Application Note #36

How to create :
«Concentric Sub Volume»
«Matryoshka Dolls»

The application-note purpose is to guide the user in creating a concentric objects, based on the source segments shape, from outer to the inner of it. The concentric shape can be used as ROIs for further analysis (Compartmentalization, gradient distribution, heat map, etcetera)

Application Flowchart

> ### Run the script
>
> • The script creates a series of concentric segments. (Matryoshka Dolls concept)

Index

1. Open the working dataset on Vision4D

Step 1.1

Select the *Open..* item from the file menu.
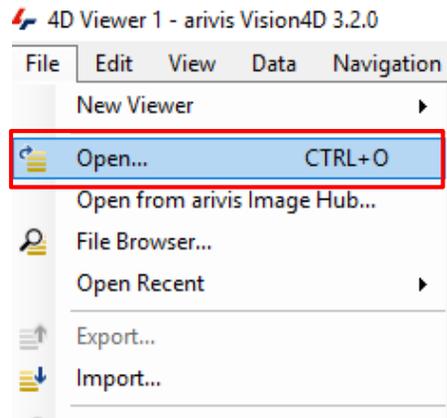
Step 1.2

Select the dataset from the file browser.

TIPS :
The dataset is visualized according to the current rendering setting parameters. Please refer to the (arivis Vision4D Help) for more details
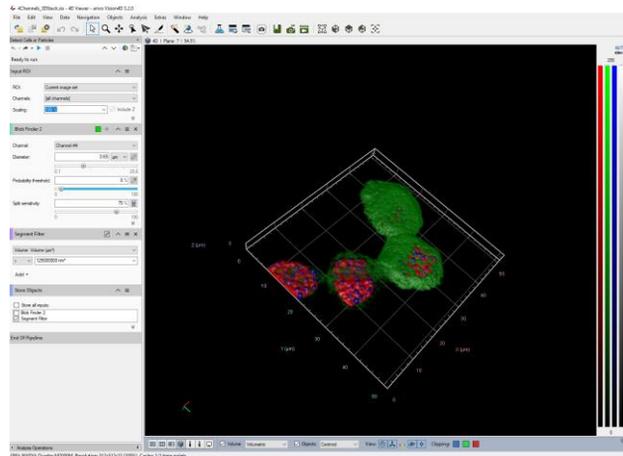
DETAILS:

The dataset is a multi dimensional, discrete, representation of your real sample volume. It can be structured as a Z series of planes (Optical sectioning) of multiple channels (dyes) in a temporal sequence of time points (located in several spatial positions).

Usually the dataset shows a single experimental situation (a complete experiment can be composed by several datasets). The datasets are available as graphic files saved in plenty of file formats (standard formats as well as proprietary formats)

2. Load the Python Script

Step 2.1
Open Python Script Editor.
From the «*Extra*» menu, select the
«*Script Editor*» item
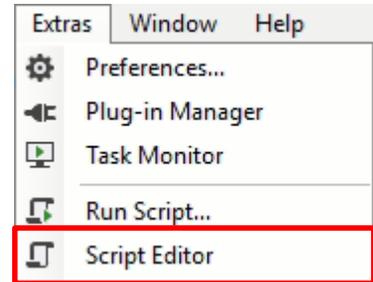
Step 2.2
Load the "*Matryoshka_doll_revxx*" Python
Script.
Browse the folder on which the file has been
saved
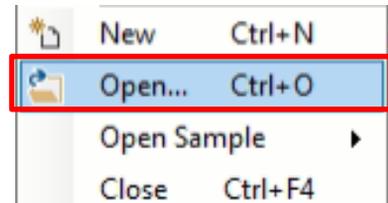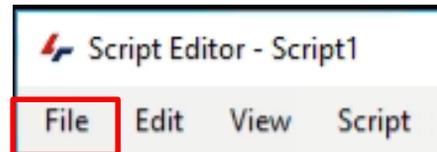
Python script code usage rights.

```
#---------------------------------------------------------------------------
#
# NAME: Matrioshka Doll
# FILE: Matrioshka_Doll_Rev1_1_05
# REVISION : 1.05  - 2021-07-03
# AUTHOR : Maurizio Abbate
# Copyright(c) 2021 arivis AG, Germany. All Rights Reserved.
#
# Permission is granted to use, modify and distribute this code,
# as long as this copyright notice remains part of the code.
#
#
# PURPOSE : starting from a single/multiple objects, the script build
# a set of concentric segments centered on the source object centroid
# MATRYOSHKA_DOLL concept
#
# PUBLIC VARIABLES DESCRIPTION:
#          MATRYOSHKA_DOLL_NUM = sets the numbers of the concentric segments
#                        [NUMBER - INTEGER]
#          TAG_DESCRIPTOR = set the TAG from which the original
#                        segments have been stored [TEXT - STRING]
#          APPLY_CONVEX_HULL = the segment borders are corrected using
#                        the convex hull algorithm [BOOL - BOOLEAN]
#          MATRYOSHKA_WITH_HOLES = Enable the holes creation inside each Doll
#
# NOTES: Tested on 3.4
```

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3. Set the Script features

In order to define the "Matryoshka" based model sub-regions features, some parameters of the script should be adjusted to match your analysis needs. These parameters are located in the code area labeled as *"USER SETTING".*

```
# @@@@@@@@@@@@@@@@@@@@@@@@@@@@ USER SETTINGS @@@@@@@@@@@@@@
TAG_DESCRIPTOR = "Manual"          #Cell Manual"
#♥
TAG_SCRIPT_DESCRIPTOR = "Matrioshka_"
#
MATRYOSHKA_DOLL_NUM = 8 # total number of dolls including the
#
APPLY_CONVEX_HULL = True
#
MATRYOSHKA_WITH_HOLES = True
# @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@ END OF USER SETTINGS @@@@@@
```

Step 3.1
TAG_DESCRIPTOR : Set the source object(s) TAG. The outer shape of this/these object(s) is used tp create the concentric, inner, sub-volumes.
TAG_SCRIPT_DESCRIPTOR : It defines the new TAG with which the concentric objects will be identified. The source object ID is added to the TAG.
MATRYOSHKA_DOLL_NUM : Set the total number of concentric sub-volumes. The parameter includes the outer source shape.
APPLY_CONVEX_HULL : If **True**, the convex hull algorithm is applied.
MATRYOSHKA_WITH_HOLES : If **True**, the inner sub-volume is subtracted from the outer contiguous, shape.
Refer to the next page for more details

NOTE :
Only the parameters located in the "*USER SETTING*" area can be modified.
Don't change any other number, definition or text in the code outside this dedicated area.

Set the Script features (continue)

The **MATRYOSHKA_WITH_HOLES** parameter changes how the inner sub-volume of each Doll is computed. it can be hollow or fill.

MATRYOSHKA_WITH_HOLES = True

Matryoshka Inner shell

Matryoshka hole

Matryoshka Outer shell
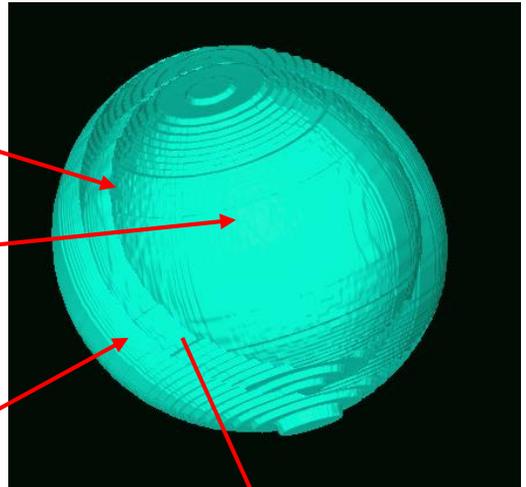
Matryoshka sub-volume

Matryoshka hole
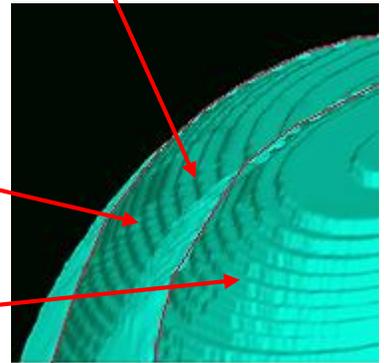
MATRYOSHKA_WITH_HOLES = False

Matryoshka sub-volume
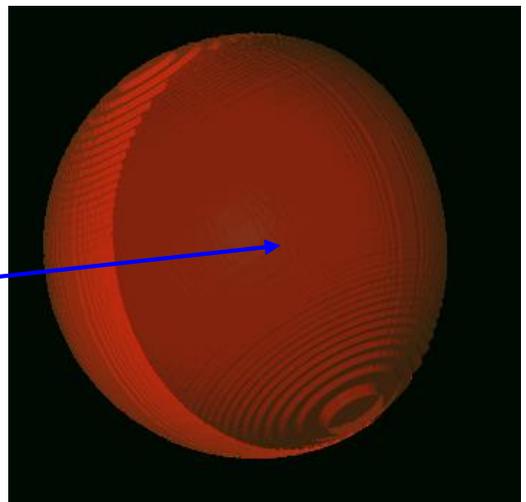
4. Run the Python Script

Step 4.1
Run the "***Matryoshka_doll_revxx***" Python Script pressing the "Run Script" button or pressing the F5 key.

TIPS :
Activate, if not already displayed, the "Output Panel". The status of the script execution (errors including) will be visualized here
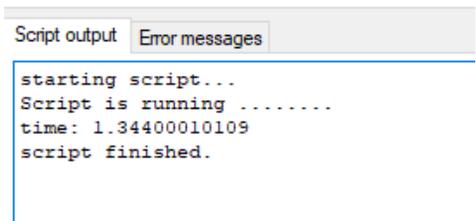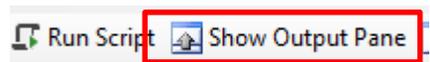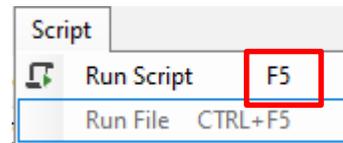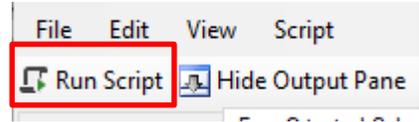
Source segment
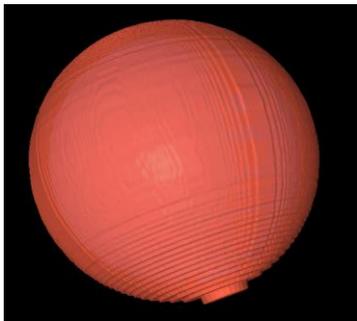
Matryoshka with holes
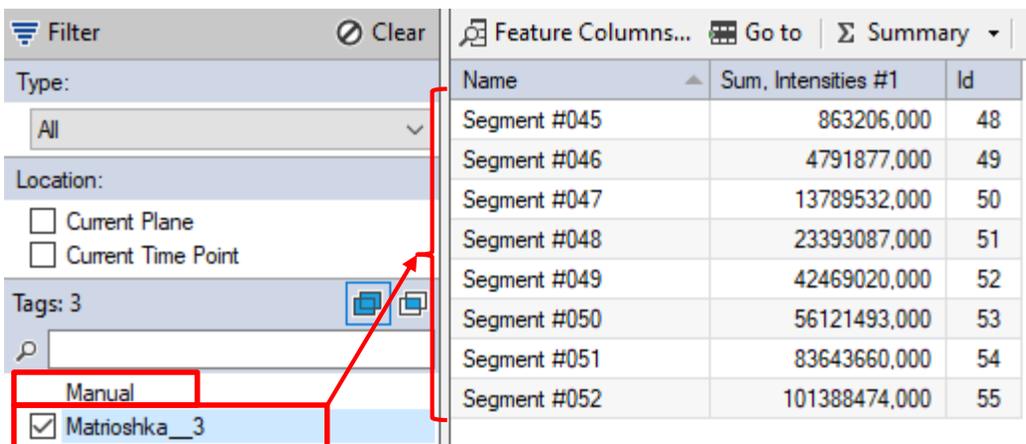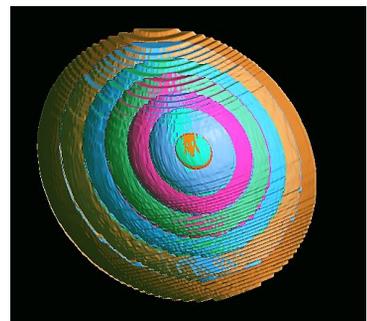
Contact the arivis local area sales manager to get more information about how to get the python script mentioned here.

Contact the arivis application support to receive additional technical details about the topic described in the application note, or how to adapt the application workflow to your requirements.

"The quantitative analysis of the images represents the art of transforming a visual sensation into its schematic and discrete form allowing its univocal description, classification and mathematical and logical interpretation of its spatial and temporal components"

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