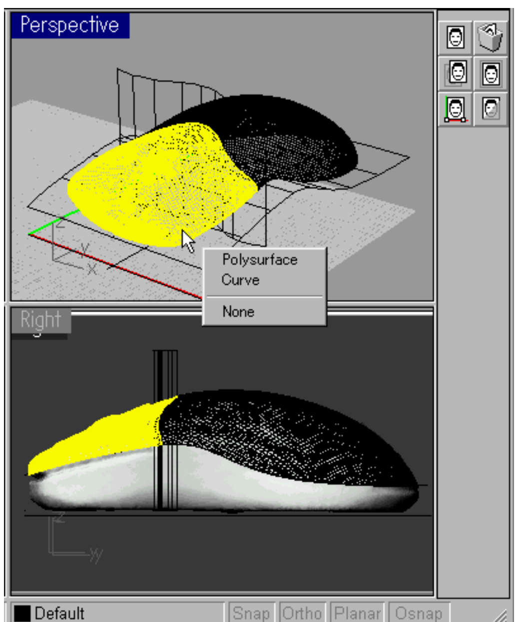


Dividing the object by using the cutting surfaces (2)

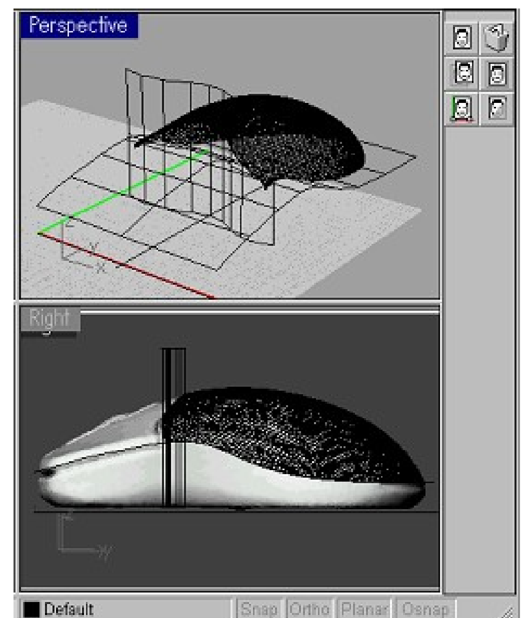
（1） In the same way, divide the mouse into the anterior objects and the posterior object.

（2） Hide the anterior object and the cutting surface.





（1）



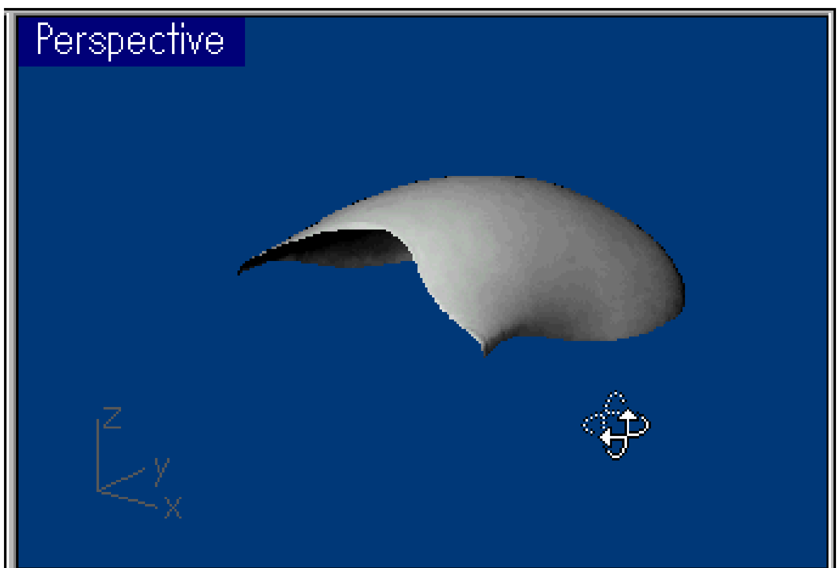
（2）

Data segmentation results for the scanned surface

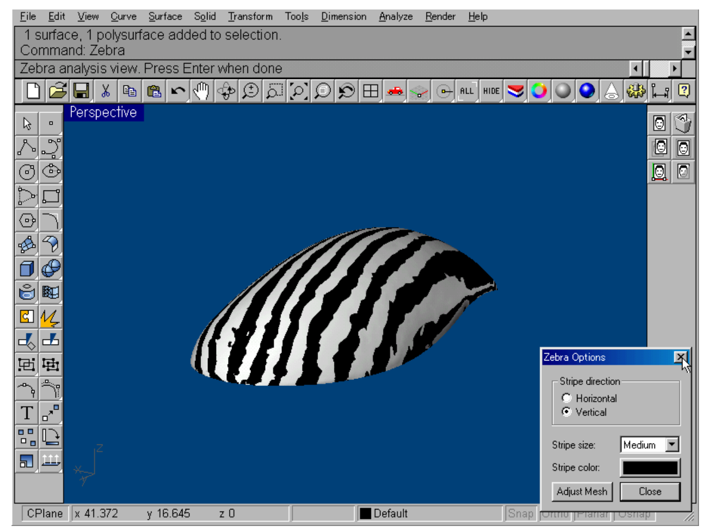
(posterior part of the mouse)

(1) This displays the shaded state. (The surface appears slightly rough.)

(2) This displays the zebra-mapped and surface-evaluated state. (The lines appear considerably wavy.)

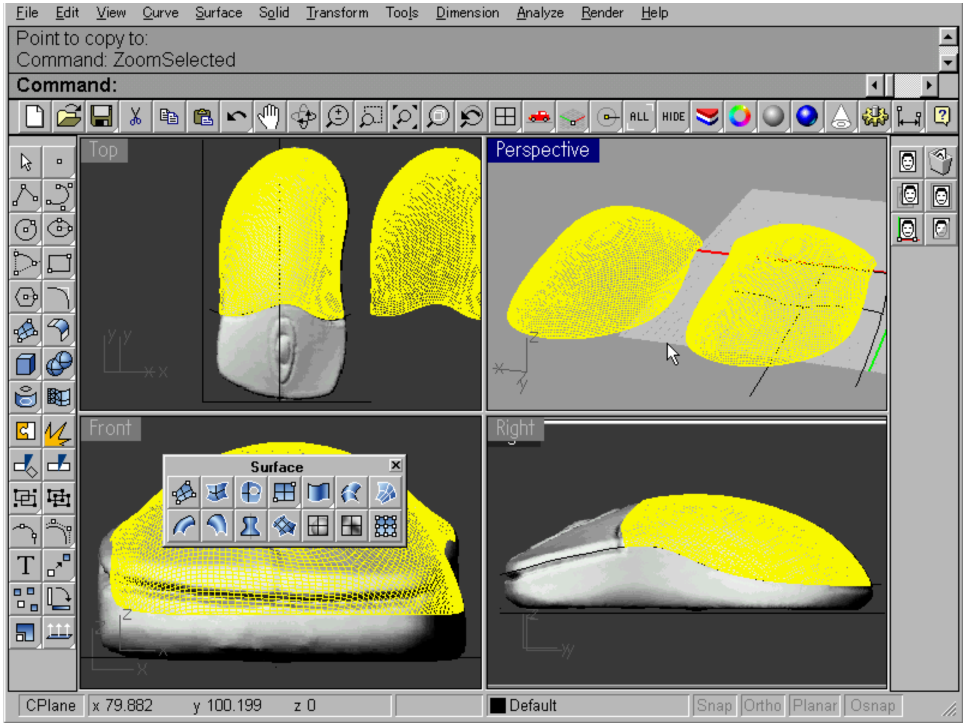


(1)



(2)

Restructuring the surface referring to the original data

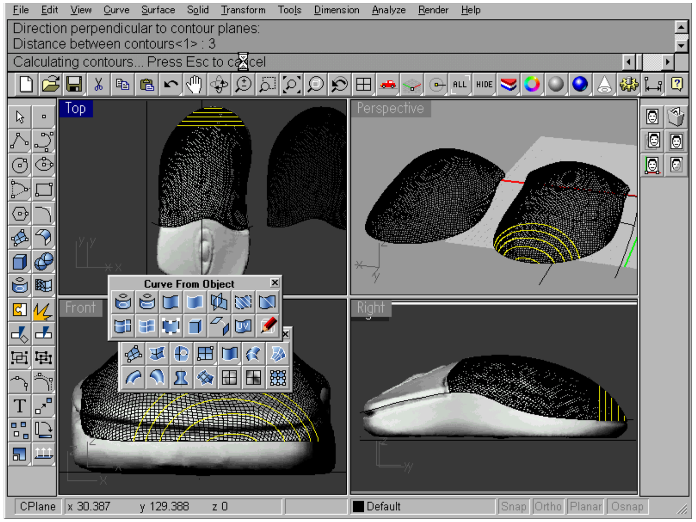


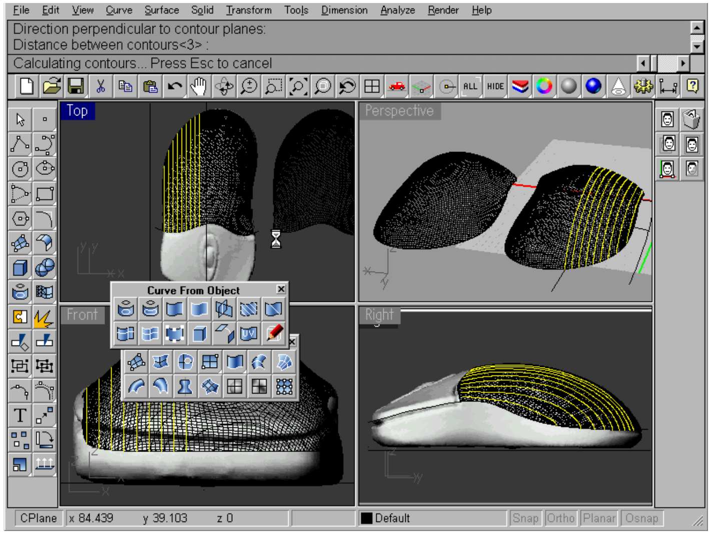
- **Proceed restructuring work referring to the original data.**
- **Copy the parted surface, and temporarily lay them nearby.**

Extracting cross-section lines

（1） As procedure for restructuring the surface, the first step is to extract cross-section lines from the object.

（2） In the first place, extract the X cross-section lines, and then extract the Y cross-section lines.



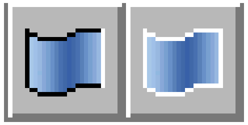


（ extract the X cross-section lines ）

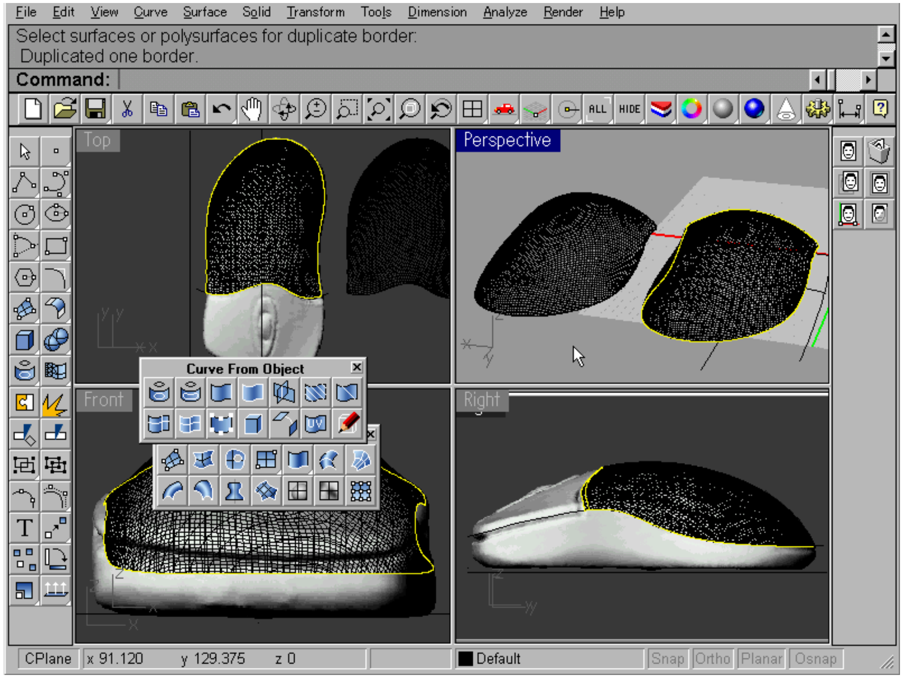
（ extract the Y cross-section lines ）

Extracting the surface edges

- After extracting the cross-section lines, extract the surface edges.
- Use the <Duplicate> tool.

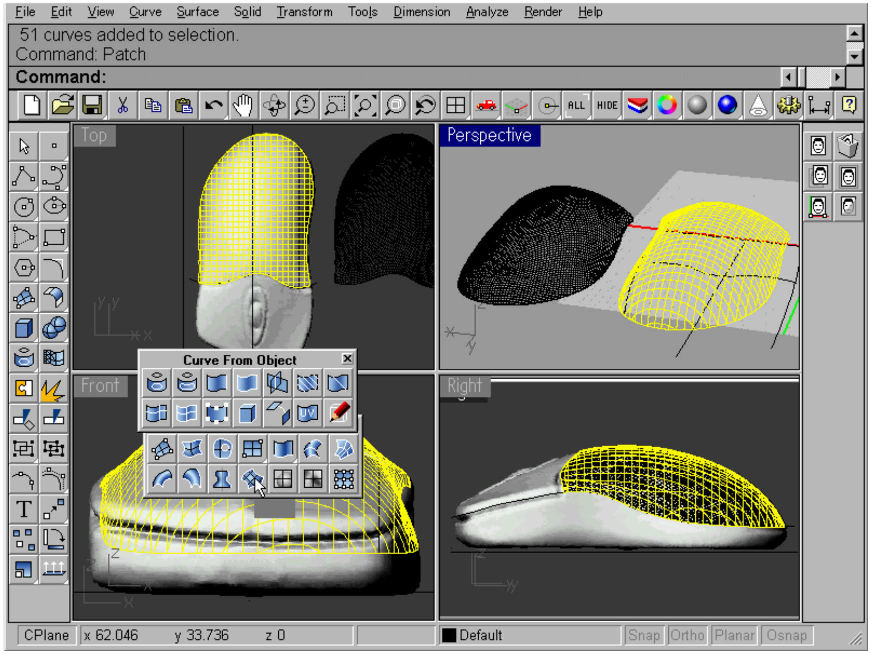


- Either can be used.



Selecting the cross-section lines

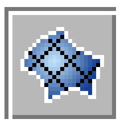
- Select the completed cross-section lines and edge lines. Various selection methods are available. By any method, select as if circumscribing the completed lines.

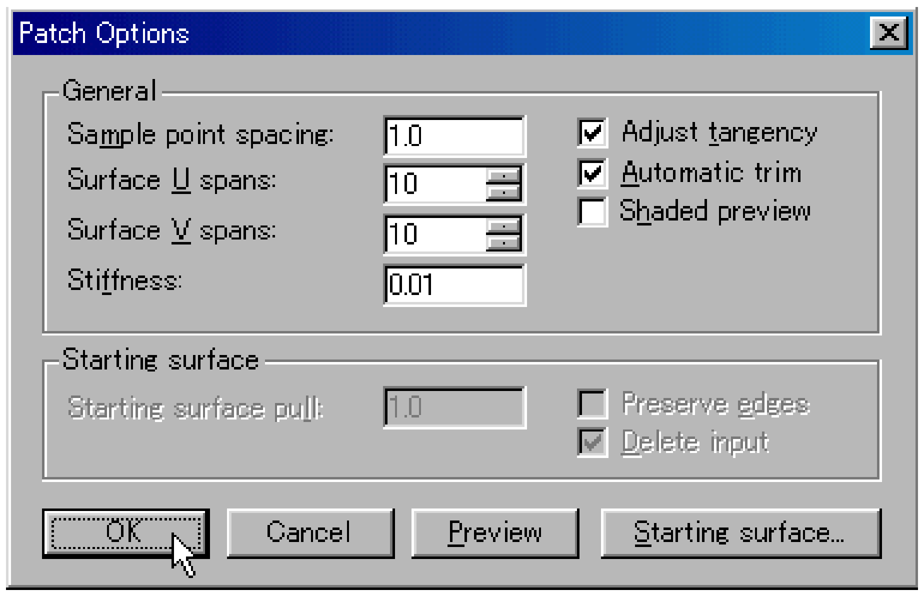


- After selection, lay the surface as the final step.

Lay the surface by using the <Patch> tool

- Various methods of laying the surface are available. Use the <Patch> tool this time.



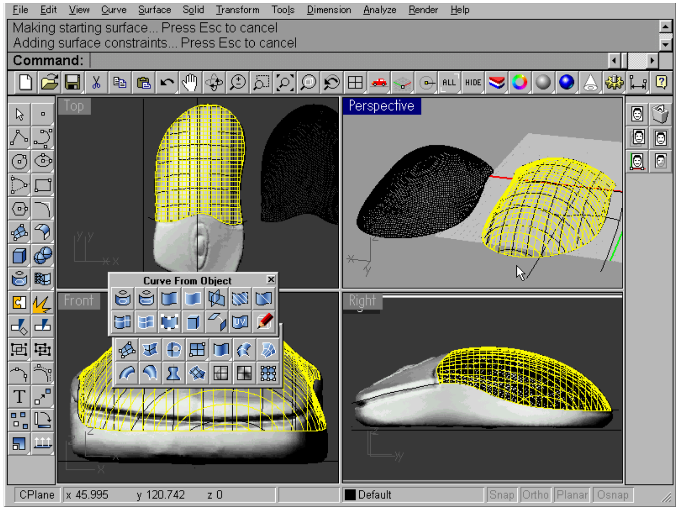


- Lay the surface without changing the default setting values.

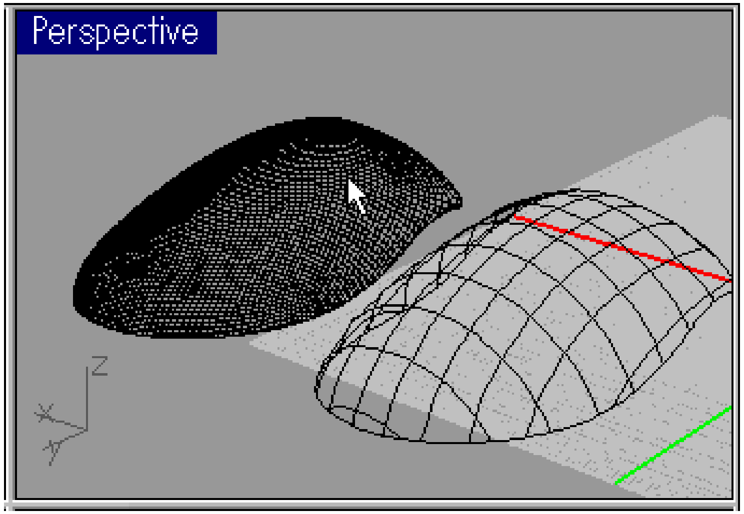
Evaluating the surface (1)

（1） This shows the state with the surface laid, though it may be little difficult to understand.

（2） Hide all unnecessary lines,and display only the surface data. When comparing with the original data, you can see that the workmanship of the surface (isoparm) has been considerably improved.



（1）

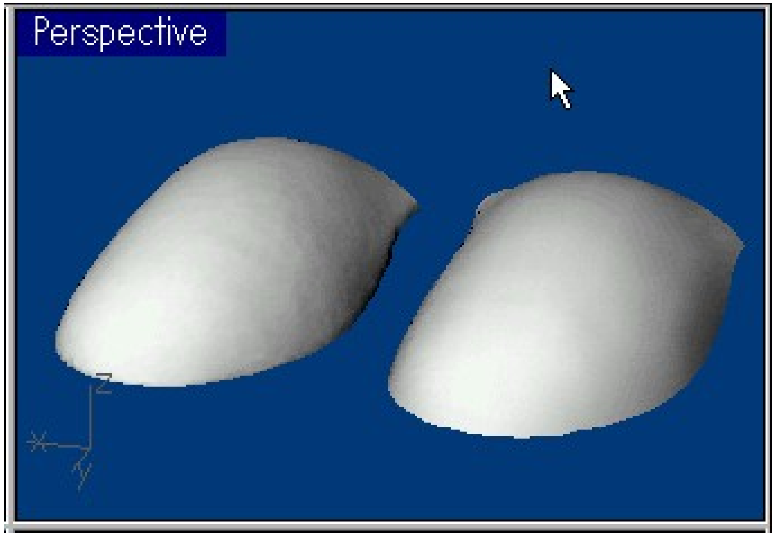


（2）

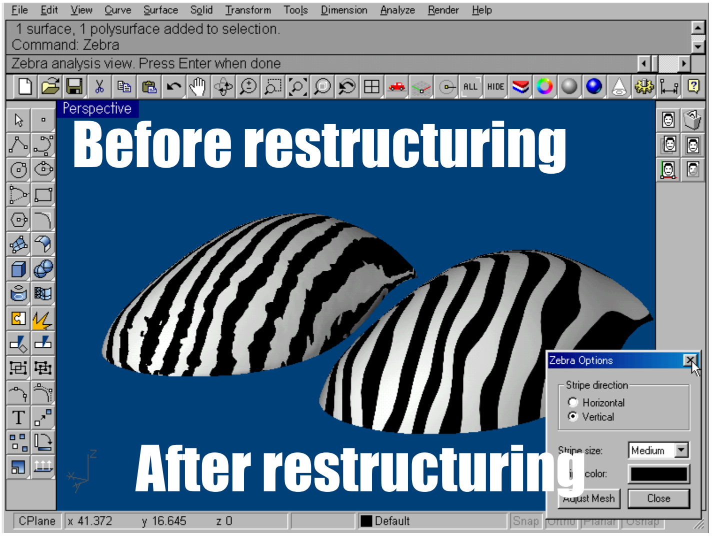
Evaluating the surface (2)

(1) Now, shade the surface. You can see the roughness of the original surface and the smoothness of the new surface to some extent.

(2) This shows the zebra-mapped state. It shows a clear difference from the original data.



(1)



(2)

Completion of the mouse

- The restructuring procedure has been introduced using the posterior part of the mouse. For the button part of the mouse, proceed the restructuring using the same procedure.

- The completed data can be positively used on solid CADs, such as Rhinoceros and SolidWorks.