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White Rabbit Corporation

Molcer Manual Index

		Page
1. Introduction	What is Molcer? What can it do for you?	3
2. Basic Operation	Open file	4
-	Open Sequential Images	4
	Overwrite molcer file	5
	Control by buttons on the screen	6
	Control by mouse	7
	Full screen display	7
3. "Preference" Menu	3.1. Render	8
	3.2. Show Frame	10
	3.3. Fix clipping plane during rotation	10
	3.4. Connect view spaces	10
	3.5. Drawing Area Size	10
	3.6. Position	11
	3.7. Scale Bar	11
	3.8. Application	12
4. "Tool" Menu	4.1. Rotation	13
5. Main Control	5.1. What is Unit?	14
	5.2. Operating Units	14
	5.3. Unit Preference (Surface, STL)	16
	5.4. Unit Preference (Voxel Surface)	16
	5.5. Unit Preference (Label)	17
	5.6. Unit Preference (Voxel)	18
	5.7. Unit Preference (Voxel Color Transmission Map)	18
	5.8. Unit Preference (other)	19
	5.9. Data Preference	20
	5.10. Voxel Export	20
	5.11. Polygon Export	20
6. Additional Information	System requirements	21
	Contact us	21
	Copyright	21

1. Introduction

What is Molcer? What can it do for you?

What is 3D image viewer Molcer?

Molcer is software to view 3D objects.

Features

Import

Half or quarter size reading for huge data.

View

Show surface view of 3D objects (Surface Rendering).
Show penetrated view of 3D objects (Volume Rendering).
Show, hide and change rendering type and color by each unit (Main Control).
Show scale bar.
Easily control clipping plane to show section.
Rotate / Move / Scale 3D objects.
Show multiple 3D objects alongside, synchronize them.

Export

Voxel data export as a sectional image sequences (Voxel export) Polygon data export with a STL / OBJ format file (Polygon export)

2. Basic Operation

How to open a Molcer file

There are four different ways to open the file;

Double-click the Molcer File (file extension;".mol").

Drag and Drop the Molcer File to the icon of Molcer Plus application.

Start the Molcer Plus application. Go to the "File" menu and choose "Open", then select Molcer File. Start the Molcer Plus application. Drag and Drop the Molcer File to the screen.

Open Sequential Images

Select "File (F)" > "Open Sequential Images (F)" in menu bar, and dialog below appears.

Press "Select Data", and open folder contains
sequential images, then choose one of them.
Press "OK" to draw 3-Dimensioned objects.

Available file format: jpg, png, bmp, tif(8bit,16bit), DICOM. DICOM without extension is also available.

Open Sequential Images	×
data 1	
Select Data	
reverse image file reading order	
data 2	
Select Data	
✓ reverse image file reading order	
*please set data 1 folder and data 2 folder into same hierarchy	
OK Cancel	

If "reverse image file reading order" is checked, sequential images are read by reversed order.



If sequential image in folder without size setting file selected, Data Preference dialog opens. See "5.9 Data Preference" about Data Preference. Reverse order read object is drawn as mirror image.



Overwrite molcer file

Select "File (F)" > "Overwrite molcer file (W)" in menu bar, and you can overwrite molcer file only.

Control by buttons on the screen

After opening a file, the screen right will be displayed. All control buttons line up at the bottom, inside the white rectangle.

This is an enlarged image of the white rectangle interior. Each button's explanation is described below (function keys are also usable).





(1) Home button

Initialize 3D object's position to home. (F2 key)



(2) Rotation buttons

Rotate 3D object clockwise (F3 key). / counterclockwise (F4 key).

(3) Whole/cut-off view switch button (F5 key)

and the second second	Whole view	Whole object is shown. Change to the cut-off view.
1	cut-off view	Cut-off object is shown. Return to the whole view.

(4) Switch the control target during cut-off view button (F6 key)

target is object You can control cut-off object. Section is fixed. Target will change to clipping plane.



target isYou can control clipping plane and change section. Object is fixed.clipping planeTarget will return to object.

(5) Show/Hide Rotation Center button (F7 key)



Rotation Center is Rotation Center appears.



(6) **Delete button** Deletes the control target object when it is available.



(8) Friend button

(7) Animation obje control buttons fram

These buttons are available on time series object. Animation playback, stop, pause and frame-by-frame.



When the button is available, the current object can switch to another one. (F8 key)

Control by mouse



whole view / cut-off view (target is object)

Mouse can control whole or cut-off 3D objects: Movement, rotation, and scaling.

Rotate an object;

Press the left mouse button and drag the mouse. To continue the rotation, simply release the left mouse button.

Rotate an object clockwise / counterclockwise;

To rotate clockwise, press and hold the left mouse button, and rotate mouse wheel forward. To rotate counterclockwise, rotate mouse wheel backward.

Move an object up, down, left or right;

Press the right mouse button and drag the mouse. The object follows the drag movement. To continue the movement, simply release the right mouse button.

Scale an object; To enlarge an object, rotate mouse wheel backward. To shrink the object, rotate mouse wheel forward.



target is clipping plane

While a 3D object is cut off and target is clipping plane, mouse can also control clipping plane.

Rotate clipping plane; Press the left mouse button and drag the mouse. To continue the rotation, simply release the left mouse button.

Move clipping plane vertically; As rotate the mouse wheel, a clipping plane moves vertically.

Full screen display

[F11] key can toggle full screen / normal display.

3. "Preference" Menu

3.1. Render

Render
cut front and back space of rotation center
apply middle ~
🗹 clip cover
✓ shadow
depth cues (fog)
show dipped area translucently
cut vertical and horizontal edges during connecting view spaces
projection orthographic \checkmark
light position $~~$ upper right $~~$
home button animation $\left \begin{array}{c} { m high speed} \right \lor$

To show Render Preference Dialog, select "Preference (P)" > "Render (R)" in menu bar.

You can change Molcer's render preferences by check boxes and combo boxes.

cut front and back space of rotation center

Show object cutting front and back space of rotation center.

Set degree by [apply] combo box.

clip cover

Cover section of cut-off object. Voxel data would be drawn if the object has it.

By "Unit Preference" in "Main Control", you can invalidate this preference by a unit.





without cover

with cover



For more reality, you can attach some shadow to the 3D object. Only available when "clip cover" is checked.

If you check "shadow", most objects have shadows. But some don't. Checking "shadow" may obviously reduce drawing speed.



without shadow



with shadow

depth cues (fog)

If you check "depth cues"(sometimes called "fog"), you can see the objects as if in the fog (farther points fade into the background).





without depth cues

show clipped area translucently

Clipped area is drawn in translucent rendering type.

By "Unit Preference" in "Main Control", you can invalidate this preference or change drawing method by a unit.



with translucent clipped area

without clipped area

cut vertical and horizontal edges during connecting view spaces

Objects are shown with all edges cut when "Preference" > "Connect view spaces" menu is checked. Select validity or degree by combo box.

projection

You can select two modes below.

perspective; The distance increases, the object is drawn smaller.

orthographic; Object is drawn by constant size regardless of distance, , so you can easily see the object's height, width and depth.



orthographic



perspective

light position

[upper right] [upper left] [lower right] [lower left] are available.

home button animation

Objects play animation when "Home button" is pushed. Select validity or speed by combo box.

3.2. Show Frame

A frame appears in the screen and helps to observe the 3D object, if "Preference (P)" > "Show Frame (F)" menu is checked.



without frame

with frame

3.3. Fix clipping plane during rotation

If "Preference (P)" > "Fix clipping plane during rotation (O)" menu is checked, object rotates alone while clipping plane is fixed.

Without check, object and clipping plane rotate simultaneously.

3.4. Connect view spaces

If "Preference (P)" > "Connect view spaces (C)" menu is checked, all objects' motion in other view spaces follow manipulation to the selecting object.



3.5. Drawing Area Size

Drawing area is between menu bar and control buttons.



Drawing Area Size x 1280x720 v width 1182 height 700 Apply

To show Drawing Area Size Preference Dialog, select "Preference (P)" > "Drawing Area Size (A)" in menu bar. Press "Apply" to set width and height by pixel. "Width" and "height" are updated when real drawing area size changes.

3.6. Position

To show Position Preference Dialog, select "Preference (P)" > "Position (P)" in menu bar. You can designate positions and angles of object and clipping plane.

Position	ı		
	home		current
object		object	
rotatio	n angle	rotatio	on angle
14	41.327	1	67.335
rotatio	n axis	rotati	on axis
x	-0.277589	x	0.0448657
у	-0.673448	у	-0.680076
z	-0.685137	z	-0.731767
transla	tion	transla	ation
x	0	x	0
у	0	у	0
magnifi	cation	magnif	fication
	1		1.07
dipping	plane	dippind	plane
rotatio	n angle	rotatio	n angle
0		2	5.6734
rotatio	n axis	rotatio	n axis
x	1	x	-0.815074
У	0	У	0.116162
z	0	z	-0.567592
transla	tion	transla	tion
	0.1		0.109346
screen c world c	oordinates x oordinates x	= 865, y = 52 = 0.625, y =	24 0.455556
A	pply	Set Current Va	alues to Home
Sav	ve As File	L	oad File

Press "Apply" button to apply input home and current values. Current values are updated immediately as object or clipping plane moves. Home values are used when "Home button" is clicked.

Press "Set Current Values to Home" button to overwrite home values by current values.

"Screen coordinates" indicates mouse pointer's position based on coordinate system which has origin point at bottom left corner of drawing area.

Press "Save As File" button to save parameters to file. "Load File" to restore.



"World coordinates" is expressed by coordinate system that smaller axis ranges from -1 to 1, the other is normalized by smaller axis.

3.7. Scale Bar

To show Scale Bar Dialog, select "Preference (P)" > "Scale Bar (I)" in menu bar.

"Frame size" indicates the length of one edge of the frame shown by "Preference" > "Show Frame" menu.

If you use "scale down in data reading" in "Preference" >

"Application" menu, scale down ratio is shown.

Check "show" to show scale bar in the screen.

Move scale bar by inputting position or pressing arrow buttons. Usable scale units are: nm, um, mm, cm and m.

Scale bar only appears when "projection" is "orthographic" in "Render Preference".



Scale Bar	×
frame size : 114.872271 mm	
show (orthographic only)	
position (-5.0 - 5.0) x -0.95	
center (0, 0) y -0.95	
4	
scale unit 🛛 mm 🗸 🗸	
length 20.00	

3.8. Application

To show Application Preference Dialog, select "Preference (P)" > "Application (Z)" in menu bar.

Application Preference
scale down in data reading
When the voxel data exceed 4096 MB, scale down all three axes to 1/4
When the voxel data exceed 1024 MB, scale down all three axes to 1/2
Please reopen this file to apply new preference.
OK Cancel
Application Preference
scale down in data reading
When the voxel data exceed 4096 MB, scale down all three axes to 1/4
When the voxel data exceed 1024 MB, scale down all three axes to 1/2
Please reopen this file to apply new preference.
OK Cancel

If your machine has not enough memory, occasionally memory errors occur. Check the boxes of "scale down in data reading" to reduce load data size. Press "OK" button and reopen the file.

4. "Tool" Menu

4.1. Rotation

To show Rotation Dialog, select "Tool (T)" > "Rotation (R)" in menu bar.



You can rotate objects by buttons on the dialog instead of mouse control. Rotate by any degrees input in "angle" by one click. If "90" box is checked, rotate by 90 degrees.

5. Main Control 5.1. What is Unit?

3D Object is consist of one or more parts.

```
The parts are called "Unit".

"Unit" has "Types" below.

"Voxel";

Voxel data drawn by volume rendering.

"Voxel Surface";

Voxel data drawn by surface rendering.

"Surface";

Polygon Surface generated from voxel data.

"STL";

Polygon Surface generated from STL format file.

"Labele";

Labeled Surface.

"Primitive";

Primitive Polygon.

and so on.
```

5.2. Operating Units

"Main Control" shows list of all Units. You can change display / hide, name, rendering type and color of the selected Unit. If you use "scale down in data reading" in "Application Preference", scale down ratio is shown.

Main	Control				
Show /	All Units Hide All Units				
Disp	Unit Name polygon3 polygon2 polygon1	Type STL Surface Voxel Surface	Rendering D A B	Color	
select path [name [render	ed unit H:¥ct_data¥XY_norogenge¥ polygon1 ring type B ~ opacity (%	€) 55 ÷ colo	reference Bac	k	
color expo	color of all units Save Load export file Voxel Polygon				

You can control display of Units by the check boxes on the left. "Show All Units" and "Hide All Units" buttons can control all check boxes at once. Other items will be edited under the list to the selected Unit.

[name] [rendering type] [opacity] [color] applies immediately. "Back" button rewinds [color] to the last one.

[opacity] is available when [rendering type] is B, C or D.

Buttons in "color of all units" box can control all Units' [color] at once. "Save" button to save, "Load" button to load.



Main (Control			
Show A	Il Units Hide All Units			
Disp	Unit Name	Туре	Rendering	Color
\checkmark	polygon3	STL	D	
	polygon2	Surface	Δ	
	pol aon1	Voxel Surface	В	
select	ed unit			
path I	H:¥ct_data¥XY_norogenge¥			
name p	polygon 1	Pr	eference	
render	ing type B 🗸 opacity (%)	55 🚖 color	Bad	< C
color	of all units Save	Load		
expor	t file Voxel	Polygon		

"Voxel Surface" "Surface" and "STL" Units' surface are drawn by assembly of triangles. [Rendering Types] are below.

- A. Triangles are opaque.
- B. Triangles are translucent.
- C. Only triangles' vertexes are drawn translucently. Triangles turning side are emphasized.
- D. Only triangles' edges are drawn translucently. Each triangle will be recognized.
- E. A and D.



Enlarged view of "D"

Enlarged view of "C"

[Rendering Type] of "Voxel" Unit have three types below.

- A. Colors are added from back to front (=alpha blending).
- B. Use the largest value in added layers (=maximum intensity projection, MIP).
- C. Color Transmission Map

5.3. Unit Preference (Surface, STL)

Press "Unit Preference" button in "Main Control" while selecting "Surface" or "STL" Unit, and dialog below appears. This section combines explanation for same functions of <u>"5.4. Unit Preference (Voxel Surface)"</u>.

Unit Preference X	(
dip cover	
show dipped area translucently forced turn off rendering type C ~ opacity (%) 50 +	
Data Preference	

"Forced turn off" in "clip cover" box invalidates designation in "Render Preference" for the selected Unit.

"Forced turn off" in "show clipped area translucently" box invalidates designation in "Render Preference" for the selected Unit.

"Rendering type" and "opacity" specify drawing method of clipped area.

5.4. Unit Preference (Voxel Surface)



Histogram graph of voxel value is shown on the left. Graph height is normalized by maximum frequency value. Usable magnifications range from one to one million.

Press "Export Histogram" button to export histogram values to a text file.





You can set pseudo color on section by [Section Color]. Select one of three color scales. Section will be colored.

Press "Auto Set" to adjust "maximum" and "minimum" value to "maximum" and "lower limits" respectively.

See <u>"5.9. Data Preference"</u> about "Data Preference".

5.5. Unit Preference (Label)

Press "Unit Preference" button in "Main Control" while selecting "Label" Unit, and dialog below appears. You can change each label color.



Press "Export Histogram" button to export histogram values to a text file.

See <u>"5.9. Data Preference"</u> about "Data Preference".

5.6. Unit Preference (Voxel)

Press "Unit Preference" button in "Main Control" while selecting "Voxel" Unit, and dialog below appears.



5.7. Unit Preference (Voxel Color Transmission Map)

Press "Unit Preference" button in "Main Control" while selecting "Voxel" Unit whose "rendering type" is C, and dialog right appears.

This dialog provides transmission map settings. See also <u>"5.4. Unit Preference (Voxel Surface)"</u> for some undescribed functions.

"limits of voxel value"

Set by three horizontal slide bars below, upper, middle and lower. Slide bars move in the range that do not violate the order, lower <= middle <= upper. You can also designate each voxel value by inputting.

"opacity maximum"

Set by vertical slide bar right. You can also designate value by inputting.



"color"

Select one of three color scales by combo box. Designate "maximum" and "minimum" value by inputting. Press "Auto Set" button to adjust "maximum" and "minimum" value to the unit respectively.







5.8. Unit Preference (other)

Press "Unit Preference" button in "Main Control" while selecting Unit other than "Voxel Surface" "Voxel" "Surface" "STL" "Label", and dialog like right appears corresponding to "Type".

Changes by combo box or check box apply immediately.

Unit Preference		>
shape	sphere \vee	
🗹 fill	🗹 marker	
Valiable	Value	
line width	1	
center coordina	144.5, 35, -0.3	
rotation	91,-0.62,-1.3,0	
radius	0.03	
sphere partition	4,8	
line number	8,4	
		Apply to List

Unit Preference		
shape	sphere \vee	
E All	- marker	
		rotation
Valiable	Value	degree 91
line width	1	
center coordinates	144.5, 35, -0.3	x -0.62
rotation	91,-0.62,-1.3,0	v -1.3
radius	0.03	/
sphere partition	4,8	z 0
line number	8,4	
		Apply to List

You can edit values in right area by selecting list. Pressing "Apply to List" button updates values.

5.9. Data Preference

Press "Data Preference" button on "Unit Preference" dialog of "Voxel Surface" or "Voxel" Unit, and dialog right appears.

If you use "scale down in data reading" in "Application Preference", scale down ratio is shown.

"Voxel size" in "voxel information" box indicates number of voxels for x-, y- and z-axes.

You can manipulate resolutions for each x-, y- and z-axis. Usable scale units are: nm, um, mm, cm and m.

Data Preference	×
voxel information voxel size : 592 x 30	7 x 145
scale unit	mm 🗸
resolution x	0.194041
У	0.194041
z	0.194041
ОК	Cancel

Data Preference		
coordinates range minimum value	maximum value	
— x \57.112732	- 57.048050	
— У -29.482588	- 29.481577	
— z -13.743327	- 13.713636	
scale unit 🛛 mm 🔍		
OK	Cancel	

Press "Data Preference" button on "Unit Preference" dialog of "Surface" or "STL" Unit, and dialog right appears.

"Coordinates range" indicates minimum and maximum values of polygon surface data for x-, y- and z-axes. Usable scale units are: nm, um, mm, cm and m.

5.10. Voxel Export

Press "Voxel" button in "export file" box of Main Control, and dialog below appears. You can export sectional image sequences with specified corresponding voxel values.

Voxel Export Preference		
corresponding voxel value 1 corresponding voxel value 2 655	rent export 0 35 65535	
convert to 8 bit image		
OK		

Press "OK" button and select save folder.

5.11. Polygon Export

Press "Polygon" button in "export file" box of Main Control, and dialog below appears. You can export polygon data with specified file format (STL and OBJ are available) and magnification.

Polygon Export Preference		
file format STL 🗸		
magnification 1.0		
ОК		

Press "OK" button and select save folder and save file.

6. Additional Information

System Requirements

Windows 7 / 8 / 10 1GB of system memory (4GB recommended) Graphic card that supports OpenGL 3.3 or higher

Contact us

We are waiting for your comments, wishes, bug findings etc... Please email; <u>support@white-rabbit.jp</u> If you inform us of bugs, please add the detailed situation of the error that had occurred.

You can see the latest version of our programs on our website; https://white-rabbit.jp/en/

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The 3D Rabbit model used in this manual is : Stanford Bunny <u>https://graphics.stanford.edu/data/3Dscanrep/</u> (c)Stanford Computer Graphics Laboratory

The 3D Deep-Sea Fish model used in this manual is : 3D-CT Deep-Sea Creatures (Japanese) https://www.aori.u-tokyo.ac.jp/project/3D/index.html

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