

SCIRun Visualization Basics

Part 1

Setup from Flash Stick

Lab 3

1. Unzip

SCIRunData_4.0_20081203.zip
on Desktop

2. Start SCIRun

- **Windows**
 - Run installer
- **OS X**
 - Open DMG

Mac OS X Finder window titled "CIBC" showing the contents of a folder named "CIBC2008".

Left Sidebar:

- DEVICES
 - Macintosh HD
 - iDisk
 - CIBC**
 - SCIRunWithMeshingTools_4.0_20081203_osx32
- SHARED
 - bumac-23
 - Burbemail02
 - Caffeine
 - consci23
 - Greg Jones' Computer
 - IRH
 - maclab13
 - All...
- PLACES
 - Desktop
 - aylaxhan
 - Applications
 - Documents
 - Movies
 - Music
 - Pictures
 - Sites
 - Developer
 - papervision-pres0.rar
- SEARCH FOR
 - Today

Main Content Area:

Name	Date Modified	Size	Kind
▼ CIBC2008	Today, 12:04 AM	--	Folder
▶ ImageVis3D	Today, 12:07 AM	--	Folder
▶ map3d	Today, 12:07 AM	--	Folder
▼ SCIRun	Today, 12:04 AM	--	Folder
▼ SCIRun	Today, 12:06 AM	--	Folder
SCIRunWithMeshingT...081203_osx32.dmg	Yesterday, 1:31 PM	53.4 MB	Disk Image
SCIRunWithMeshingT...081203_osx64.dmg	Yesterday, 3:45 PM	50.5 MB	Disk Image
SCIRunWithMeshingT...0081203_win32.exe	Yesterday, 1:31 PM	9.1 MB	EXE File
SCIRun_4.0_20081203_linux.tgz	Yesterday, 1:32 PM	28.3 MB	gzip c...rchive
SCIRun_4.0_20081203_source.tgz	Yesterday, 1:32 PM	154.7 MB	gzip c...rchive
▼ SCIRunData	Today, 12:04 AM	--	Folder
SCIRunData_4.0_20081203.zip	Yesterday, 3:47 PM	412.8 MB	ZIP archive
▶ Seg3D	Today, 12:04 AM	--	Folder

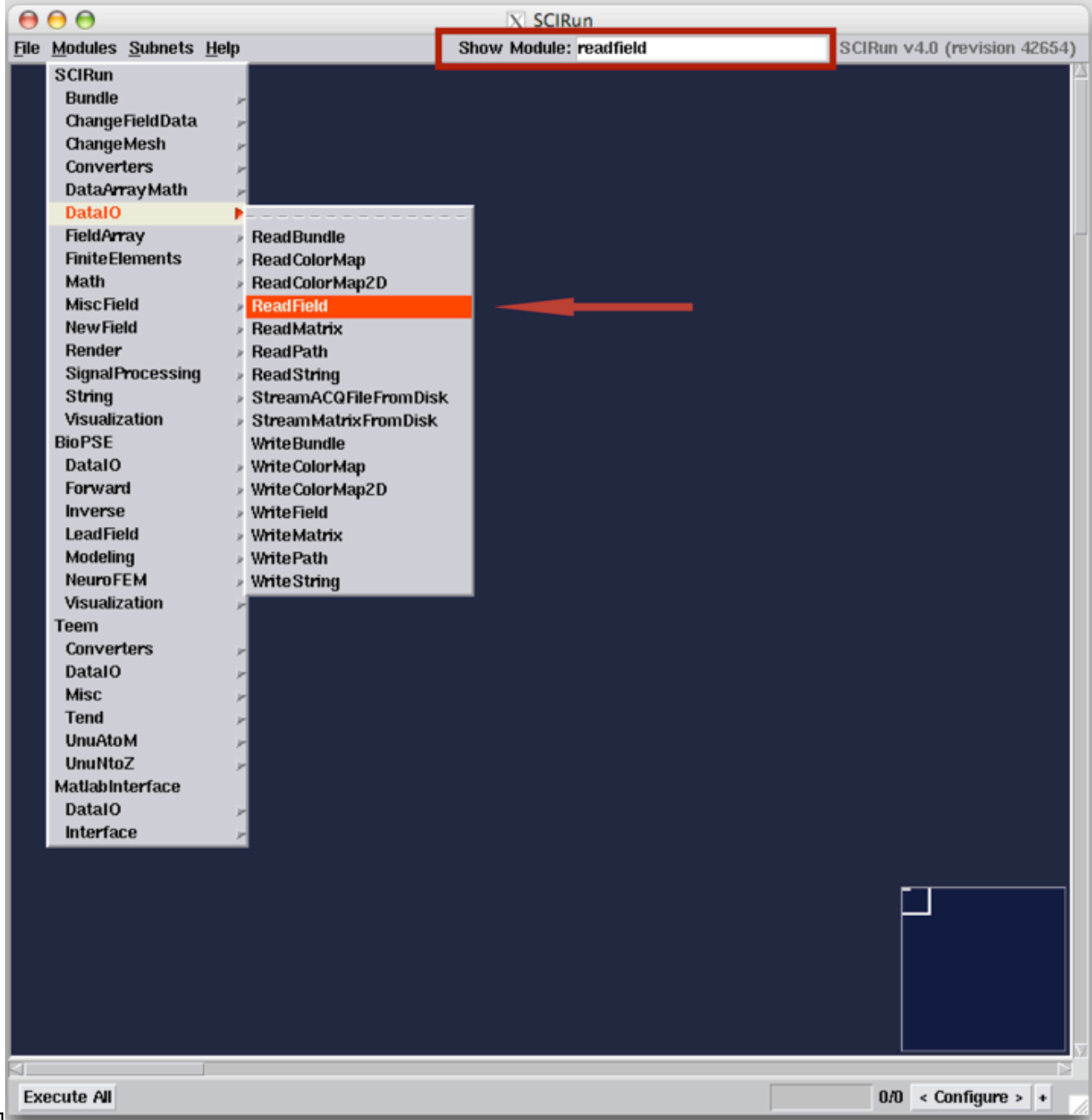
13 items, 82.2 MB available

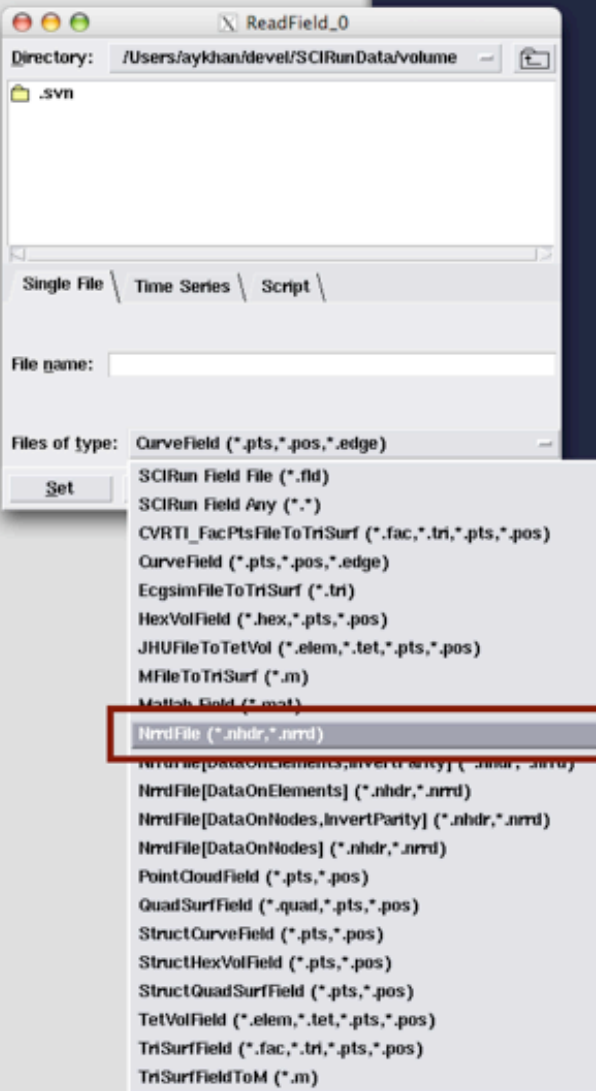
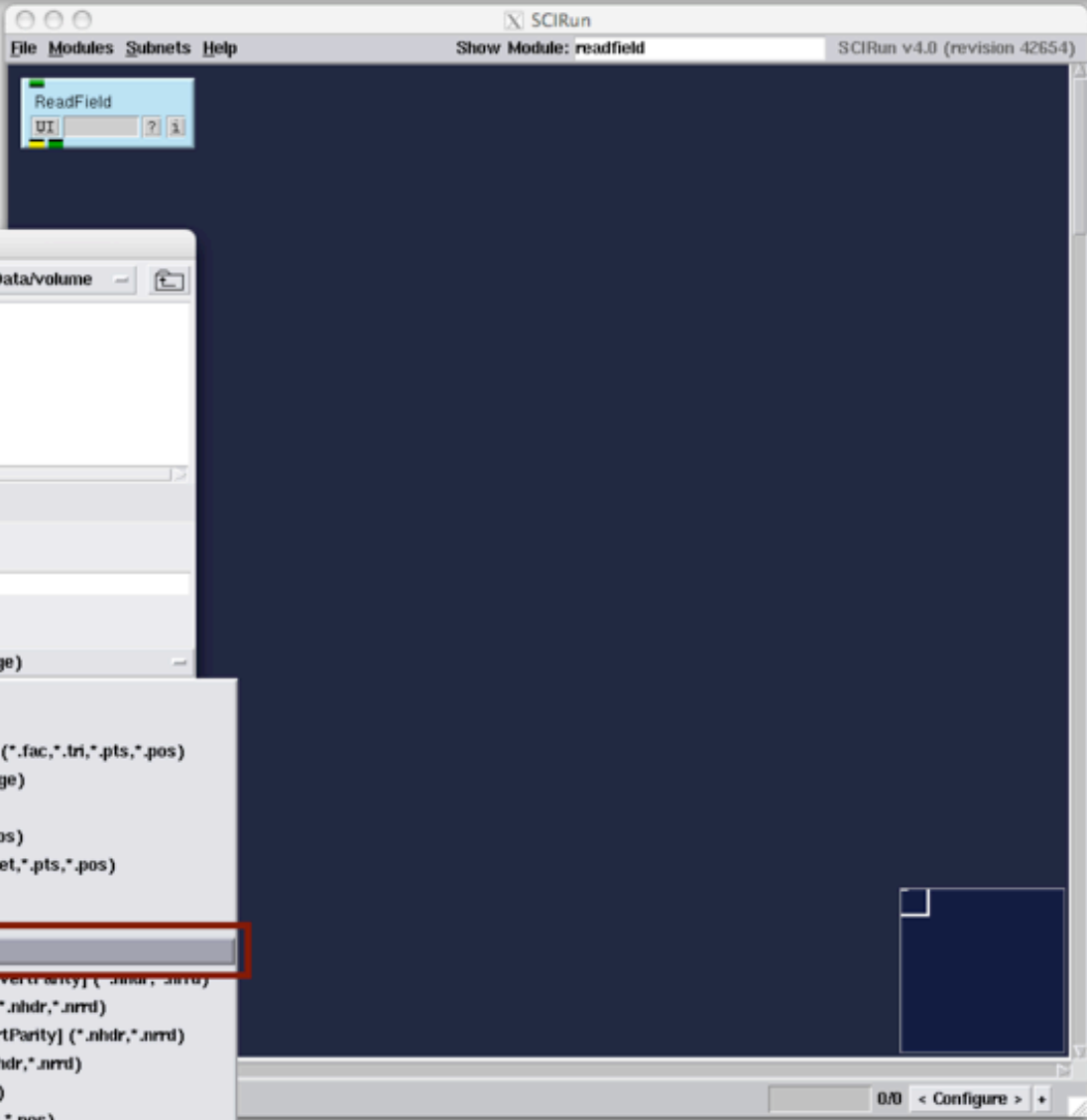


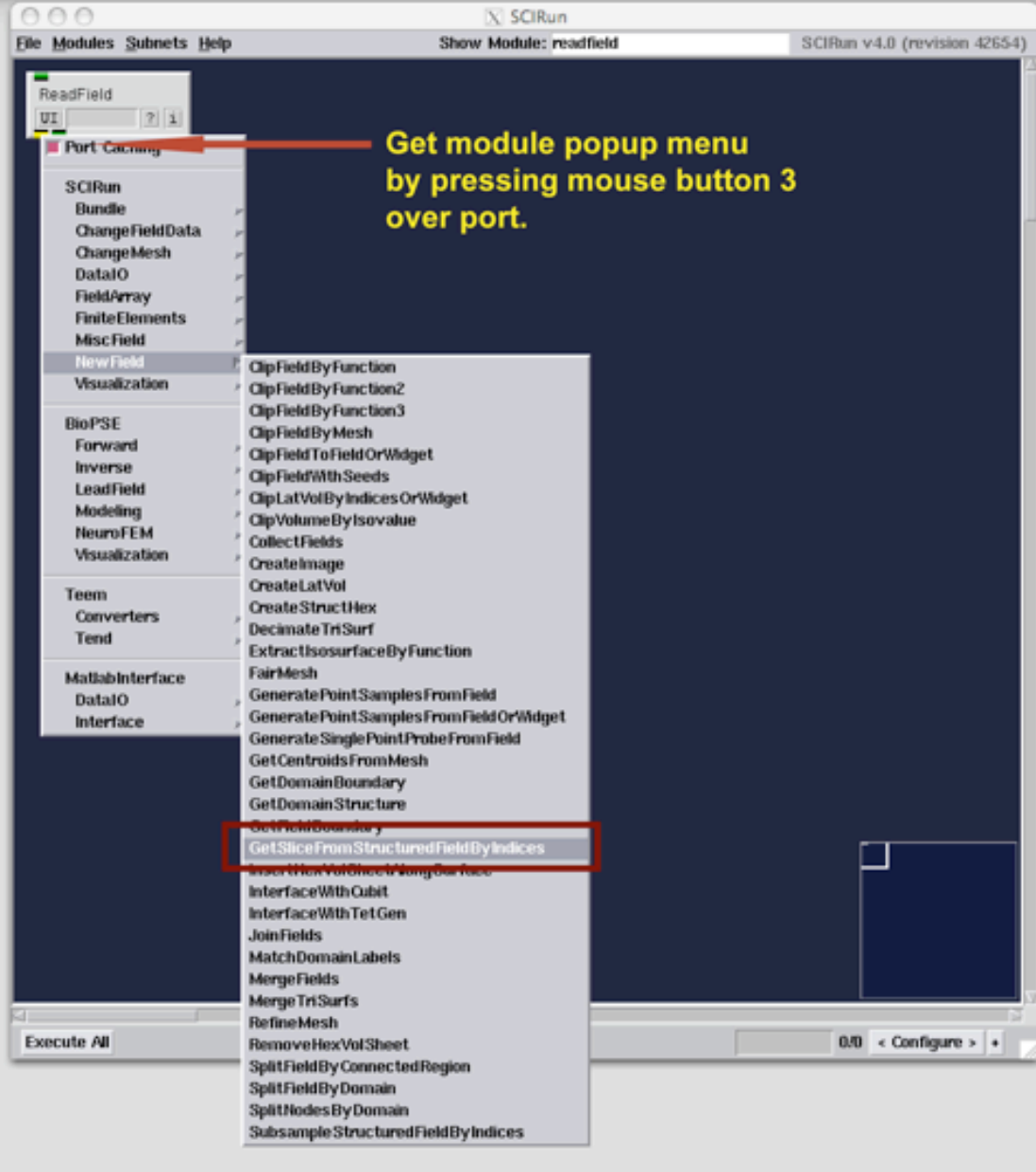
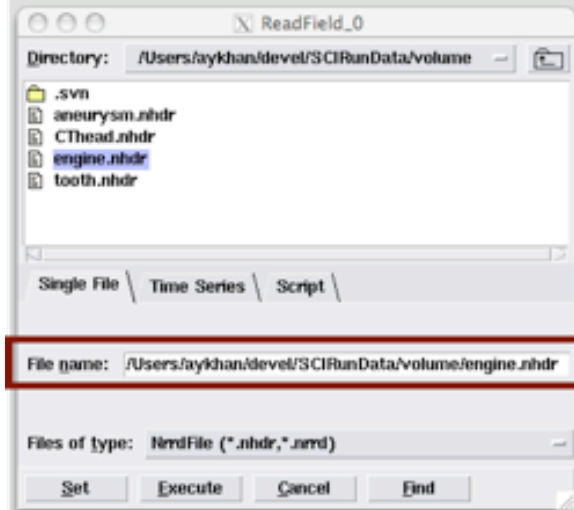
Read Dataset

Lab 3

1. Add **ReadField** module
2. Read Nrrd files
3. Flash drive users:
 - Use file browser to navigate to **Desktop/SCIRunData_4.0_20081203**
4. Read SCIRunData file **volume/engine.nhdr**







Get module popup menu by pressing mouse button 3 over port.

Slice, Visualize Field

Lab 3

5. Slice field

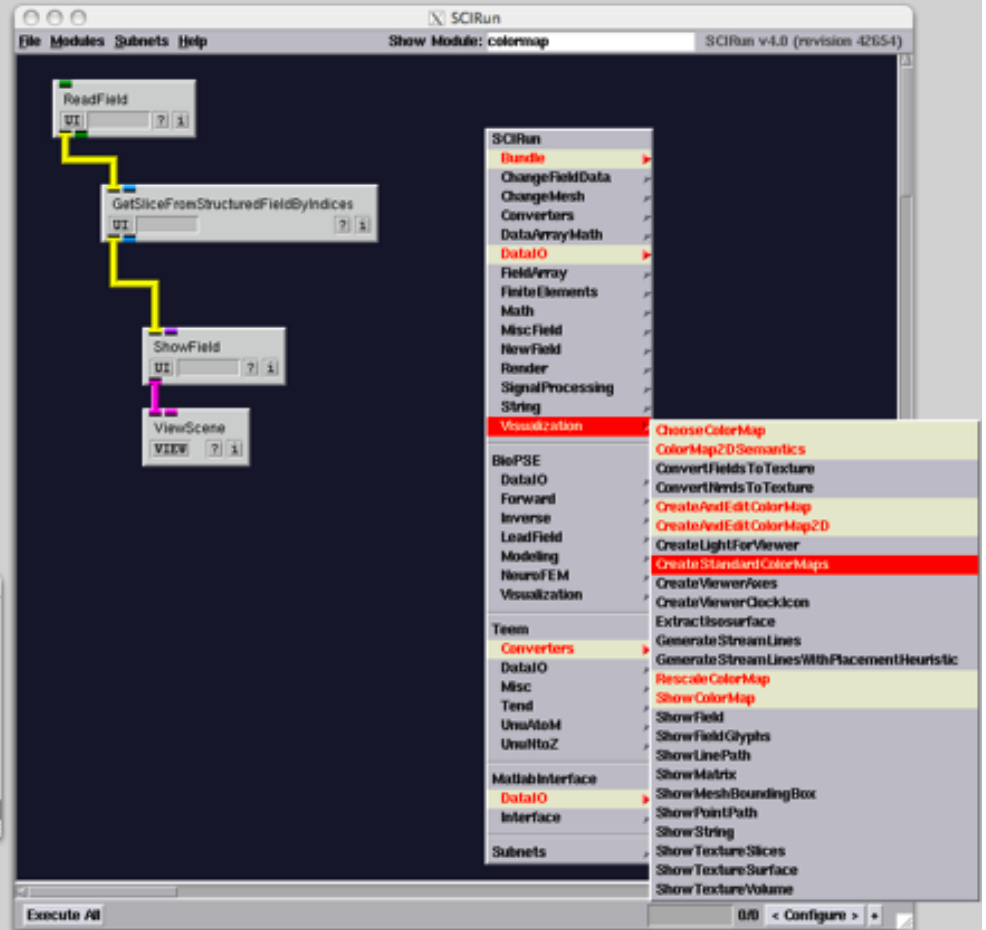
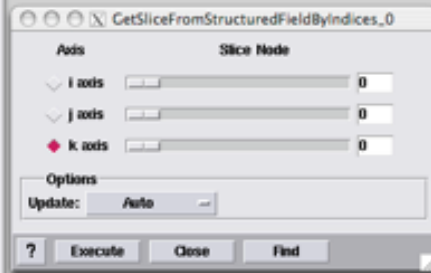
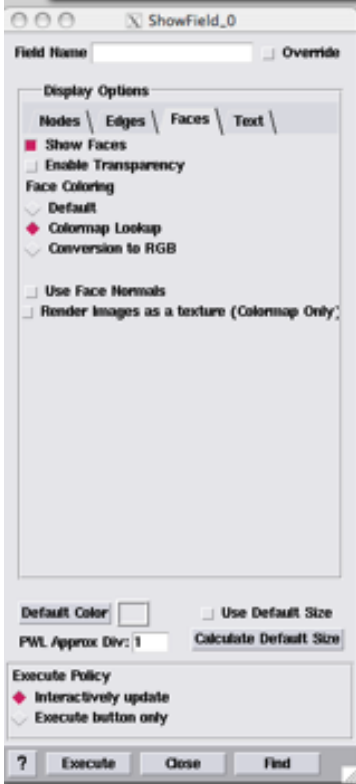
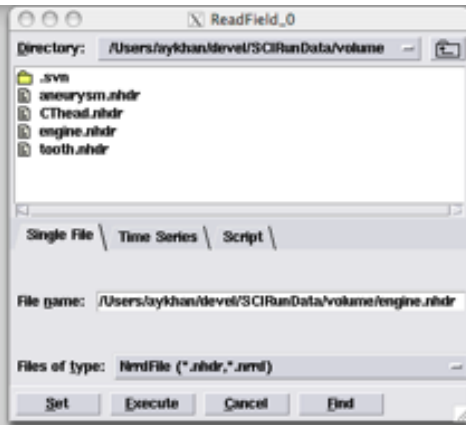
- Connect **GetSlicesFromStructuredFieldByIndices** module to **ReadField**

6. Add Visualization modules **ShowField** and **ViewScene**

7. Add **CreateStandardColorMaps** and **RescaleColorMaps**

8. Execute network

9. Use sliders to change slice position



The screenshot displays the SCIRun v4.0 (revision 42654) interface. The main window shows a workflow graph with the following nodes:

- ReadField** (UI)
- GetSliceFromStructuredFieldByIndices** (UI)
- RescaleColorMap** (UI)
- CreateStandardColorMaps** (UI)
- ShowField** (UI)
- ViewScene** (VIEW)

The workflow is connected as follows: ReadField feeds into GetSliceFromStructuredFieldByIndices. GetSliceFromStructuredFieldByIndices feeds into both RescaleColorMap and ShowField. RescaleColorMap feeds into CreateStandardColorMaps. ShowField feeds into ViewScene.

Three configuration windows are open:

- ShowField_0**: Shows display options for Nodes, Edges, Faces, and Text. The 'Show Faces' checkbox is checked. Other options include 'Enable Transparency', 'Face Coloring' (Default, Colormap Lookup, Conversion to RGB), 'Use Face Normals', and 'Render Images as a texture (Colormap Only)'. The 'Execute Policy' is set to 'Interactively update'.
- GetSliceFromStructuredFieldByIndices_0**: Shows axis selection for the slice. The 'k axis' is selected. The 'Update' option is set to 'Auto'.
- ReadField_0**: Shows the file directory as '/Users/aykhan/level/SCIRunData/volume' and the file name as '/Users/aykhan/level/SCIRunData/volume/engine.nhdr'.

At the bottom of the SCIRun window, the **Execute All** button is highlighted with a red box and a red arrow pointing to it.

SCIRun v4.0 (revision 42654)

File Modules Subnets Help Show Module: colormap

ReadField UI 0.00 ? i

GetSliceFromStructuredFieldByIndices UI 0.01 ? i

CreateStandardColorMaps UI 0.01 ? i

RescaleColorMap UI 0.01 ? i

ShowField UI 0.01 ? i

ViewScene VIEW ? i

ViewScene 1 Window 1

File Views Help

Axis Slice Node

i axis 0

j axis 0

k axis 49

Options

Update: Auto

Execute Close Find

Execute All

NewWindow Autoview Go Home Set Home LockView < Configure >

Show Bounding Box

Lab 3

10. Add **ShowMeshBoundingBox** module
11. Change number of lines in cage for each dimension
12. Execute network

SCIRun v4.0 (revision 42654)

File Modules Subnets Help Show Module: boundingBox

ReadField UI 0.22 ? i

GetSliceFromStructuredFieldByIndices UI 0.00 ? i

CreateStandardColorMaps UI 0.01 ? i

RescaleColorMap UI 0.24 ? i

ShowField UI 0.00 ? i

ShowMeshBoundingBox UI ? ? i

ViewScene VIEW ? ? i

Execute All 6/6 < Configure > +

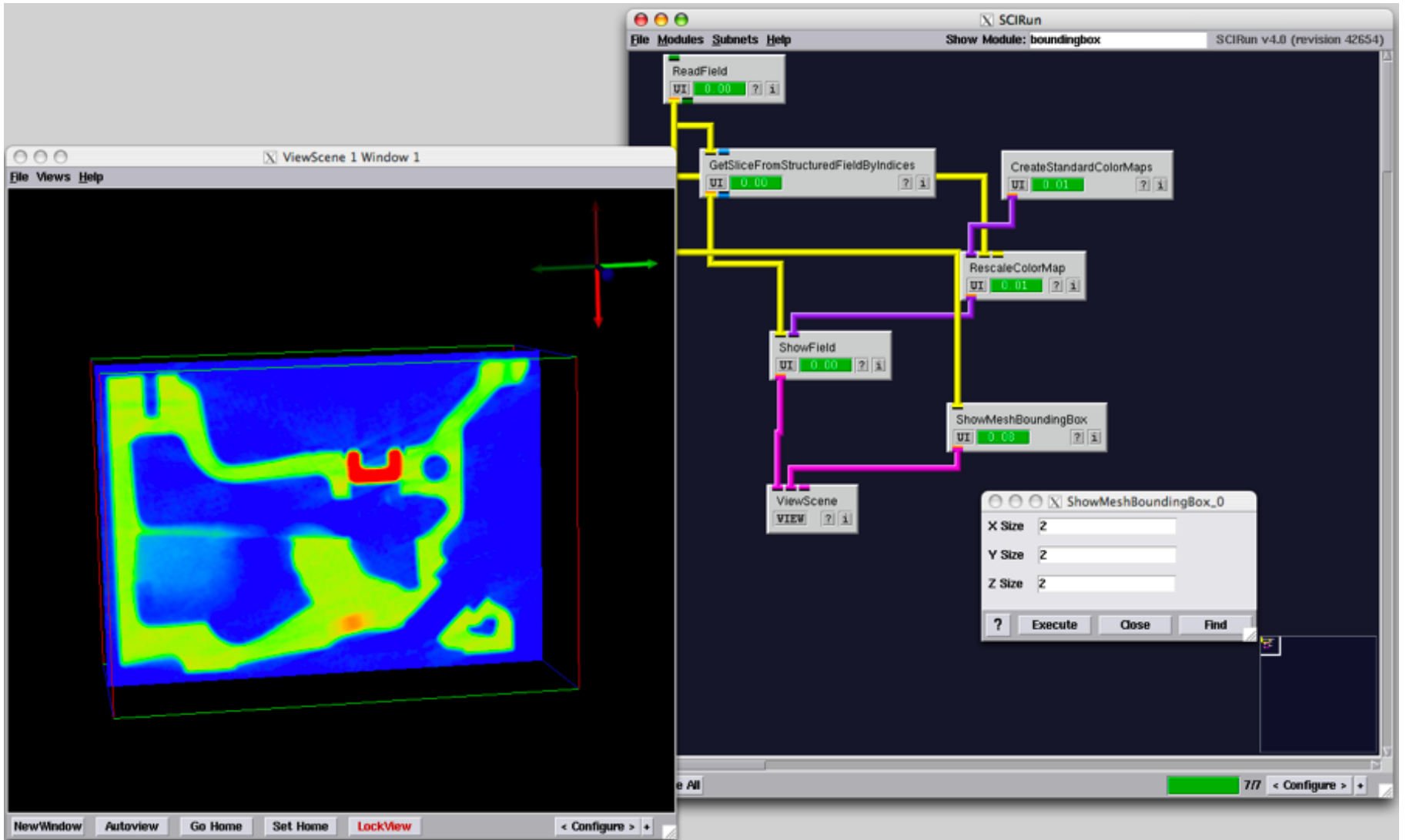
ShowMeshBoundingBox_0

X Size 2

Y Size 2

Z Size 2

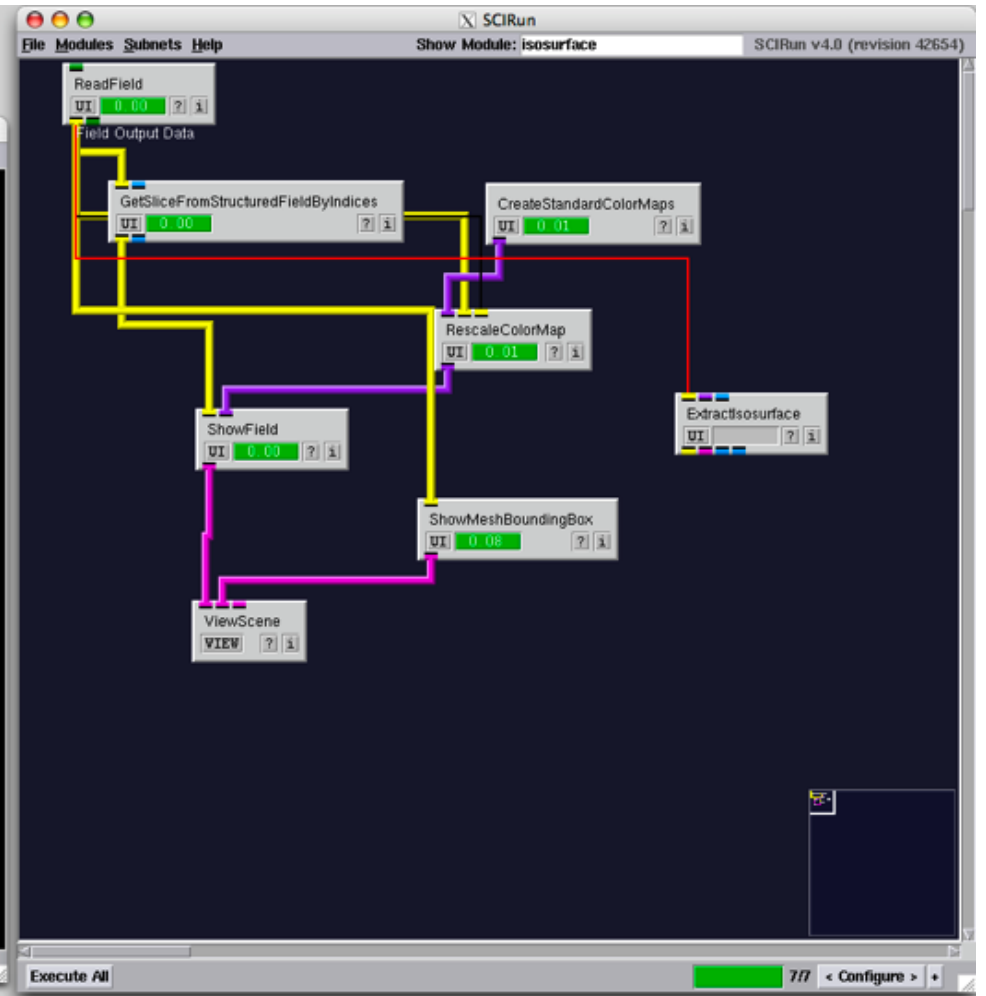
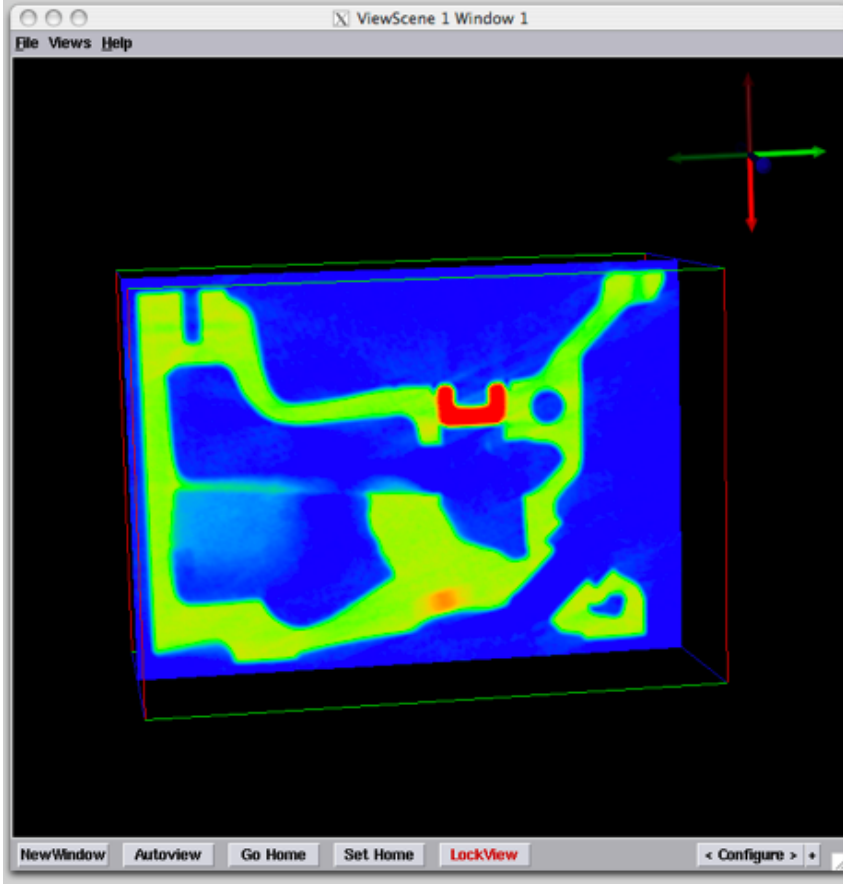
? Execute Close Find

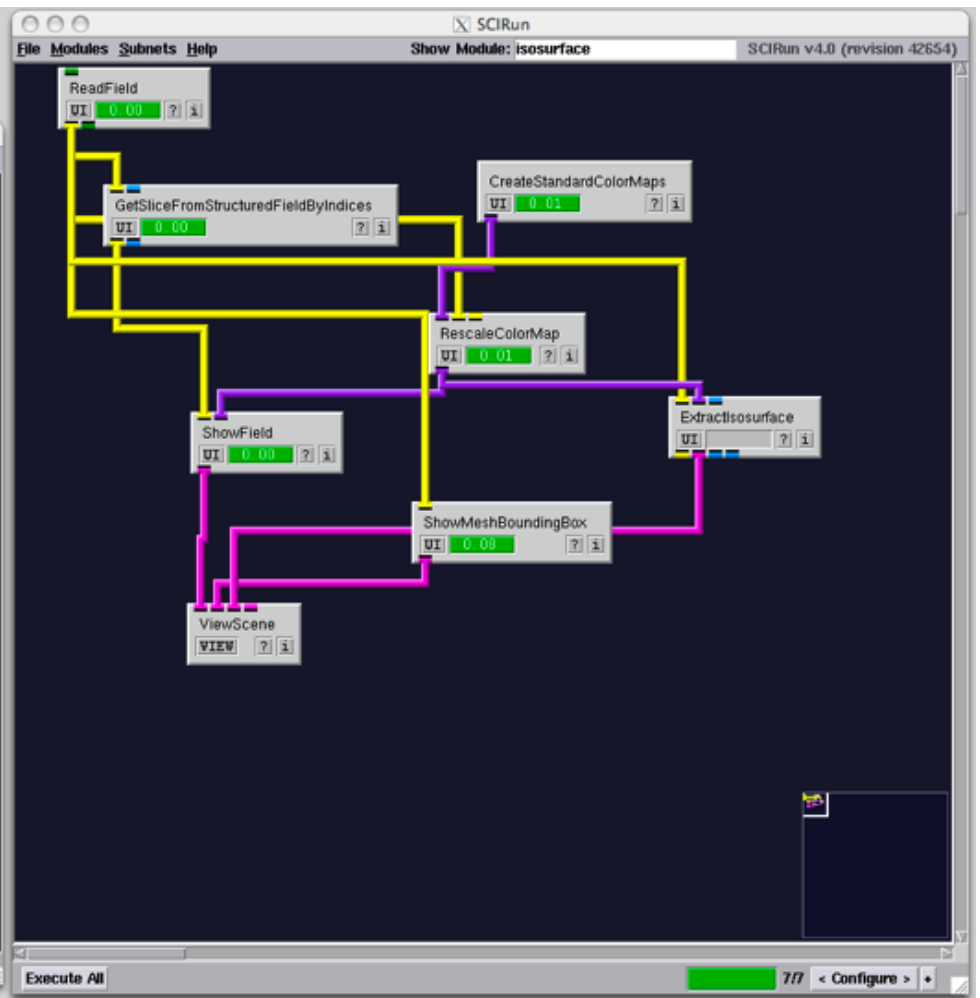
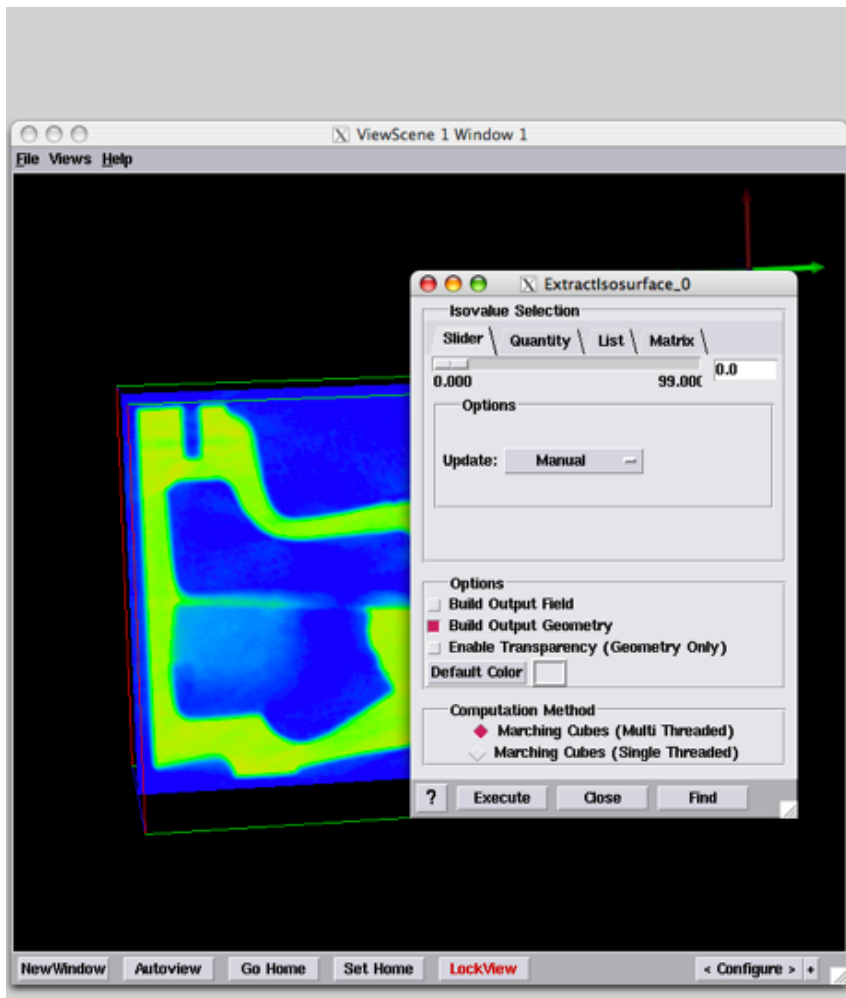


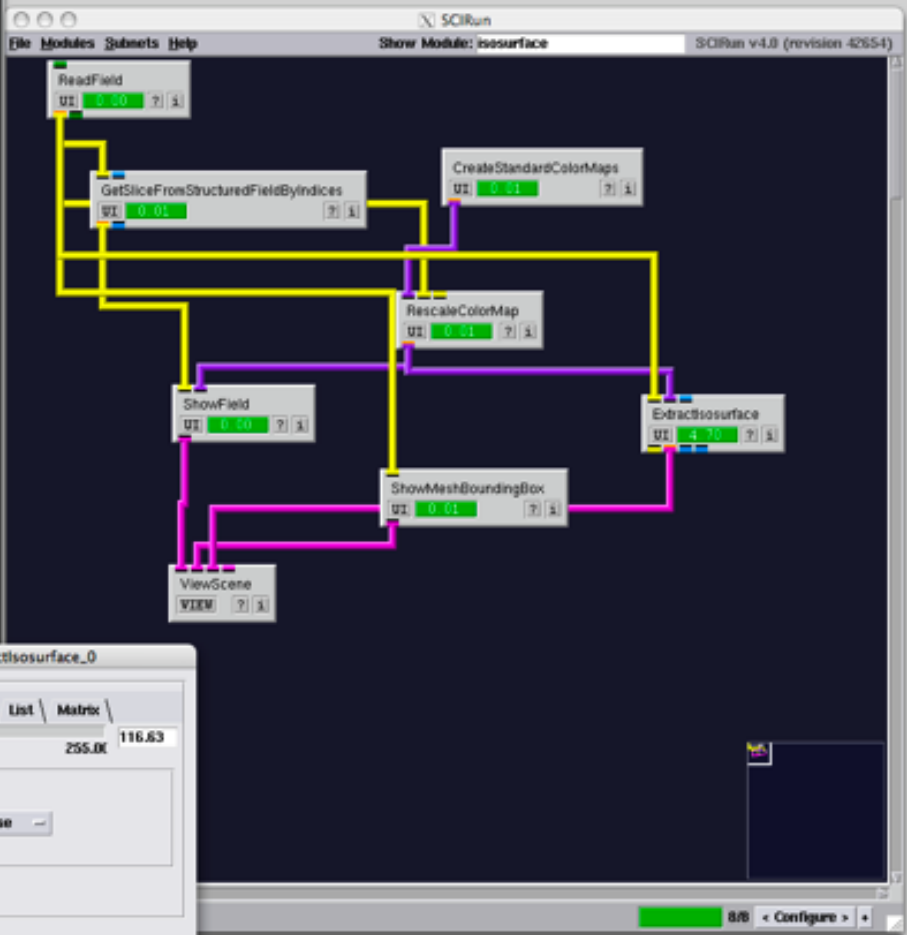
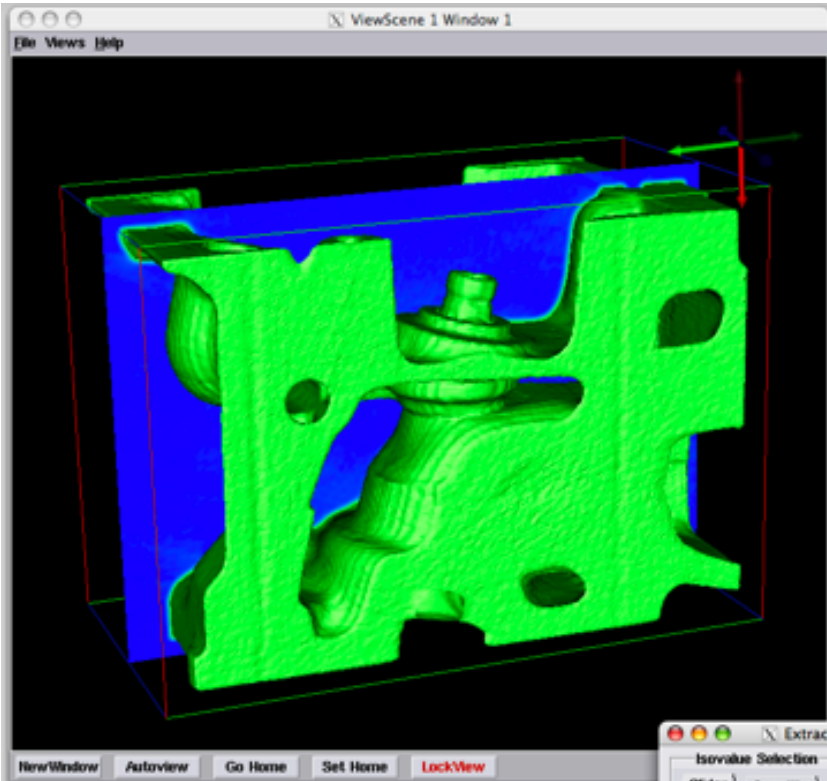
Isosurface

Lab 3

13. Connect **ExtractIsosurface** module to **ReadField**
14. Color isosurface output geometry using colormap
15. Execute Network
16. Use slider to change isovalue







ExtractIsosurface_0

Isosurface Selection

Slider | Quantity | List | Matrix

0.00 255.00 116.63

Options

Update: On Release

Options

- Build Output Field
- Build Output Geometry
- Enable Transparency (Geometry Only)

Default Color

Computation Method

- Marching Cubes (Multi Threaded)
- Marching Cubes (Single Threaded)

? Execute Close Find



SCIRun Visualization Basics

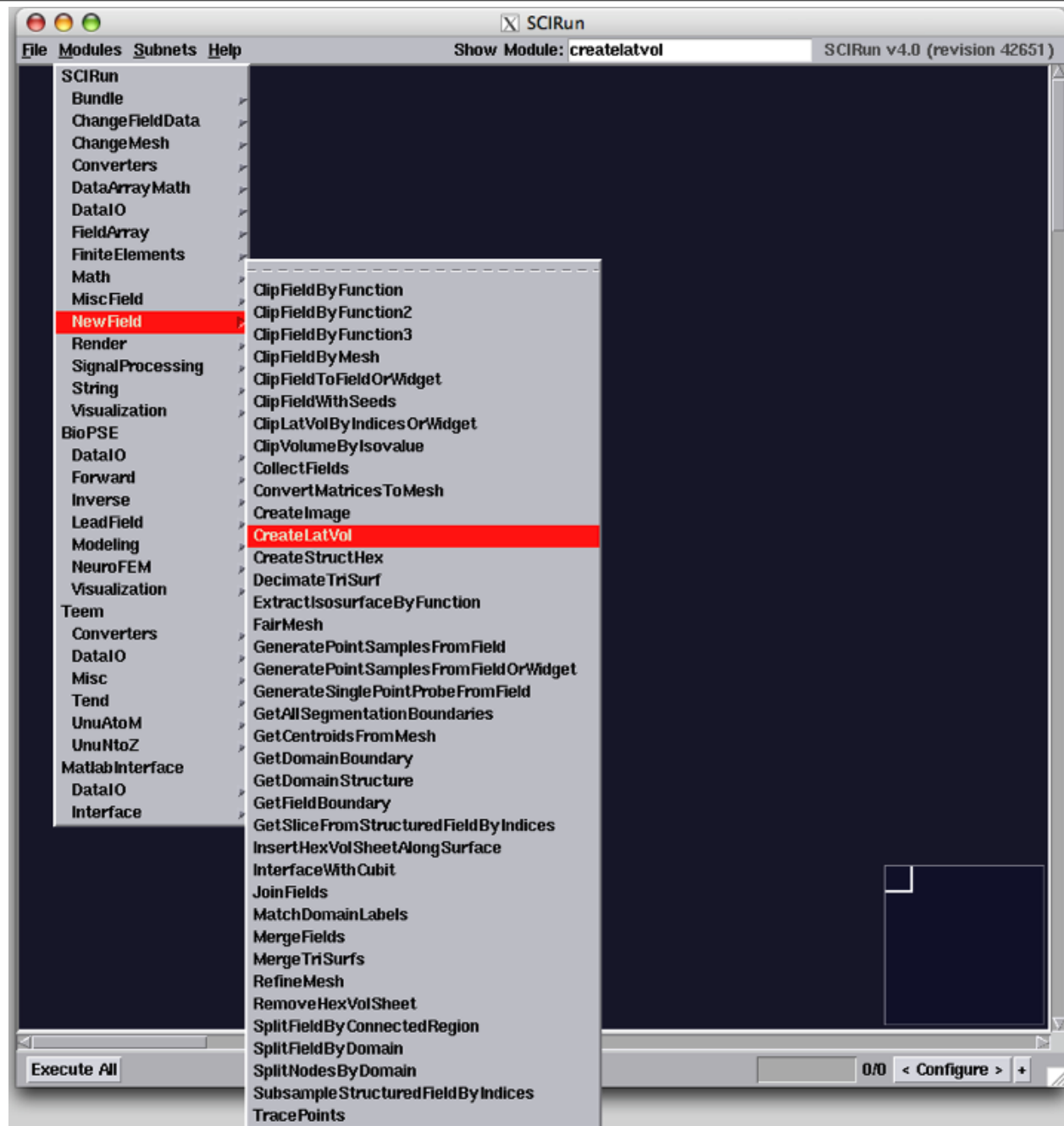
Part 2

Create Field

Lab 3

1. Create Lattice volume using **CreateLatVol** module
2. Assign data at nodes using **CalculateFieldData** module
 - Connect **CalculateFieldData** to **CreateLatVol**
 - Expression:

RESULT = sqrt(X*X + Y*Y + Z*Z)



The image shows a screenshot of the SCIRun v4.0 software interface. In the foreground, a dialog box titled "CalculateFieldData2_0" is open, displaying the "Create New Field Data" configuration screen. The dialog includes a function definition, input/output arrays, caching options, and a text area for the function code.

Function: $RESULT = function(DATA,A,B,C,...)$

Input array: DATA1 (scalar/vector/tensor: data from field port) **Input array:** INDEX (scalar: number of the element)

Input array: DATA2 (scalar/vector/tensor: data from field port) **Input array:** SIZE (scalar: number of elements)

Input array: X, Y, Z (scalar: Cartesian coordinates of node/element) **Input array:** ELEMENT (element: object containing element properties)

Input array: POS (vector: vector with node/element position) **Output array:** RESULT (scalar)

Input array: A, B, C, ... (scalar/vector/tensor: data from field data ports)

Caching: Cache Result Count: 0

Output Type: Output Data Type :

function

```
RESULT = sqrt( X * X + Y * Y + Z * Z )
```

Buttons:

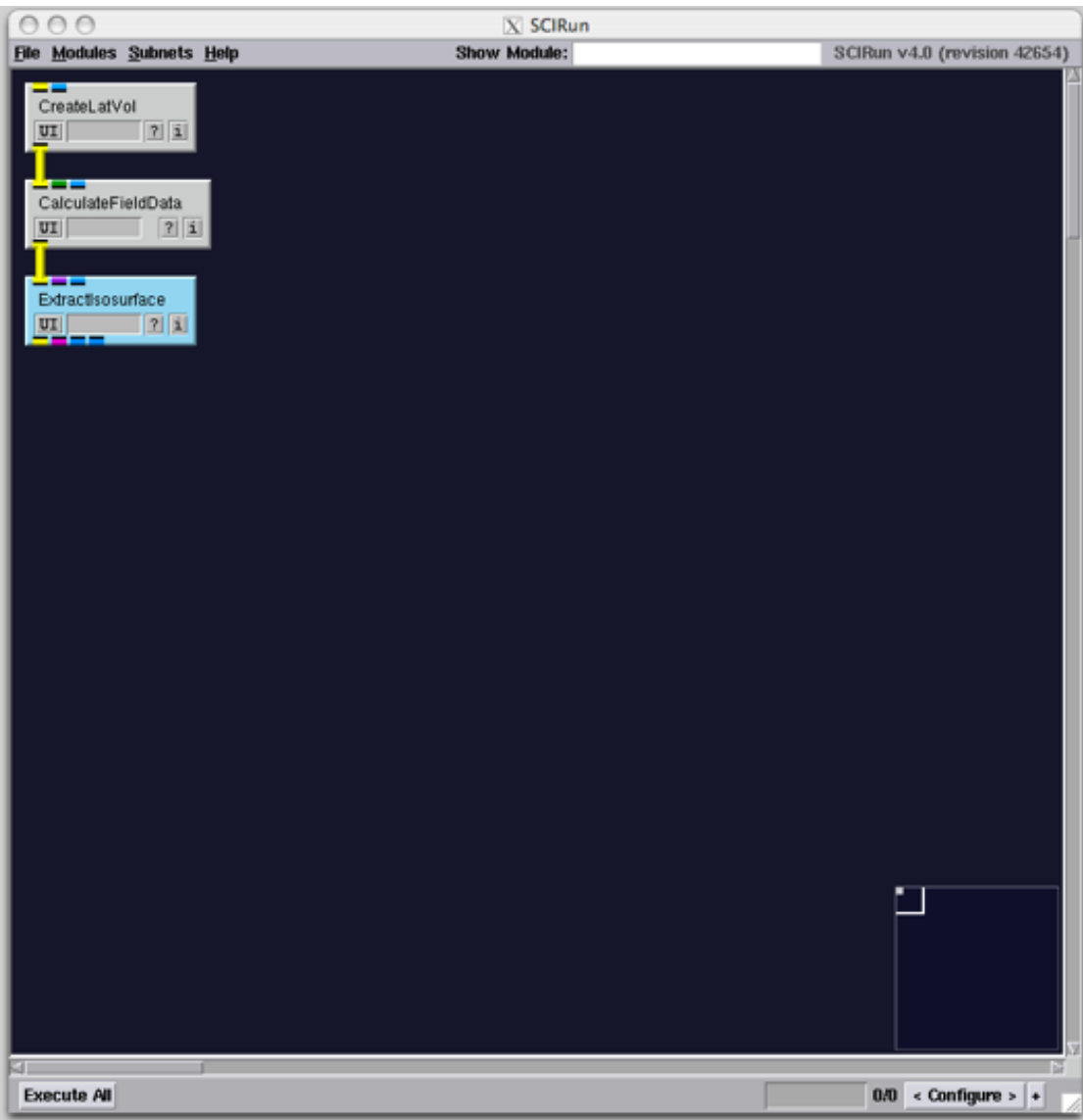
The background window, titled "SCIRun", shows a module tree with "CreateLatVol" and "CalculateFieldData2" modules. The status bar at the bottom indicates "Execute All" and "0/0 < Configure >".

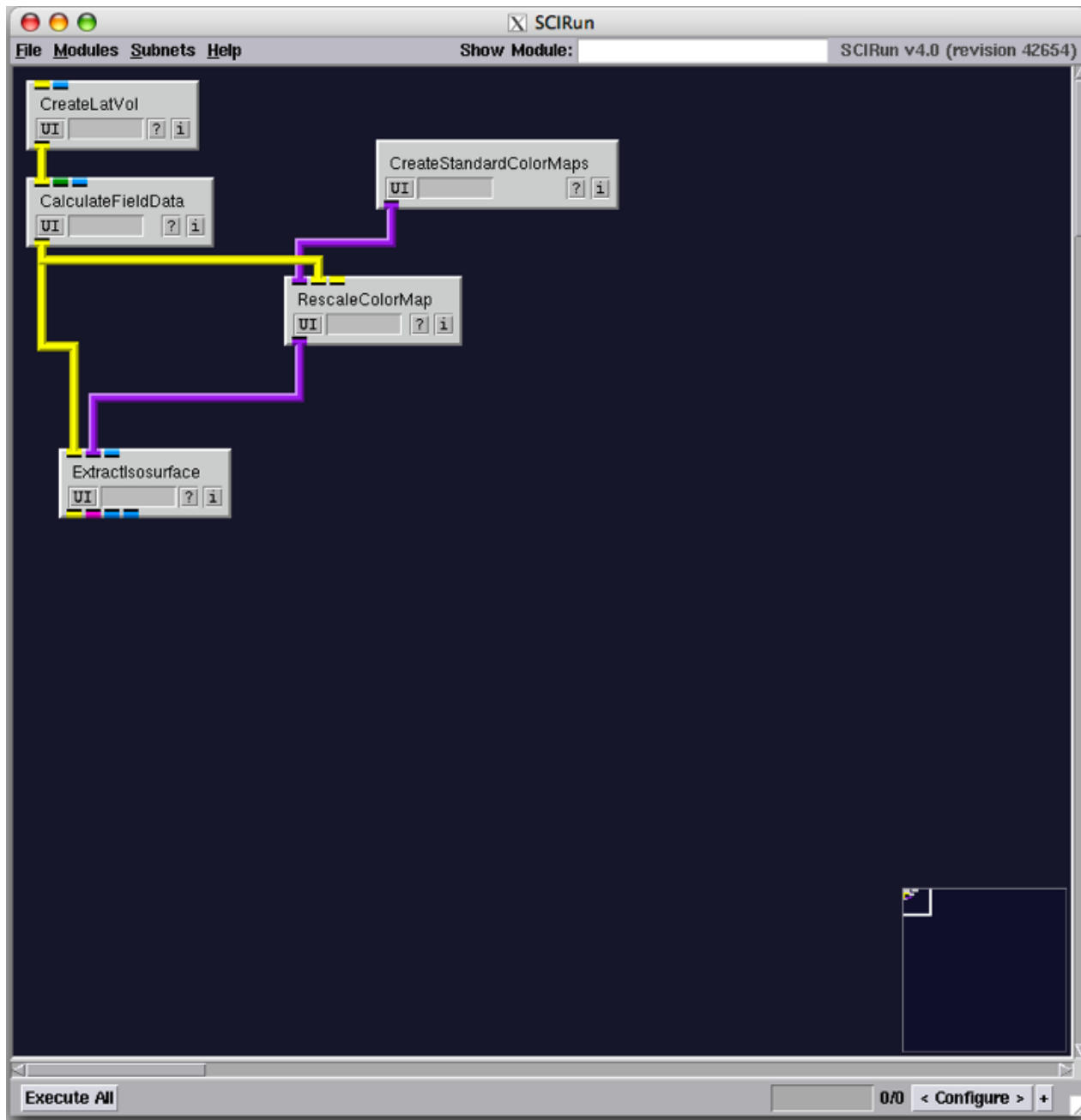


Visualize Isosurface

Lab 3

3. Connect **ExtractIsosurface** module to **CalculateFieldData**
4. Add **ColorMap**
5. Execute network
6. Show **4x4x4** mesh bounding box

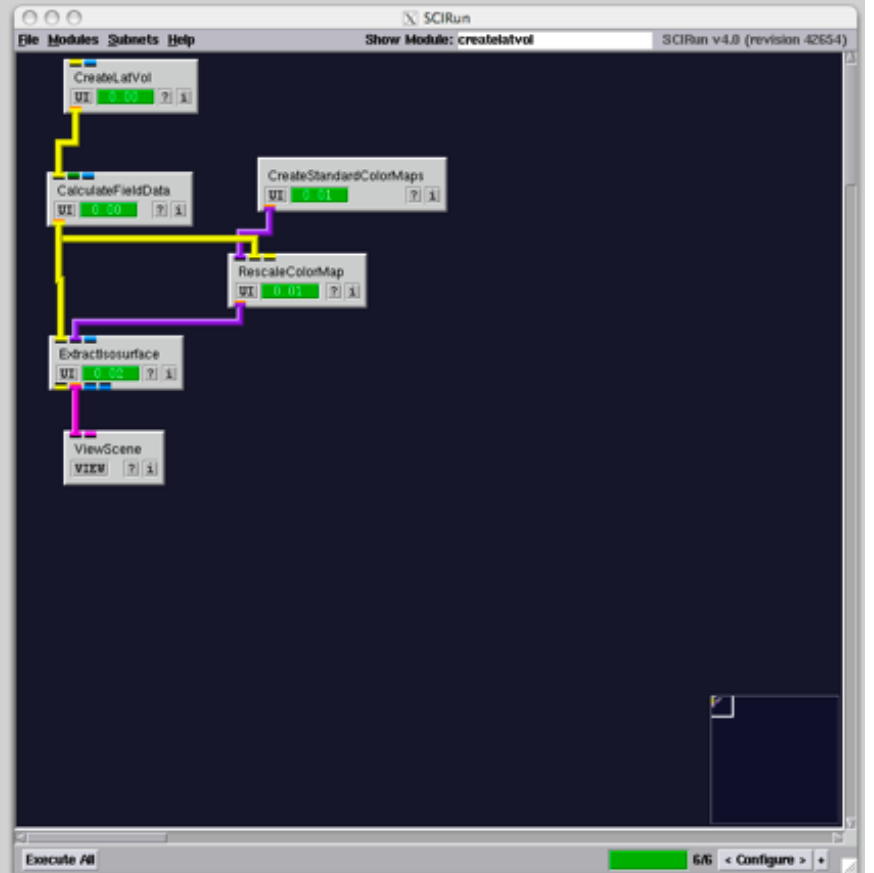
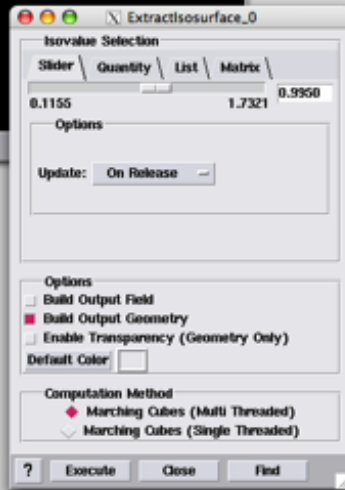
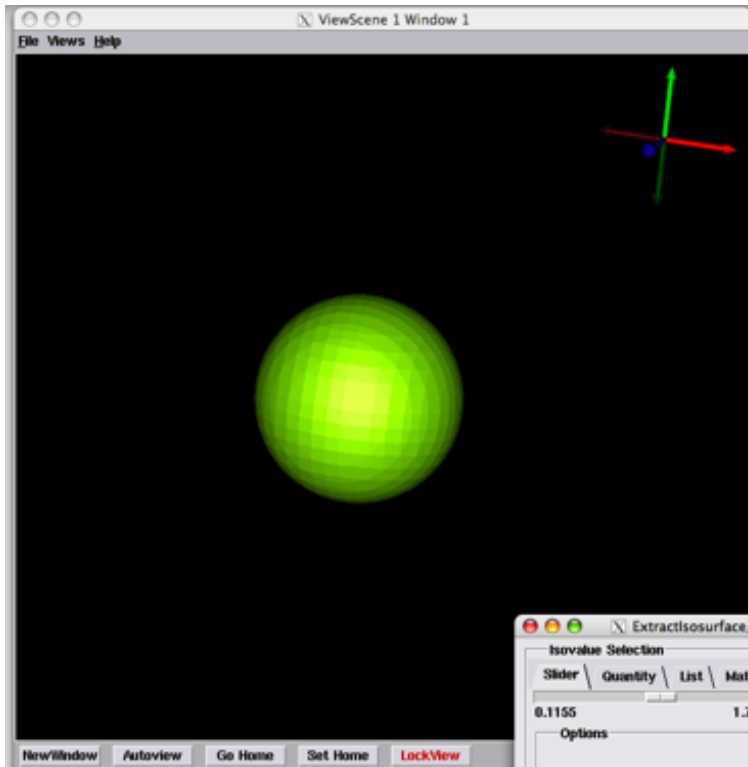


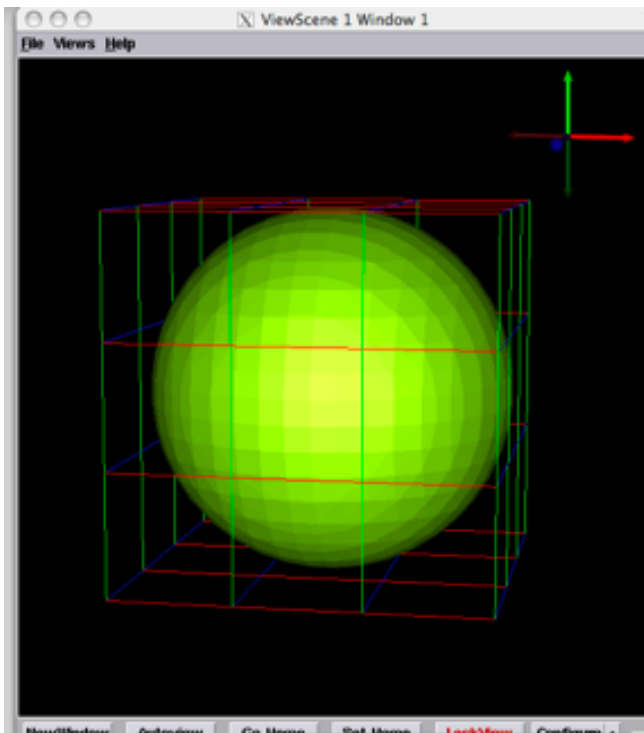


The screenshot displays the SCIRun v4.0 (revision 4265-4) interface. It consists of several windows:

- ViewScene 1 Window 1:** A 3D visualization window showing a dark scene with a small blue cube and a 3D coordinate system (red, green, blue axes).
- ExtractIsoSurface_0:** A configuration window for the ExtractIsoSurface module. It includes:
 - Isovalue Selection:** A slider with tabs for Quantity, List, and Matrix. The current value is 0.1155, with a range from 1.7321 to 0.1155.
 - Options:** An "Update" dropdown set to "On Release".
 - Options (checkboxes):**
 - Build Output Field
 - Build Output Geometry
 - Enable Transparency (Geometry Only)
 - Default Color:** A color selection box.
 - Computation Method:**
 - Marching Cubes (Multi Threaded)
 - Marching Cubes (Single Threaded)
- Workflow Graph:** A graph showing the execution flow:
 - CreateLatVol (UI: 0.01)
 - CalculateFieldData (UI: 0.02)
 - CreateStandardColorMaps (UI: 0.00)
 - RescaleColorMap (UI: 0.02)
 - ExtractIsoSurface (UI: 0.01)
 - ViewScene (VIEW)
- Log Window:** A log window titled "Log for SCIRun_Visualization_ExtractIsoSurface_0 -- pid:" containing the following warning:


```
WARNING: (SCIRun_Visualization_ExtractIsoSurface_0) Typed isovalue 0 was out of range. Using isovalue 0.1155 instead
```





Extractisosurface_0

Isovalue Selection

Slider | Quantity | List | Matrix |

0.1155 1.7321 0.9950

Options

Update: On Release

Options

- Build Output Field
- Build Output Geometry
- Enable Transparency (Geometry Only)

Default Color: []

Computation Method

- Marching Cubes (Multi Threaded)
- Marching Cubes (Single Threaded)

? Execute Close Find

SCIRun

Show Module: createlatvol SCIRun v4.0 (revision 42654)

File Modules Subsets Help

CreateLatVol UI: 0.00 ? |

CalculateFieldData UI: 0.01 ? |

CreateStandardColorMaps UI: 0.02 ? |

RescaleColorMap UI: 0.03 ? |

ShowMeshBoundingBox UI: 0.00 ? |

Extractisosurface UI: 0.04 ? |

ViewScene VIEW ? |

ShowMeshBoundingBox_0

X Size: 4

Y Size: 4

Z Size: 4

? Execute Close Find

Execute All 7/7 < Configure >



Slice Field

Lab 3

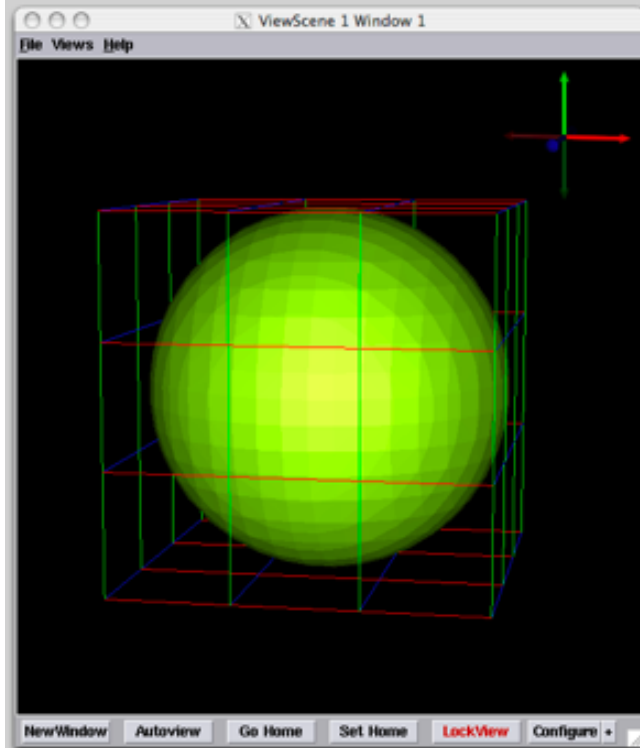
7. Connect

GetSliceFromStructuredFieldByIndices
to **CalculateFieldData**

8. Add **ShowField** module

9. Connect **RescaleColorMap** to **ShowField**

10. Execute network



SCIRun v4.0 (revision 42654)

File Modules Subnets Help Show Module: getslice

CreateLatVol UI 0.00

CalculateFieldData UI 0.01

CreateStandardColorMaps UI 0.02

RescaleColorMap UI 0.03

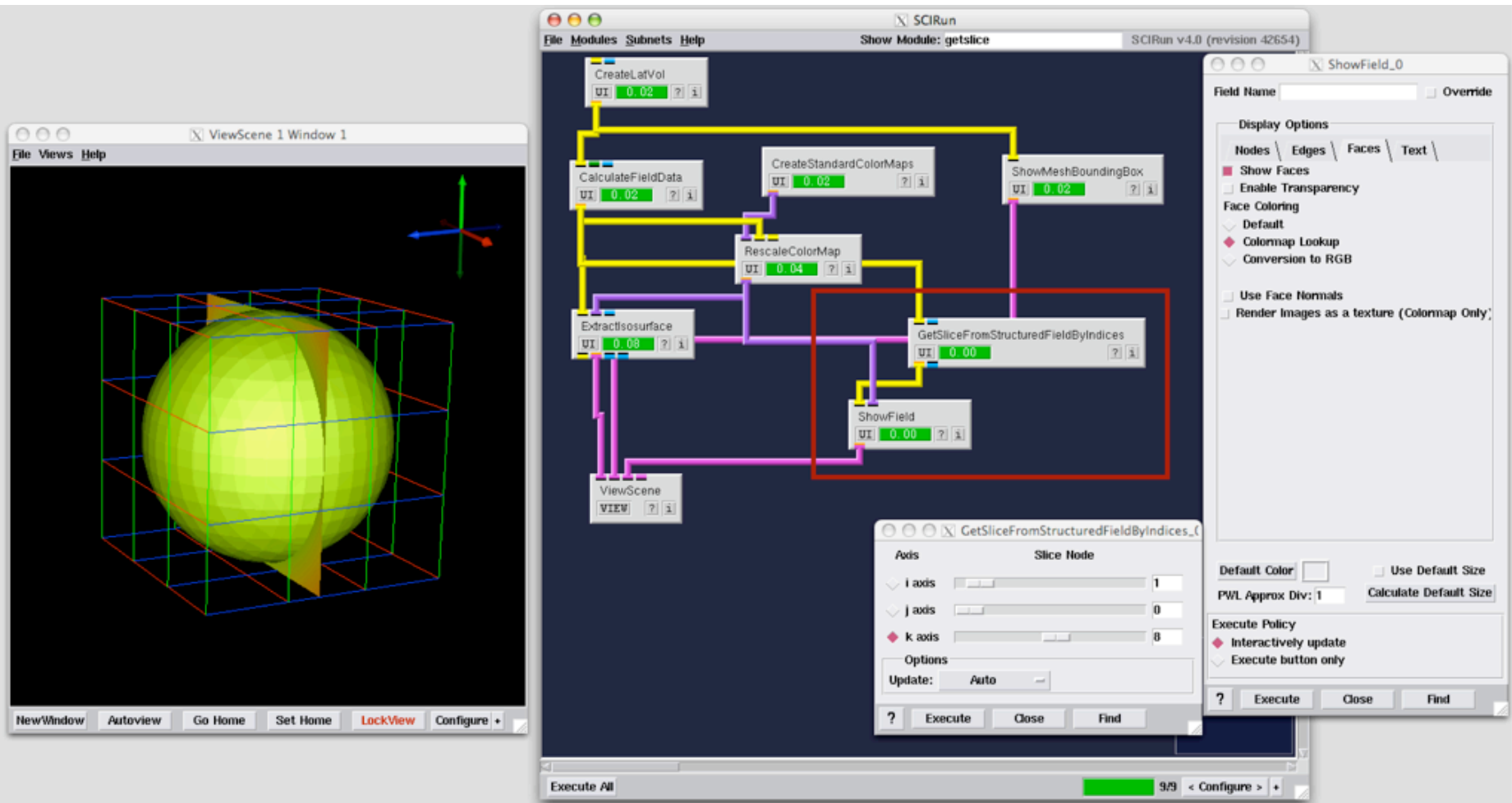
ShowMeshBoundingBox UI 0.00

ExtractIsosurface UI 0.04

ViewScene VIEW

Execute All

- SCIRun
- Bundle
- ChangeFieldData
- ChangeMesh
- Converters
- Data/Array/Math
- Data/O
- Field/Array
- FiniteElements
- Math
- Misc/Field
- New Field**
- Render
- SignalProcessing
- String
- Visualization
- BioPSE
- Data/O
- Forward
- Inverse
- LeadField
- Modeling
- NeuroFEM
- Visualization
- Teem
- Converters
- Data/O
- Misc
- Tend
- Unu/ToM
- Unu/ToZ
- MatlabInterface
- Data/O
- Interface
- Subnets
- ClipFieldByFunction
- ClipFieldByFunction2
- ClipFieldByFunction3
- ClipFieldByMesh
- ClipFieldToFieldOrWidget
- ClipFieldWithSeeds
- ClipLatVolByIndicesOrWidget
- ClipVolumeByIsovalue
- CollectFields
- ConvertMatricesToMesh
- CreateImage
- CreateLatVol
- CreateStructHex
- DecimateTriSurf
- ExtractIsosurfaceByFunction
- FairMesh
- GeneratePointSamplesFromField
- GeneratePointSamplesFromFieldOrWidget
- GenerateSinglePointProbeFromField
- GetAllSegmentationBoundaries
- GetCentroidsFromMesh
- GetDomainBoundary
- GetDomainStructure
- GetFieldBoundary
- GetSliceFromStructuredFieldByIndices**
- InsertHexVolSheetAlongSurface
- InterfaceWithCubit
- InterfaceWithTetGen
- JoinFields
- MatchDomainLabels
- MergeFields
- MergeTriSurfs
- RefineMesh
- RemoveHexVolSheet
- SplitFieldByConnectedRegion
- SplitFieldByDomain
- SplitNodesByDomain



Clip Volume

Lab 3

11. Convert LatVol to unstructured mesh using **ConvertMeshToUnstructuredMesh**

12. Clip volume subset:

- Connect **ClipFieldByFunction** to **ConvertMeshToUnstructuredMesh**
- Expression:

DATA > 1 && X < 0

SCIRun v4.0 (revision 42654)

File Modules Subnets Help Show Module:

CreateLatVol UI 0.02 ? i

CalculateFieldData UI 0.02 ? i

CreateStandardColorMaps UI 0.02 ? i

ShowMeshBoundingBox UI 0.02 ? i

RescaleColorMap UI 0.04 ? i

Align MeshBoundingBoxes

Calculate MeshNodes

Cleanup TetMesh

Convert HexVolToTetVol

Convert MeshCoordinateSystem

Convert MeshToIrregularMesh

Convert MeshToPointCloud

Convert MeshToUnstructuredMesh

Convert QuadSurfToTriSurf

Edit MeshBoundingBox

Generate PolarProjection

Project PointsOntoMesh

Remove UnusedNodes

Resample RegularMesh

Scale FieldMeshAndData

Smooth Mesh

Swap NodeLocationsWithMatrixEntries

Transform MeshWithTransform

Transform PlanarMesh

dFieldByIndices ? i

Port Caching

SCIRun

Bundle

ChangeFieldData

ChangeMesh

DataIO

FieldArray

FiniteElements

MiscField

NewField

Visualization

BioPSE

Forward

Inverse

LeadField

Modeling

NeuroFEM

Visualization

Teem

Converters

Tend

MatlabInterface

DataIO

Interface

Execute All 9/9 < Configure > +

Extract Boundary

Lab 3

13. Use **GetFieldBoundary** to get boundary surface
14. Use **ApplyMappingMatrix** modules (create 2) to map field onto boundary surface
15. Visualize field

ClipFieldByFunction_0
Create Clipping Expression

Function: expression(DATA,A,B,C,...)

Input array: DATA (scalar/vector/tensor: data from field port) Input array: INDEX (scalar: number of the element)
 Input array: X, Y, Z (scalar: Cartesian coordinates of node/element) Input array: SIZE (scalar: number of elements)
 Input array: POS (vector: vector with node/element position) Input array: ELEMENT (element: object containing element properties)
 Input array: A, B, C, ... (scalar/vector/tensor: data from matrix ports)

Expression

DATA > 1 && X < 0

Clipping location
 Element Center One Node Most Nodes All Nodes

Parser Help

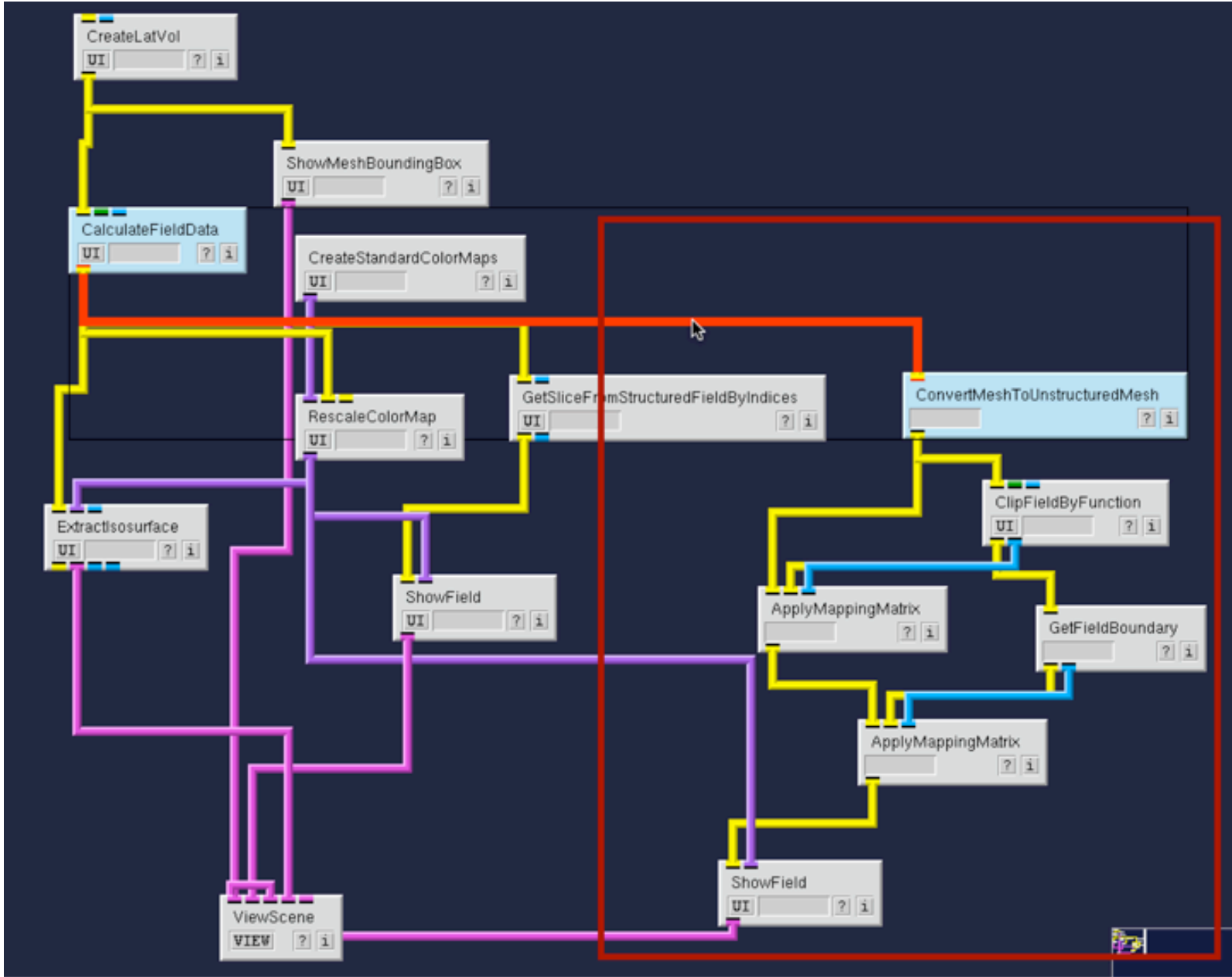
? Execute Close Find

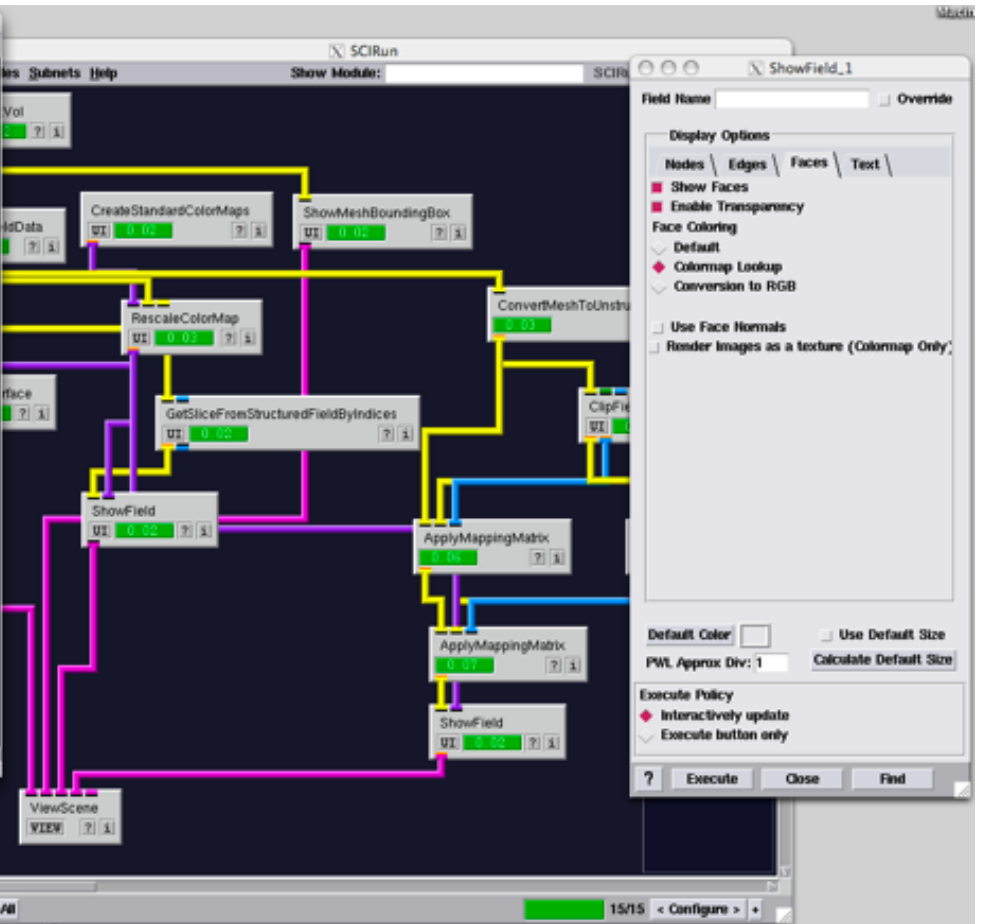
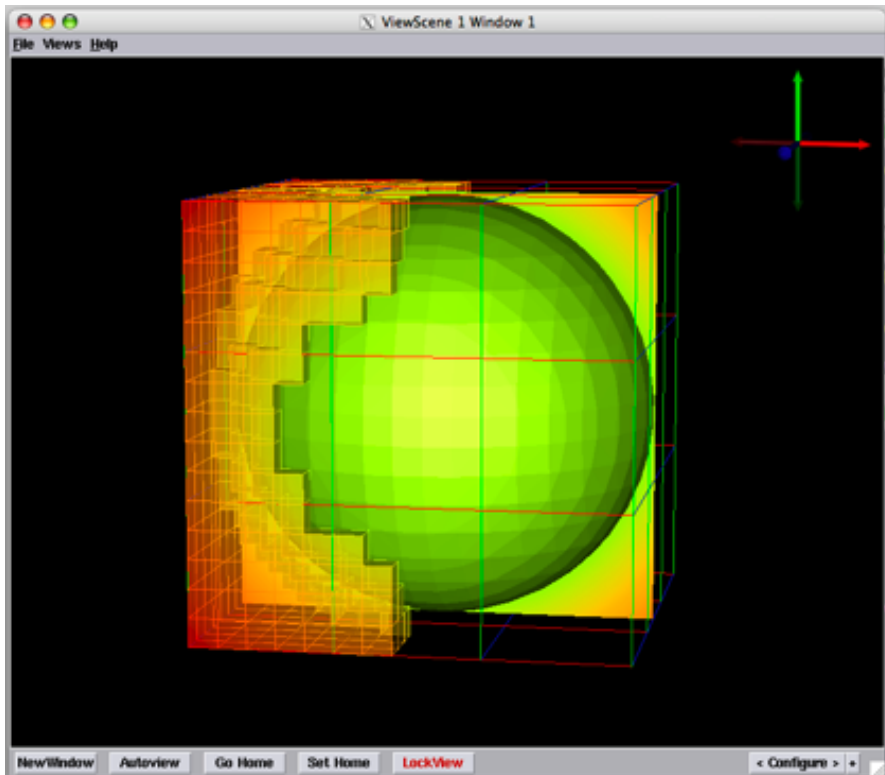
SCIRun v4.0 (revision 42654)

File Modules Subnets Help Show Module:

Execute All 9/9 < Configure >







Field Name: Override

Display Options

- Nodes | Edges | Faces | Text |
- Show Faces
- Enable Transparency
- Face Coloring
 - Default
 - Colormap Lookup
 - Conversion to RGB
- Use Face Normals
- Render Images as a texture (Colormap Only)

Default Color: Use Default Size

PWL Approx Div: 1 Calculate Default Size

Execute Policy

- Interactively update
- Execute button only

? Execute Close Find

ClipFieldByFunction_0

Create Clipping Expression

Function: expression(DATA,A,B,C,...)

Input array: DATA (scalar/vector/tensor: data from field port) Input array: INDEX (scalar: number of the element)

Input array: X, Y, Z (scalar: Cartesian coordinates of node/element) Input array: SIZE (scalar: number of elements)

Input array: POS (vector: vector with node/element position) Input array: ELEMENT (element: object containing elements)

Input array: A, B, C, ... (scalar/vector/tensor: data from matrix parts)

Expression

DATA > 1 && X < 0

Clipping location

Element Center One Node Most Nodes All Nodes

Parser Help

? Execute Close Find

