

SCIRun Visualization Basics

Part 1

Setup from Flash Stick

Lab 3

1. Unzip the SCIRun zip file on Desktop

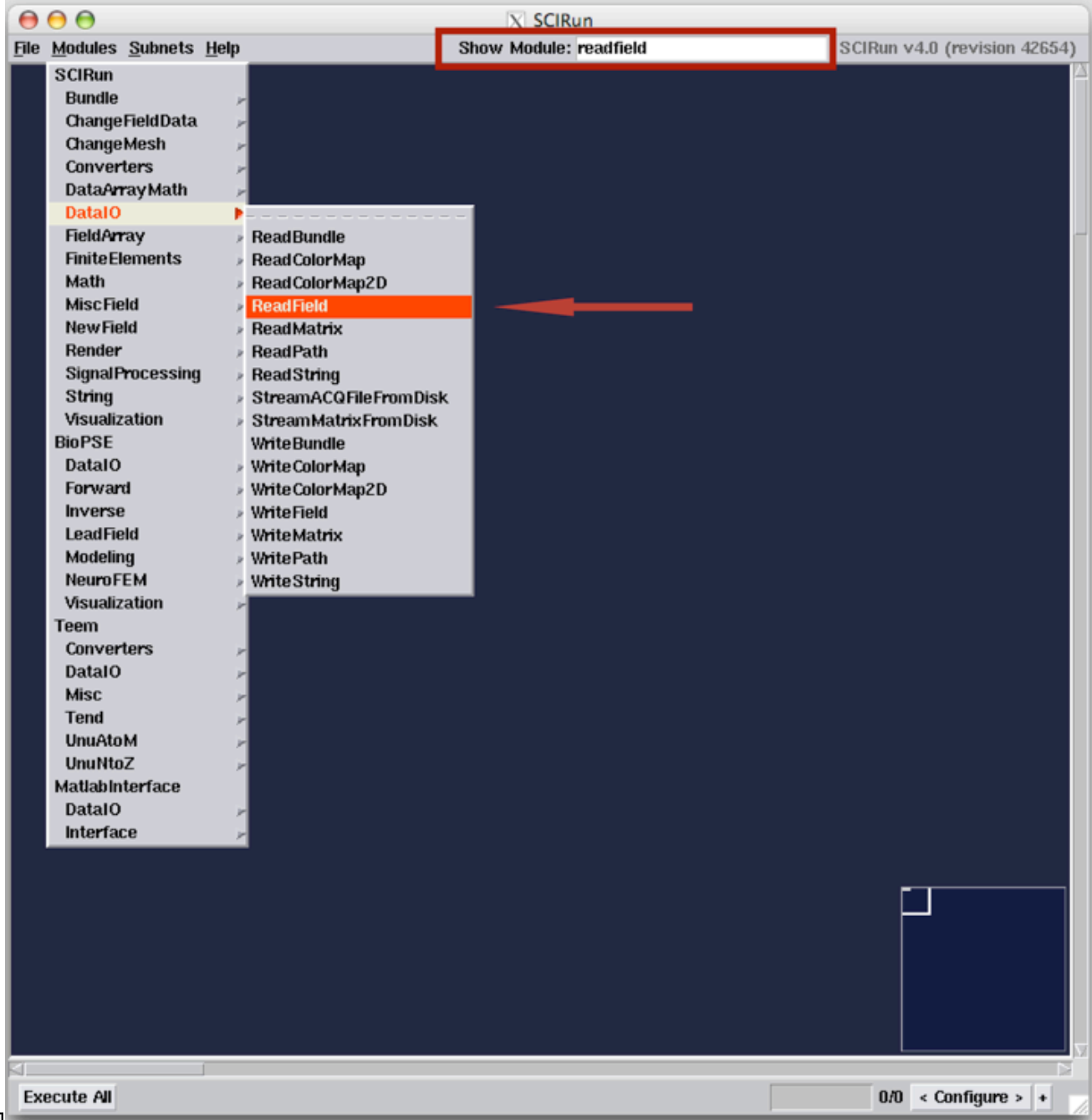
2. Start SCIRun

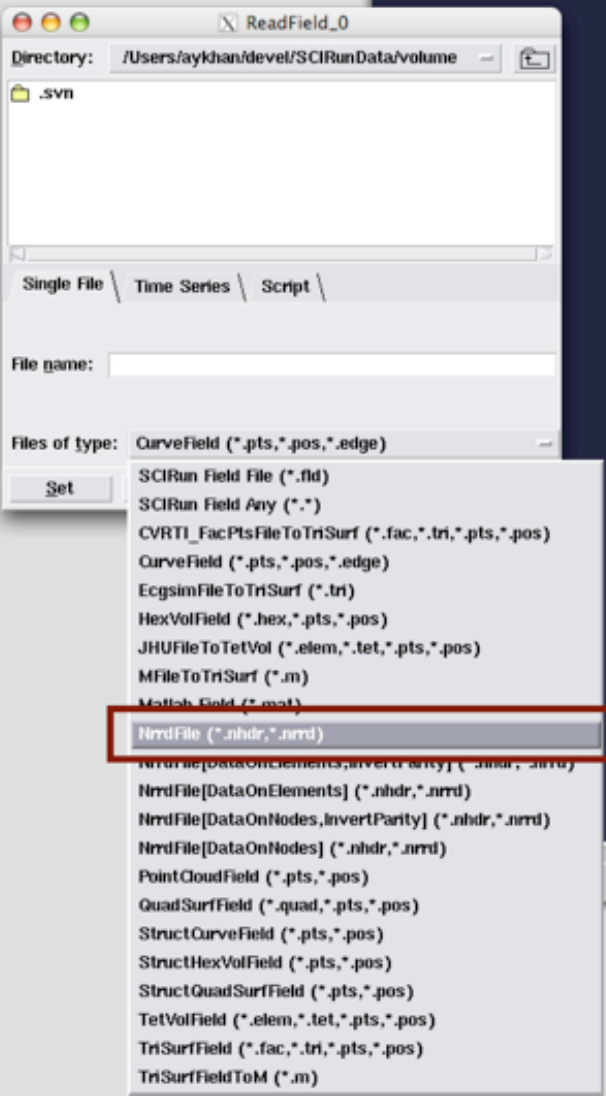
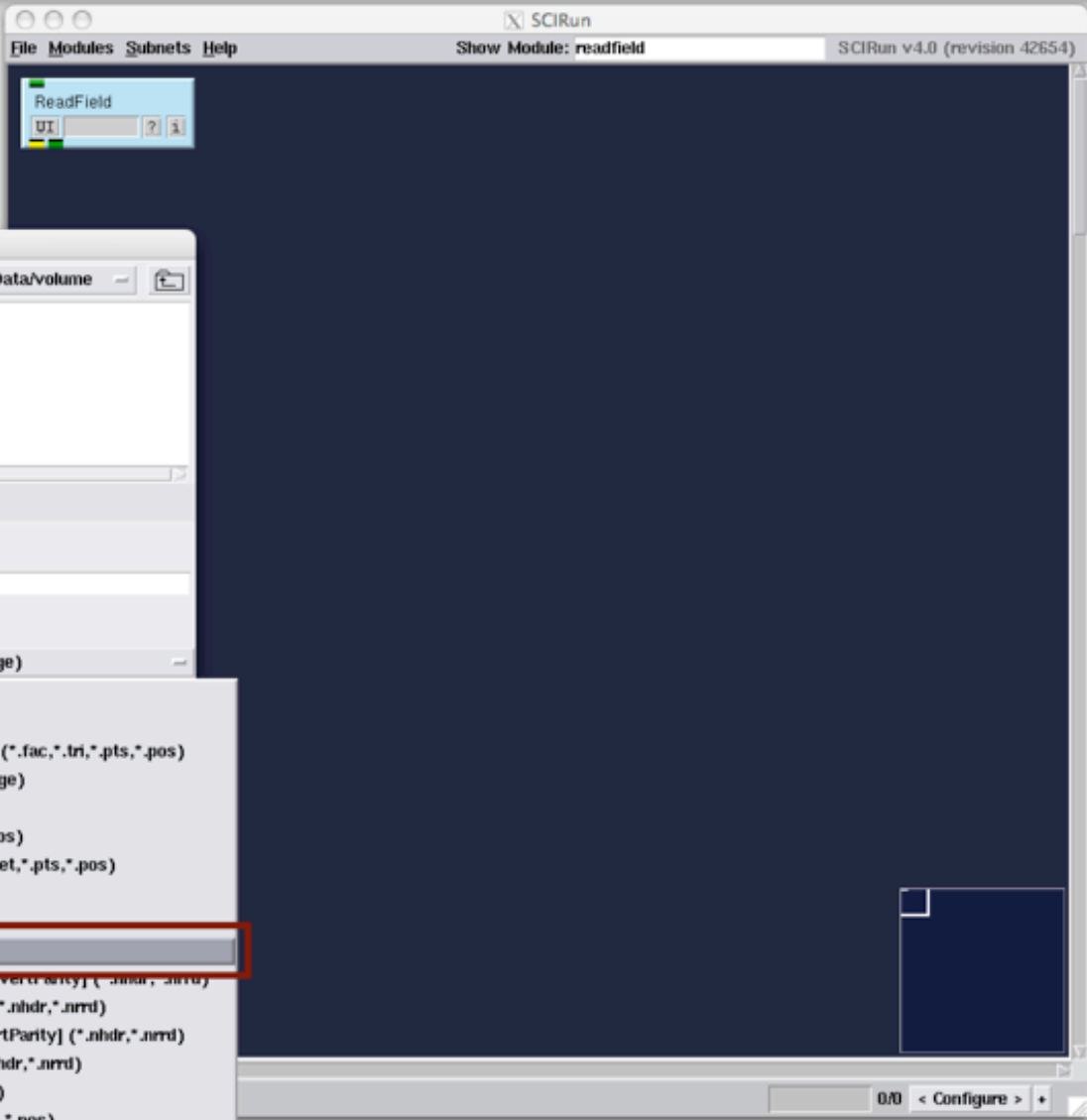
- **Windows**
 - Run installer
- **OS X**
 - Open DMG

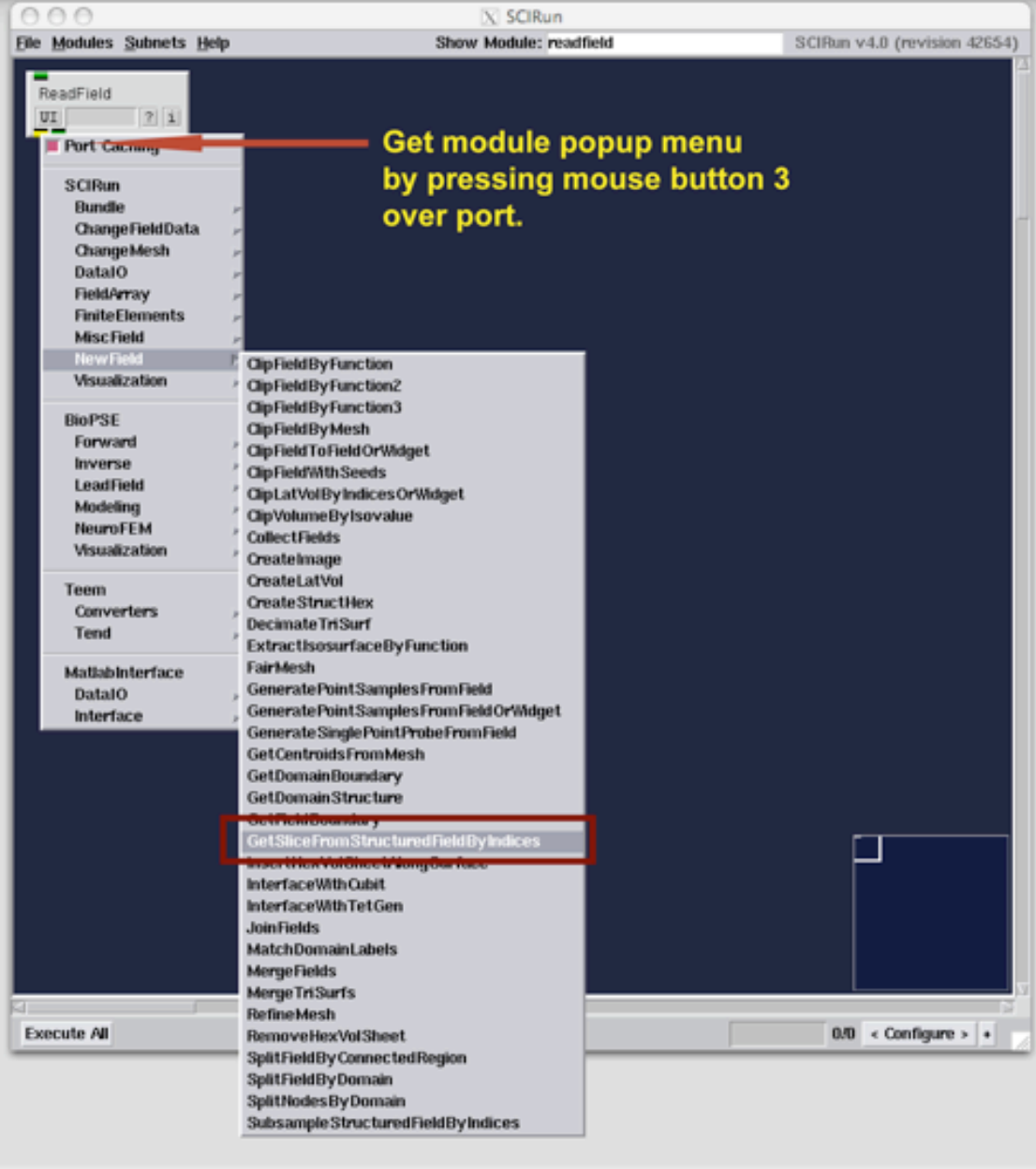
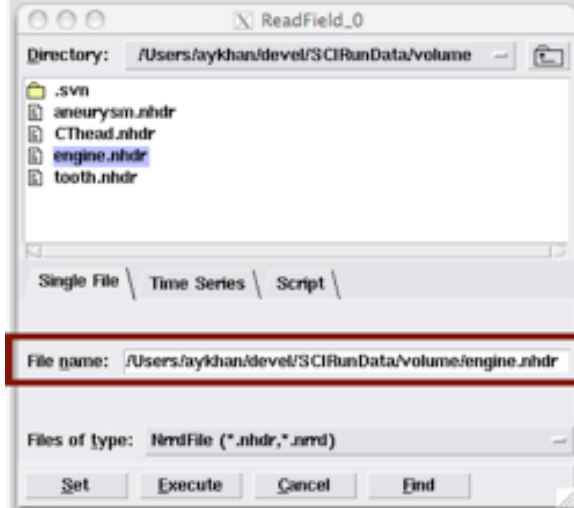
Read Dataset

Lab 3

1. Add **ReadField** module
2. Read Nrrd files
3. Read SCIRunData file **volume/
engine.nhdr**







Slice, Visualize Field

Lab 3

5. Slice field

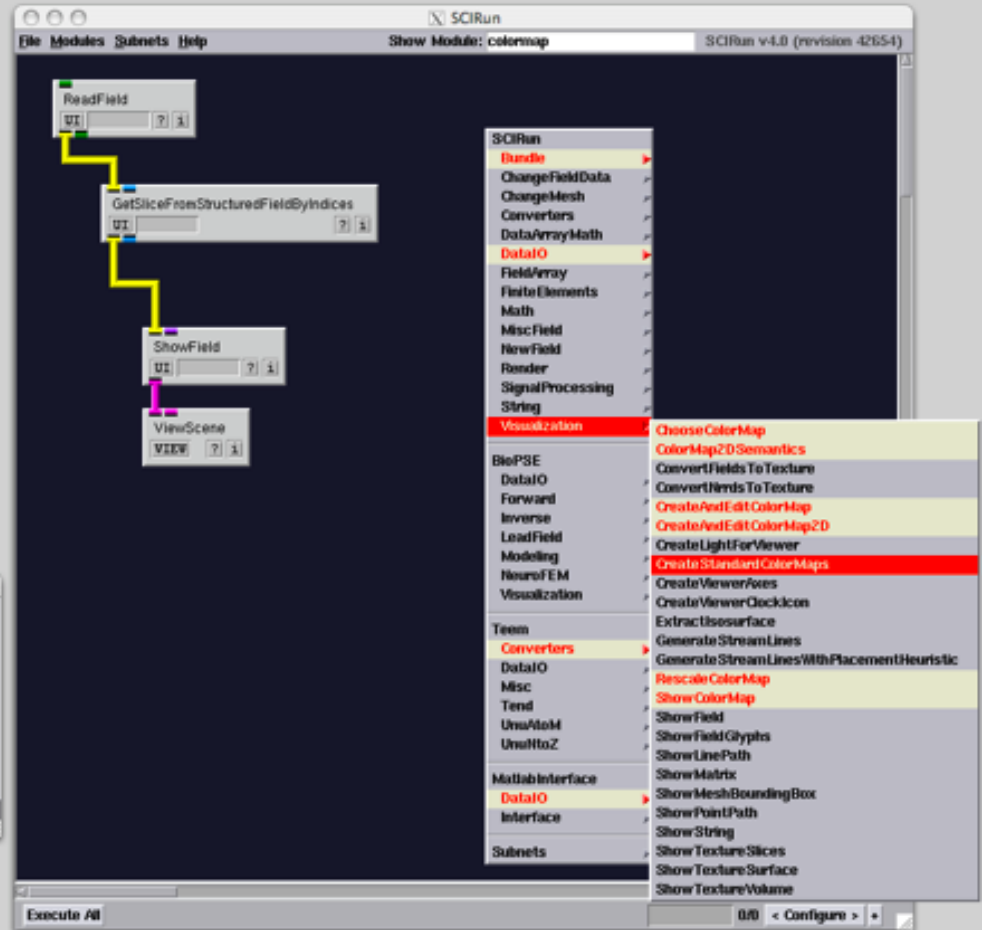
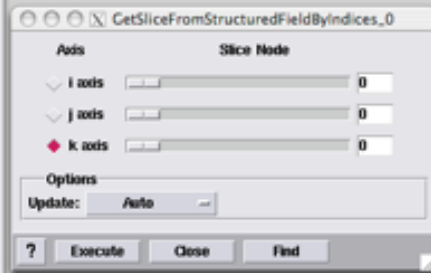
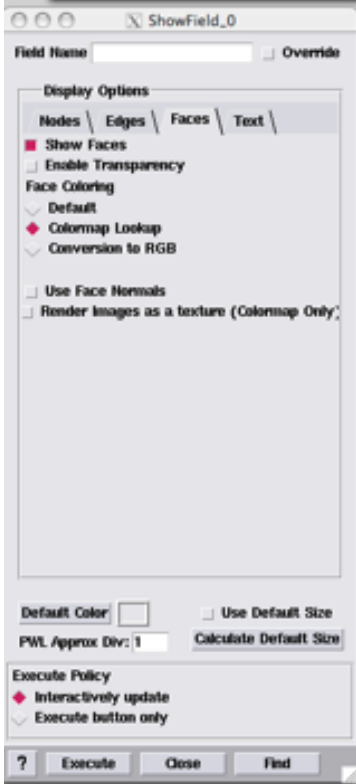
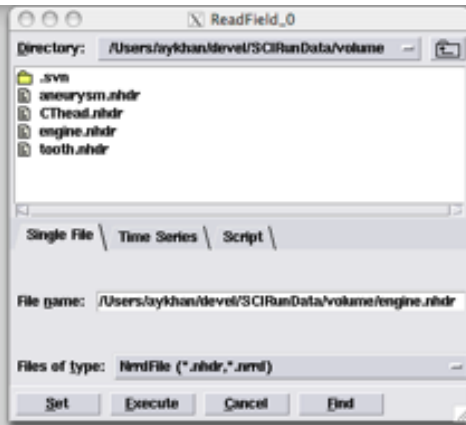
- Connect **GetSlicesFromStructuredFieldByIndices** module to **ReadField**

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)

Three configuration windows are open:

- ReadField_0**: Shows the file path `/Users/aykhan/level/SCIRunData/volume/engine.nhdr` and file type `NrrdFile (*.nhdr,*.nrrd)`.
- ShowField_0**: Contains display options such as **Show Faces**, **Enable Transparency**, **Face Coloring**, and **Use Face Normals**.
- GetSliceFromStructuredFieldByIndices_0**: Shows axis selection (i, j, k) and slice node settings.

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

The image displays the SCIRun v4.0 (revision 42654) interface. The main workspace contains a pipeline of nodes: ReadField (UI: 0.00), GetSliceFromStructuredFieldByIndices (UI: 0.01), RescaleColorMap (UI: 0.01), CreateStandardColorMaps (UI: 0.01), and ShowField (UI: 0.01). A ViewScene node (UI: VIEW) is connected to the ShowField node. A configuration window for 'GetSliceFromStructuredFieldByIndices_0' is open, showing the 'k axis' set to 49. The ViewScene window displays a 3D visualization of a complex, multi-colored structure, likely a brain slice, with a coordinate system (red, green, blue axes) overlaid. The ViewScene window has a toolbar with buttons for NewWindow, Autoview, Go Home, Set Home, LockView, and a Configure button.

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)

Show Module: boundingBox

File Modules Subnets Help

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

ShowMeshBoundingBox_0

X Size 2

Y Size 2

Z Size 2

? Execute Close Find

Execute All 6/6 < Configure > +

The image displays the SCIRun v4.0 (revision 42654) software interface. On the left, a window titled "ViewScene 1 Window 1" shows a 3D visualization of a field. The field is represented as a colored volume within a bounding box, with colors ranging from blue (low values) to red (high values). A red U-shaped region is highlighted within the field. The window includes a coordinate system with red, green, and blue axes and a toolbar with buttons for "NewWindow", "Autoview", "Go Home", "Set Home", "LockView", and a "Configure" dropdown.

On the right, the main SCIRun window shows a node-based workflow for visualizing the field. The workflow consists of the following nodes connected by colored lines:

- ReadField**: UI 0.00
- GetSliceFromStructuredFieldByIndices**: UI 0.00
- CreateStandardColorMaps**: UI 0.01
- RescaleColorMap**: UI 0.01
- ShowField**: UI 0.00
- ShowMeshBoundingBox**: UI 0.00
- ViewScene**: VIEW

A configuration window titled "ShowMeshBoundingBox_0" is open in the bottom right, showing settings for the bounding box size:

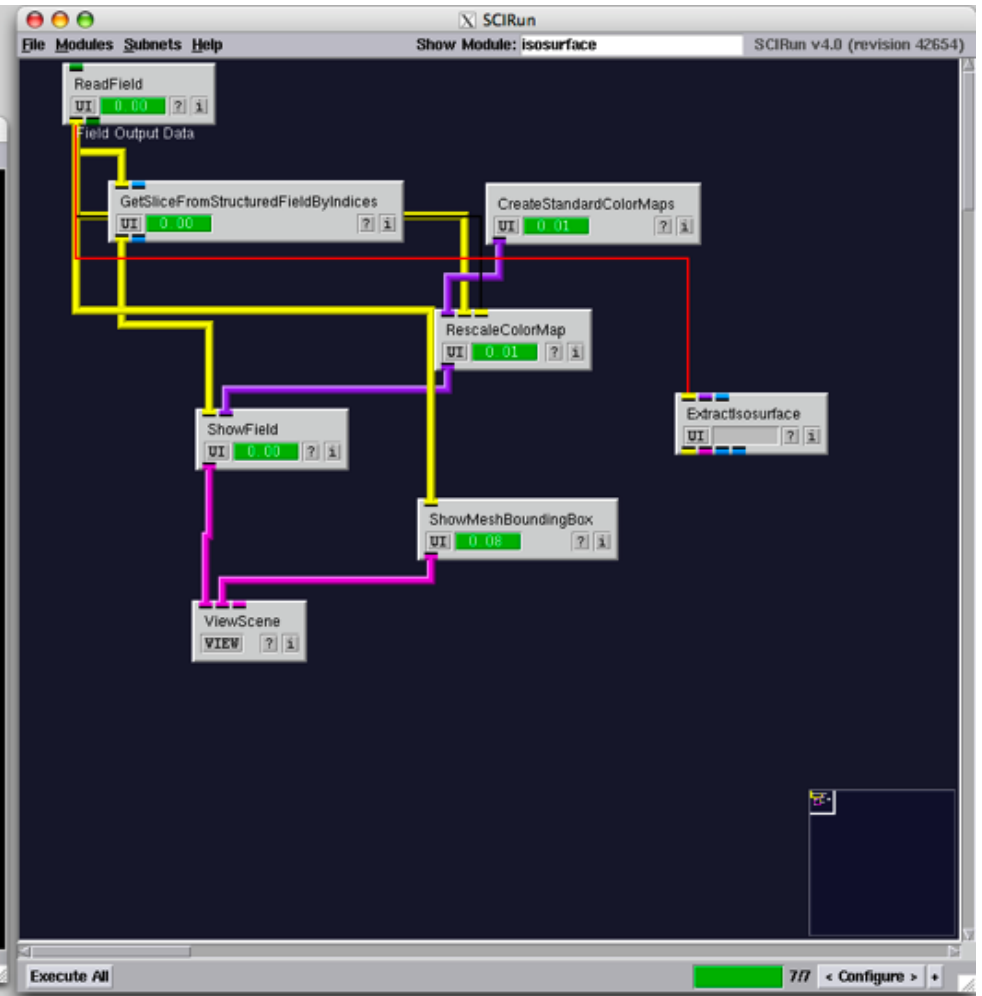
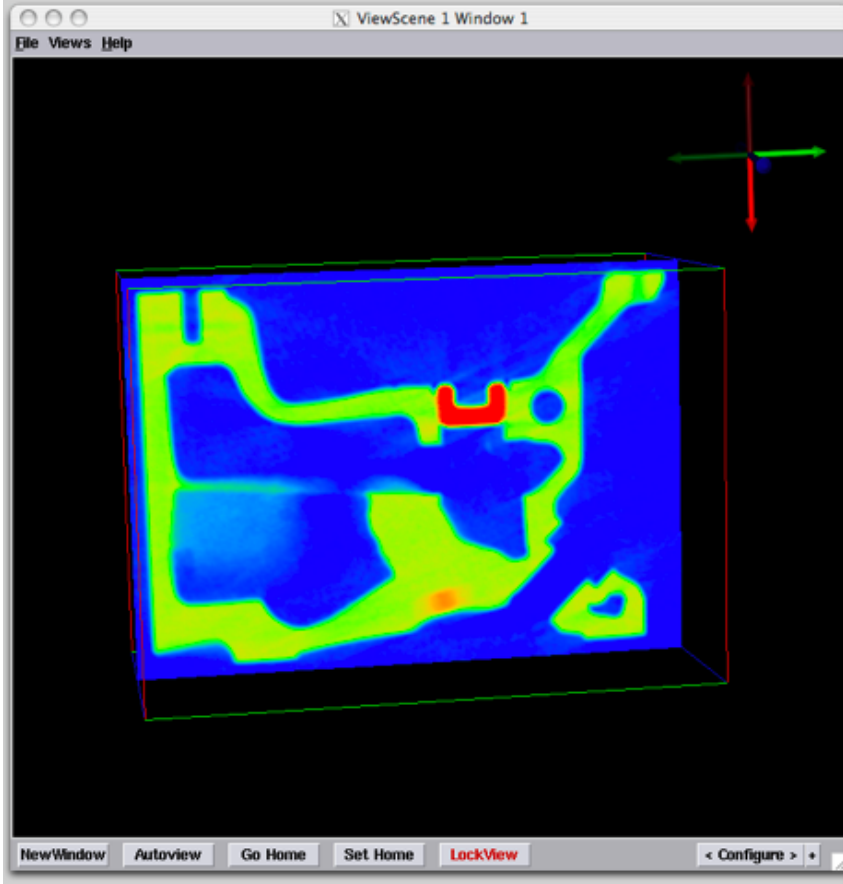
- X Size: 2
- Y Size: 2
- Z Size: 2

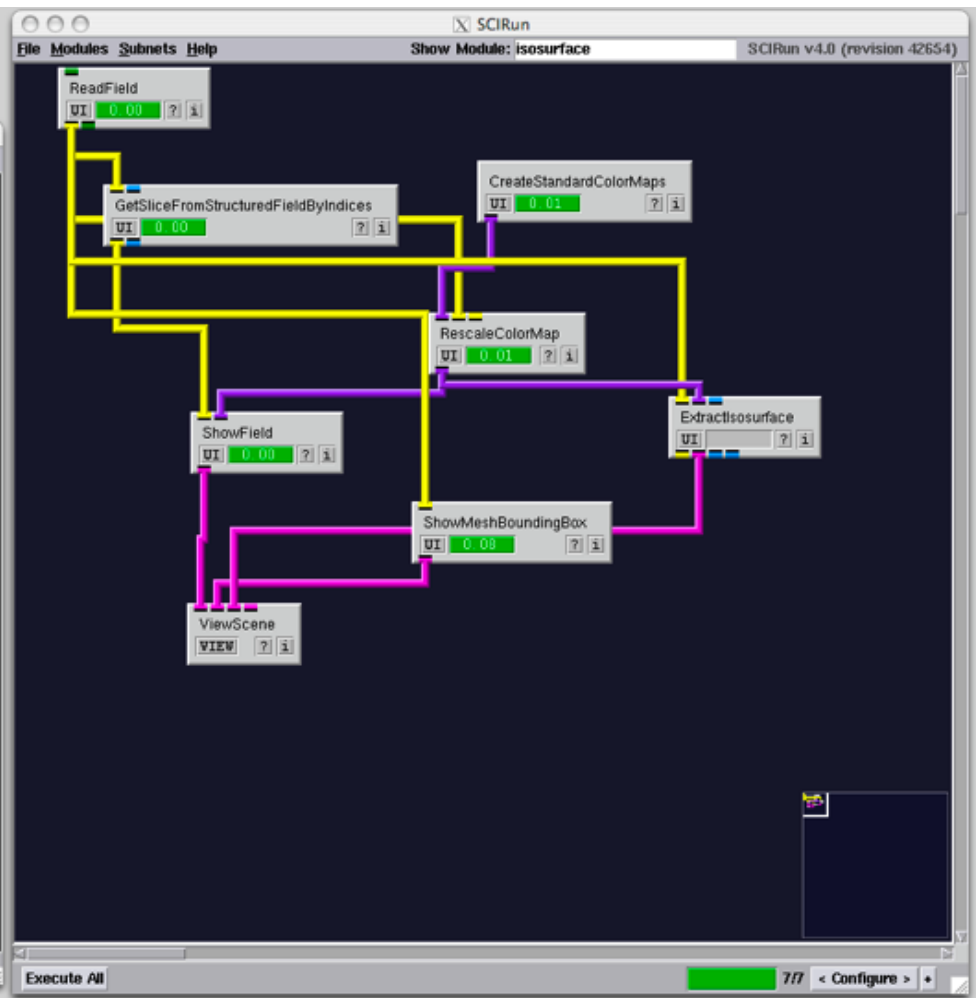
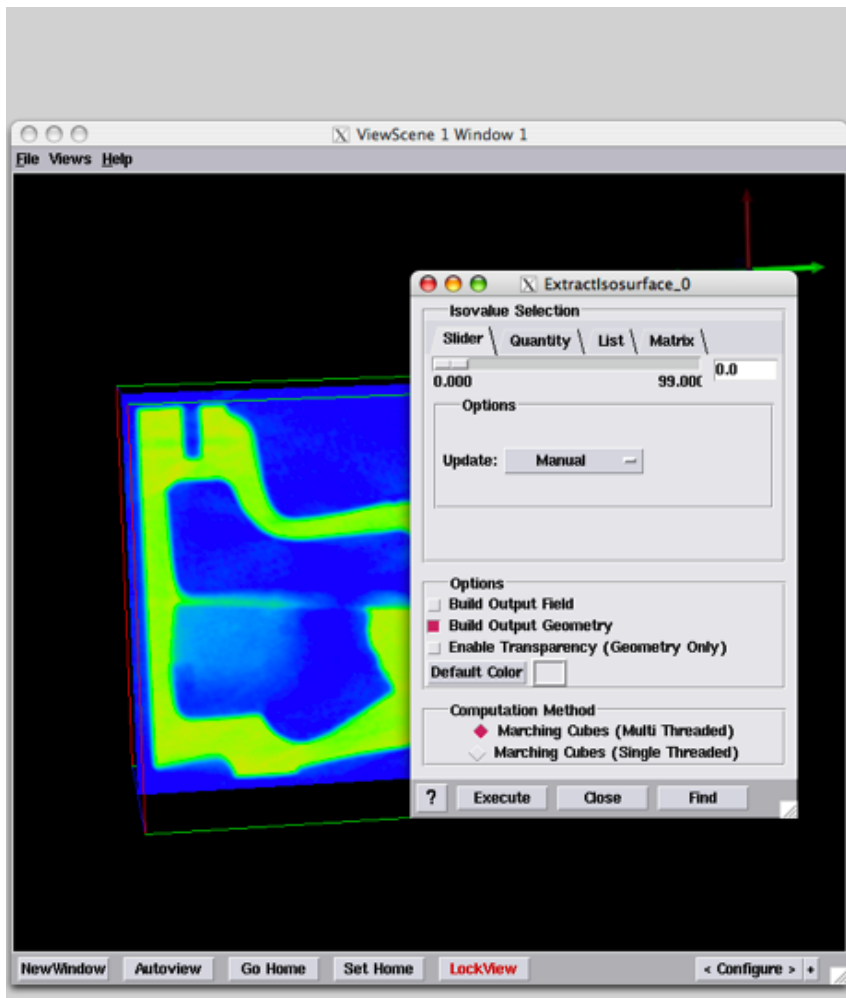
The configuration window also includes "Execute", "Close", and "Find" buttons. The main SCIRun window has a menu bar with "File", "Modules", "Subnets", and "Help", and a status bar at the bottom showing "7/7" and a "Configure" dropdown.

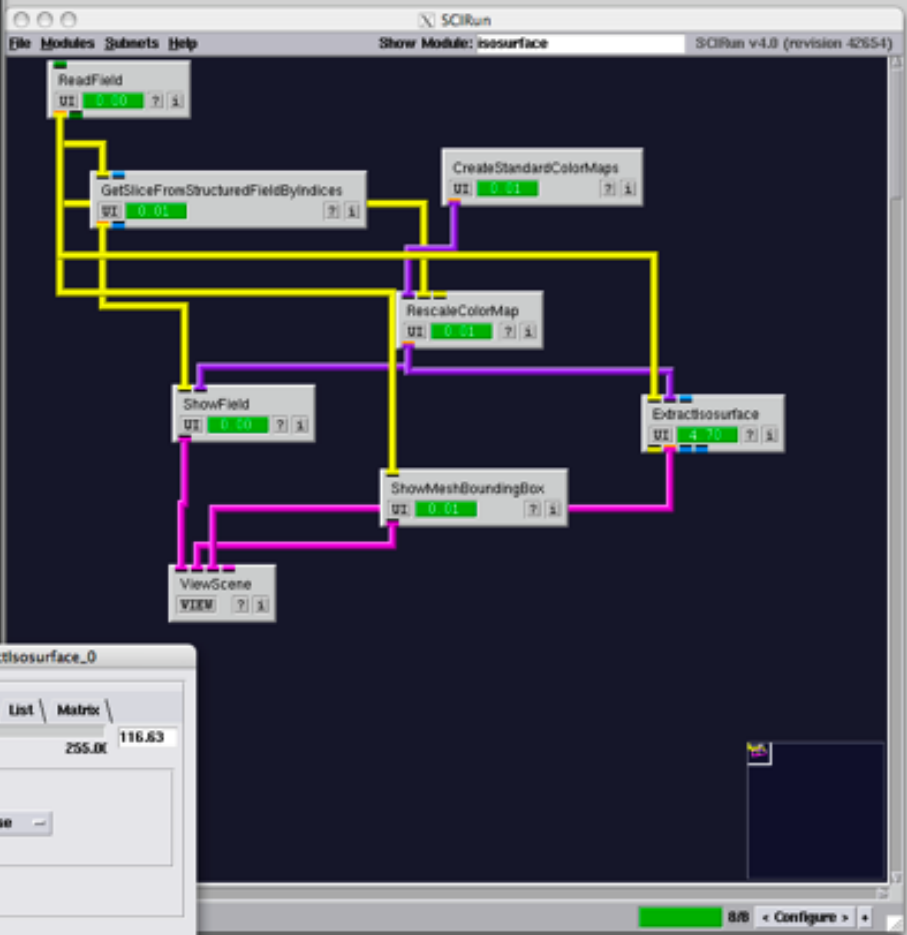
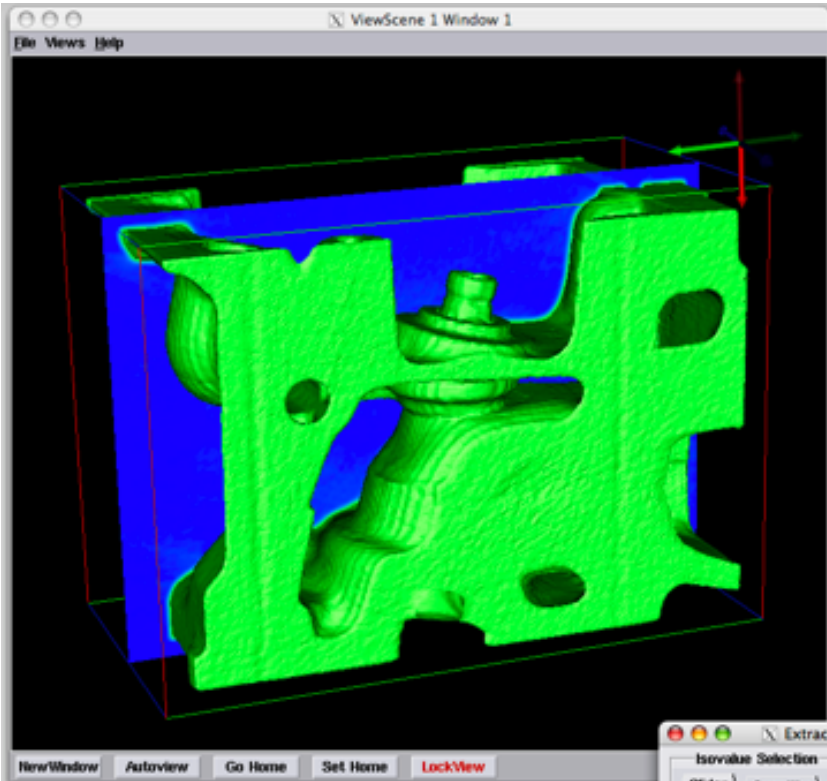
Isosurface

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

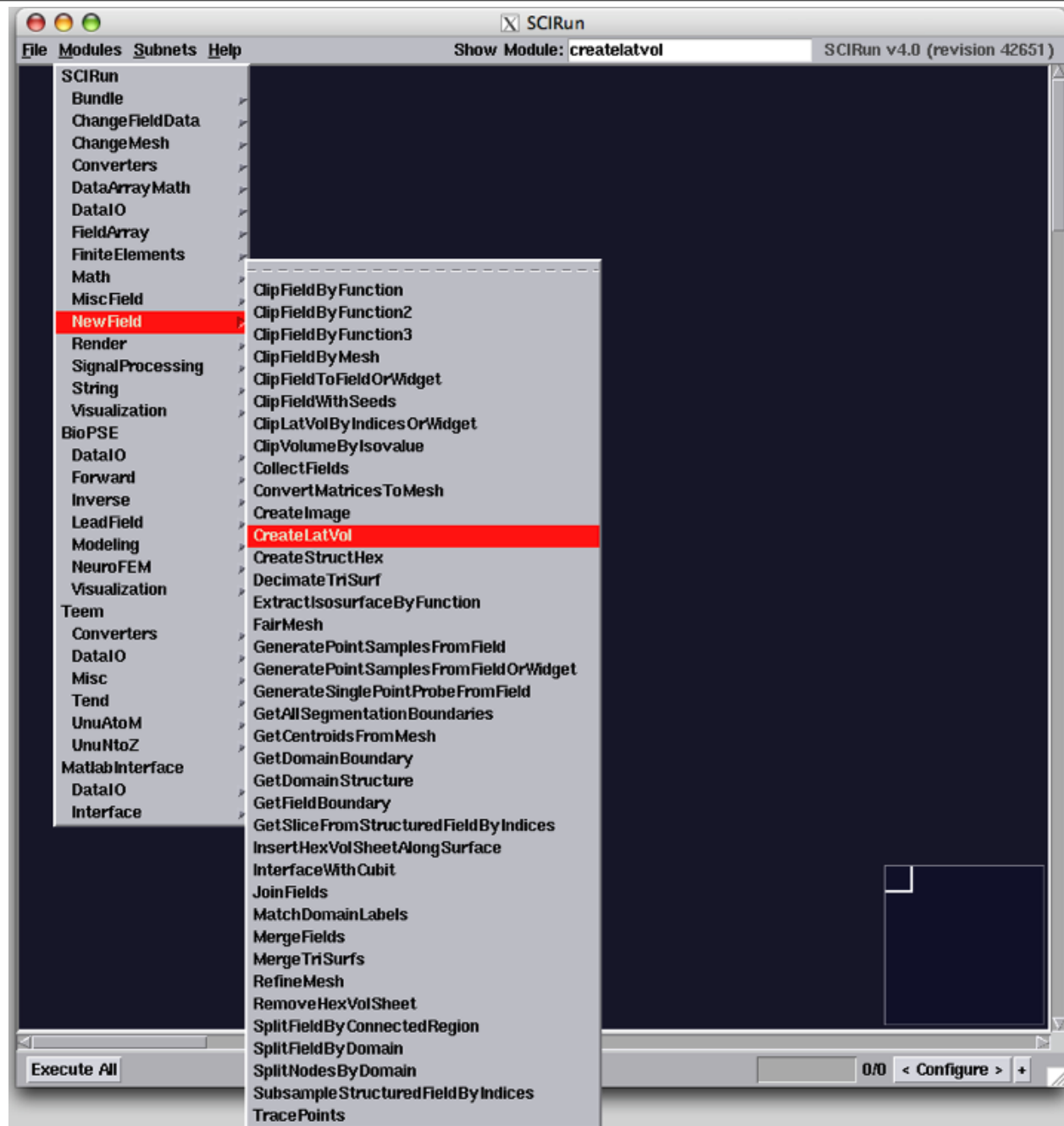
Part 2

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)



SCIRun v4.0 (revision 42654)

File Modules Subnets Help Show Module:

CreateLafVol
UI ?

CalculateFieldData2
UI ?

Execute All 0/0 < Configure >

CalculateFieldData2_0

Create New Field Data

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 Clear Cache

Output Data Type : Scalar

function

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

Parser Help

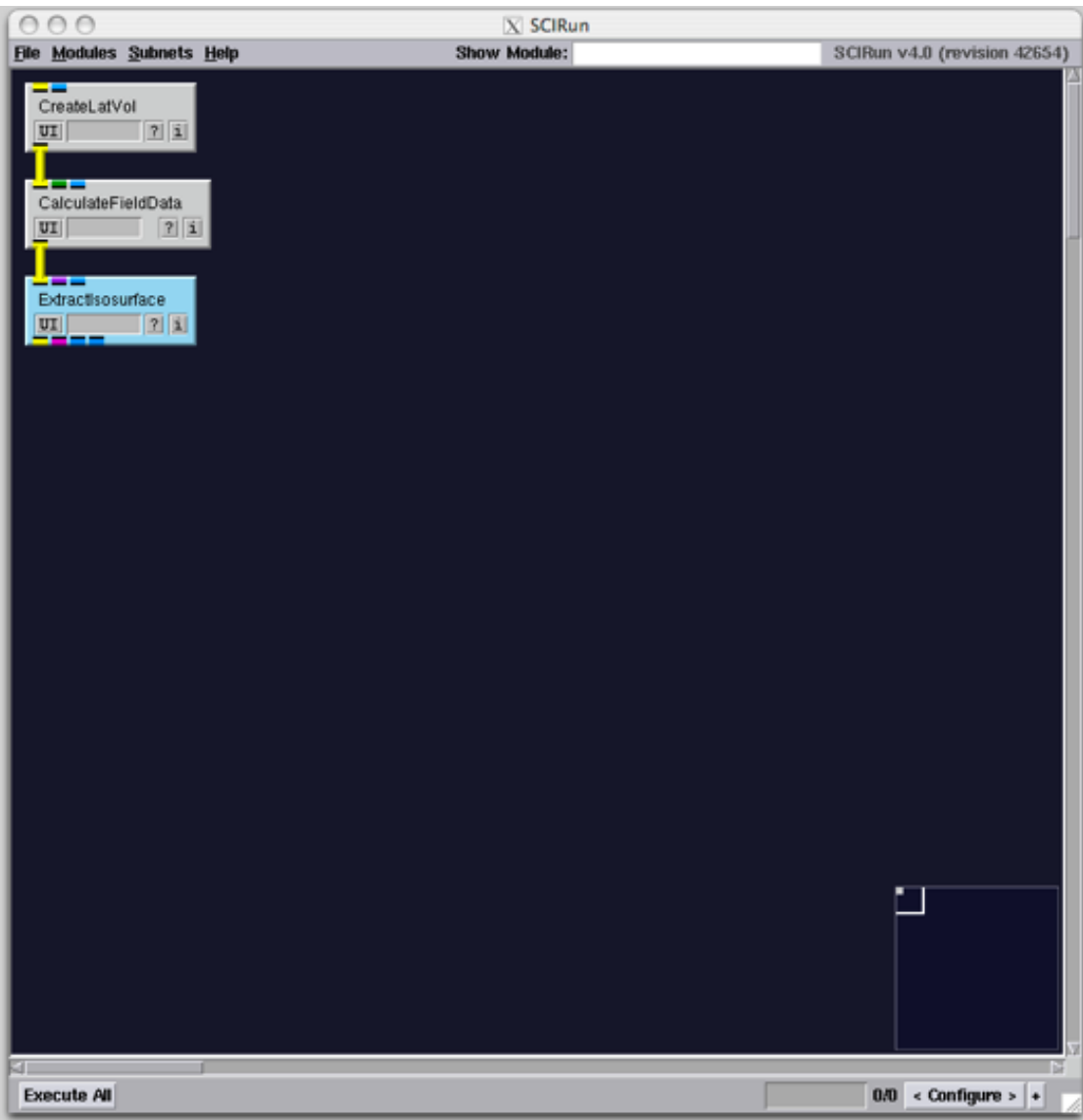
? Execute Close Find

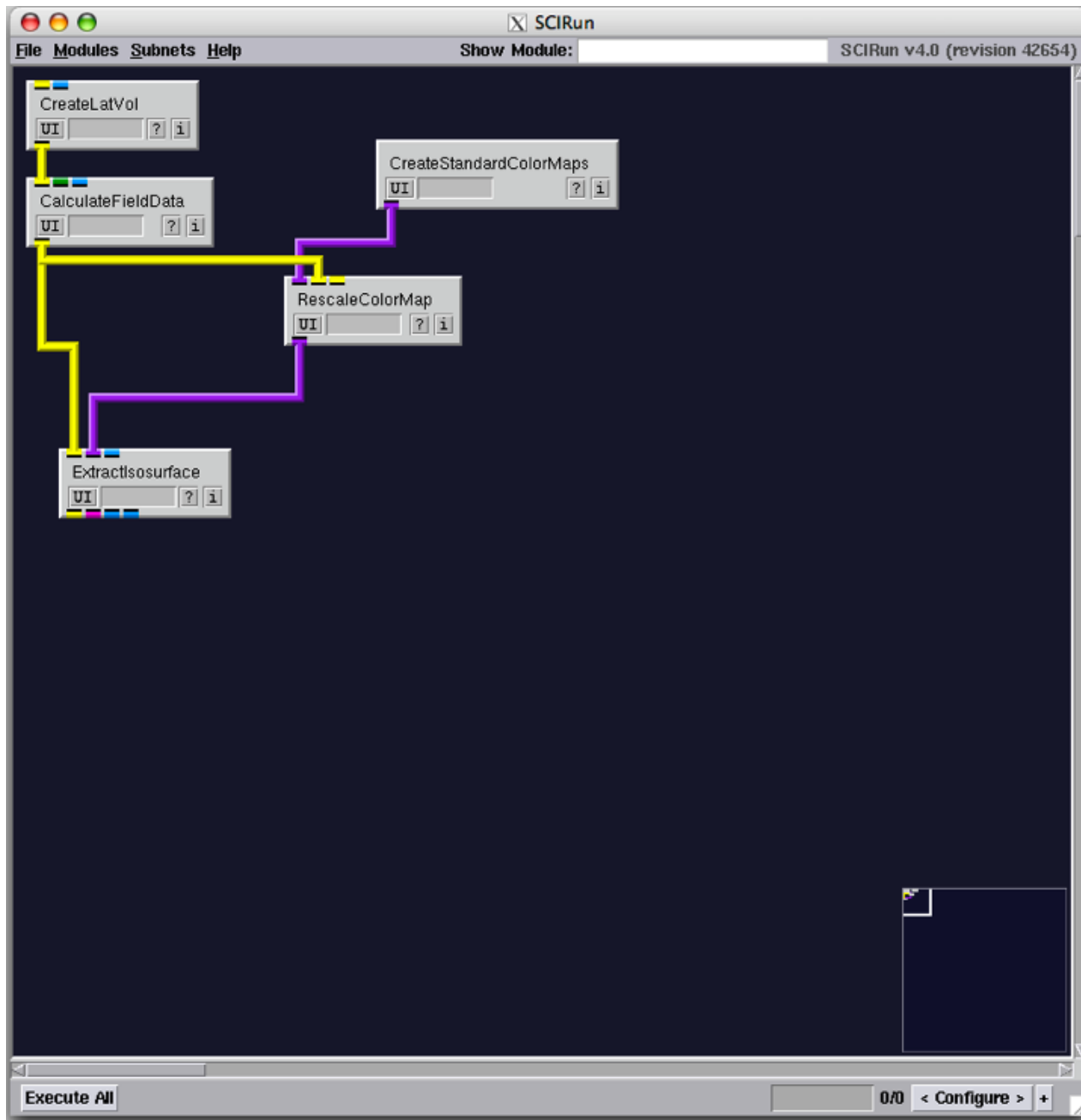


Visualize Isosurface

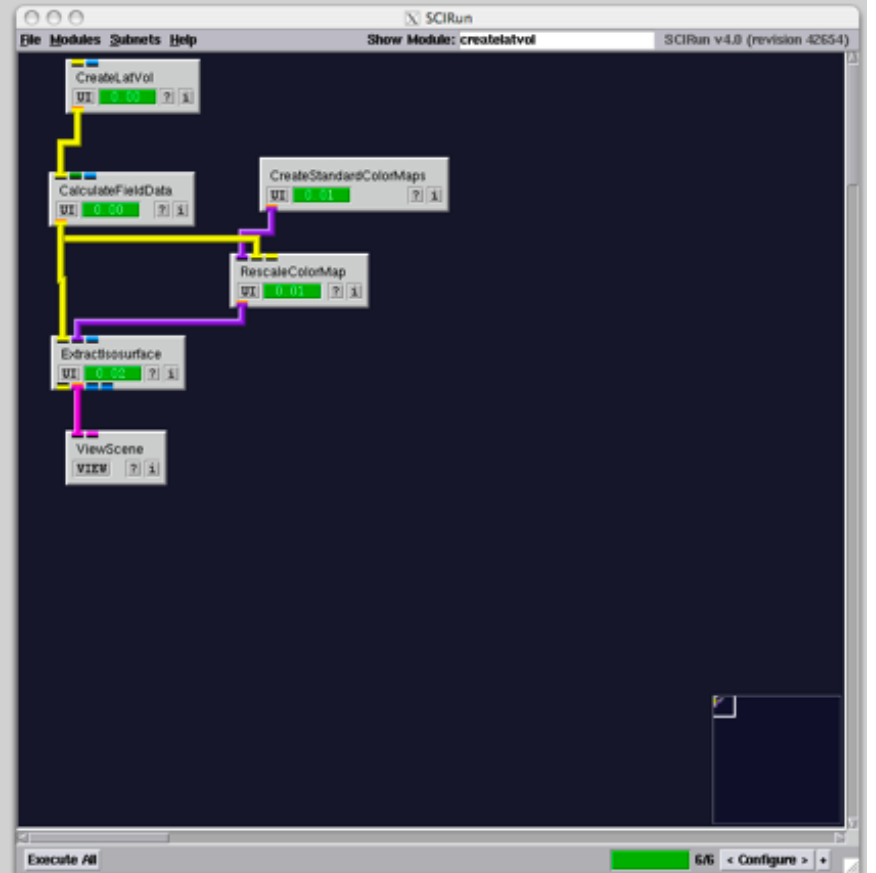
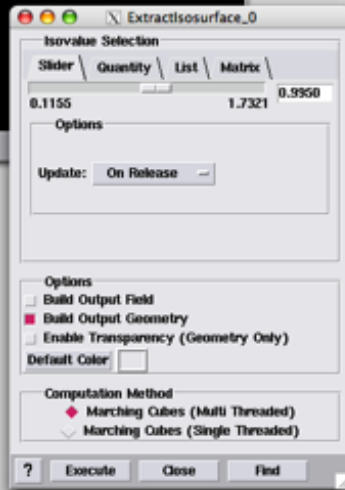
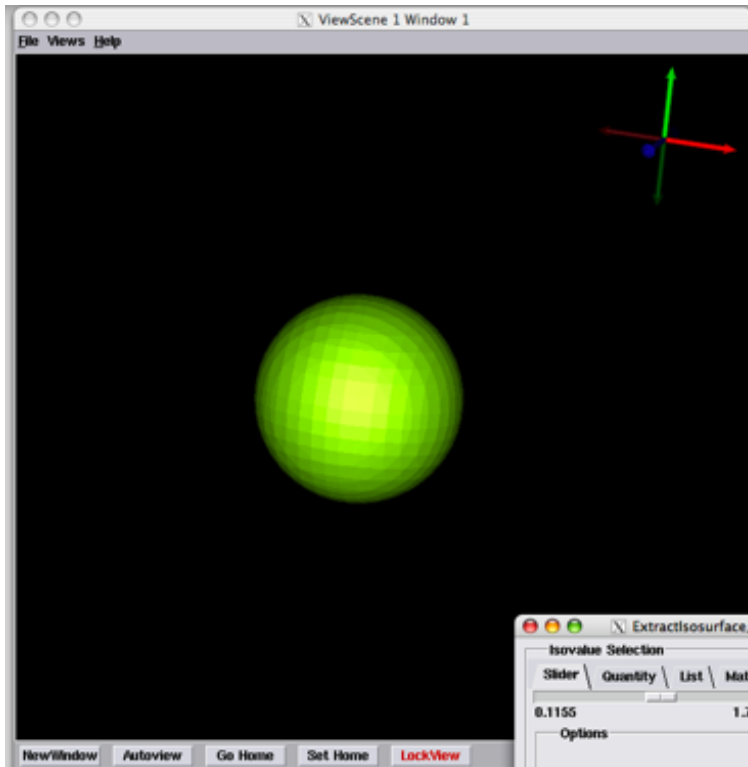
Lab 3

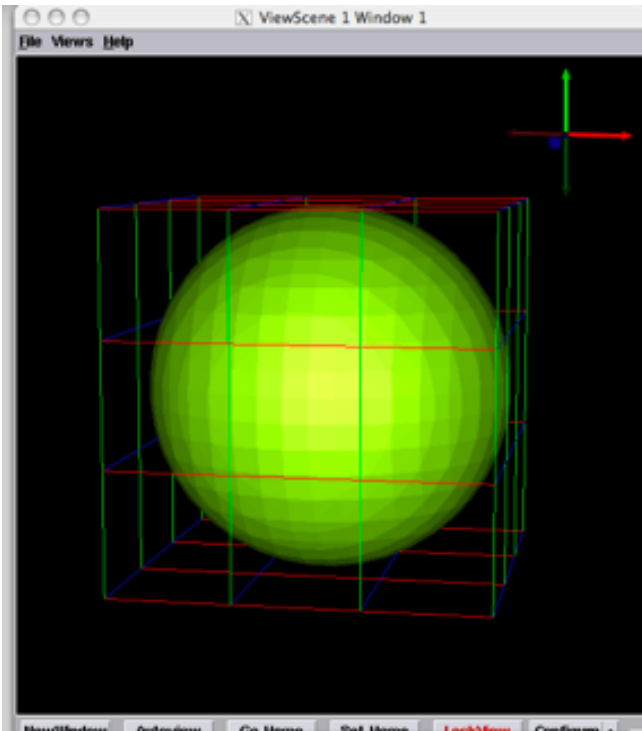
3. Connect **ExtractIsosurface** module to **CalculateFieldData**
4. Add **ColorMap**
5. Execute network
6. Show **4x4x4** mesh bounding box





The screenshot displays the SCIRun v4.0 (revision 4265-4) interface. On the left, the 'ViewScene 1 Window 1' shows a 3D coordinate system with a small blue cube. The central 'ExtractIsoSurface_0' window is configured with an isovalue of 0.1155, selected from a range of 1.7321 to 0.1155. The 'Options' section includes 'Build Output Geometry' (checked) and 'Enable Transparency (Geometry Only)'. The 'Computation Method' is set to 'Marching Cubes (Multi Threaded)'. On the right, the 'SCIRun' workflow graph shows a sequence of modules: 'CreateLatVol' (UI: 0.01), 'CalculateFieldData' (UI: 0.02), 'CreateStandardColorMaps' (UI: 0.00), 'RescaleColorMap' (UI: 0.02), and 'ExtractIsoSurface' (UI: 0.01), all connected to a 'ViewScene' module. A status bar at the bottom right indicates 'Execute All' with a progress indicator at 6/6. Below the main windows, a log window displays a 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)

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

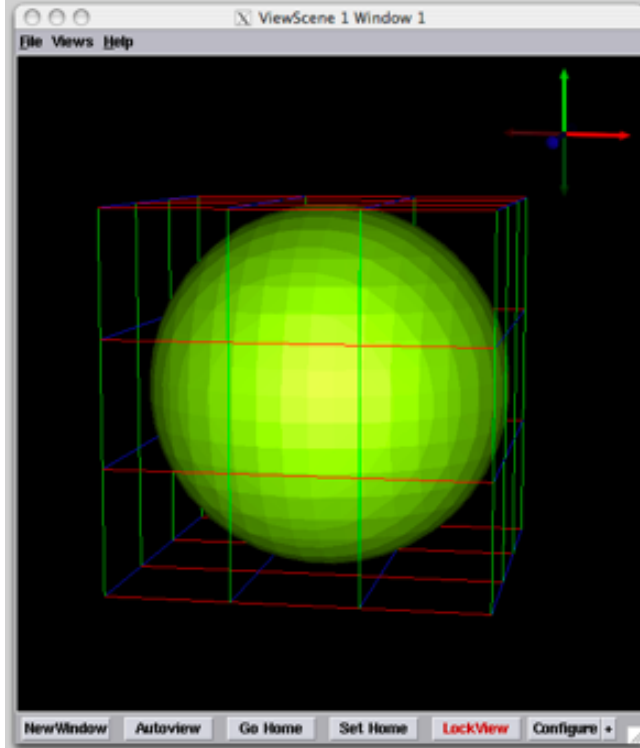
7. Connect

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 ? |

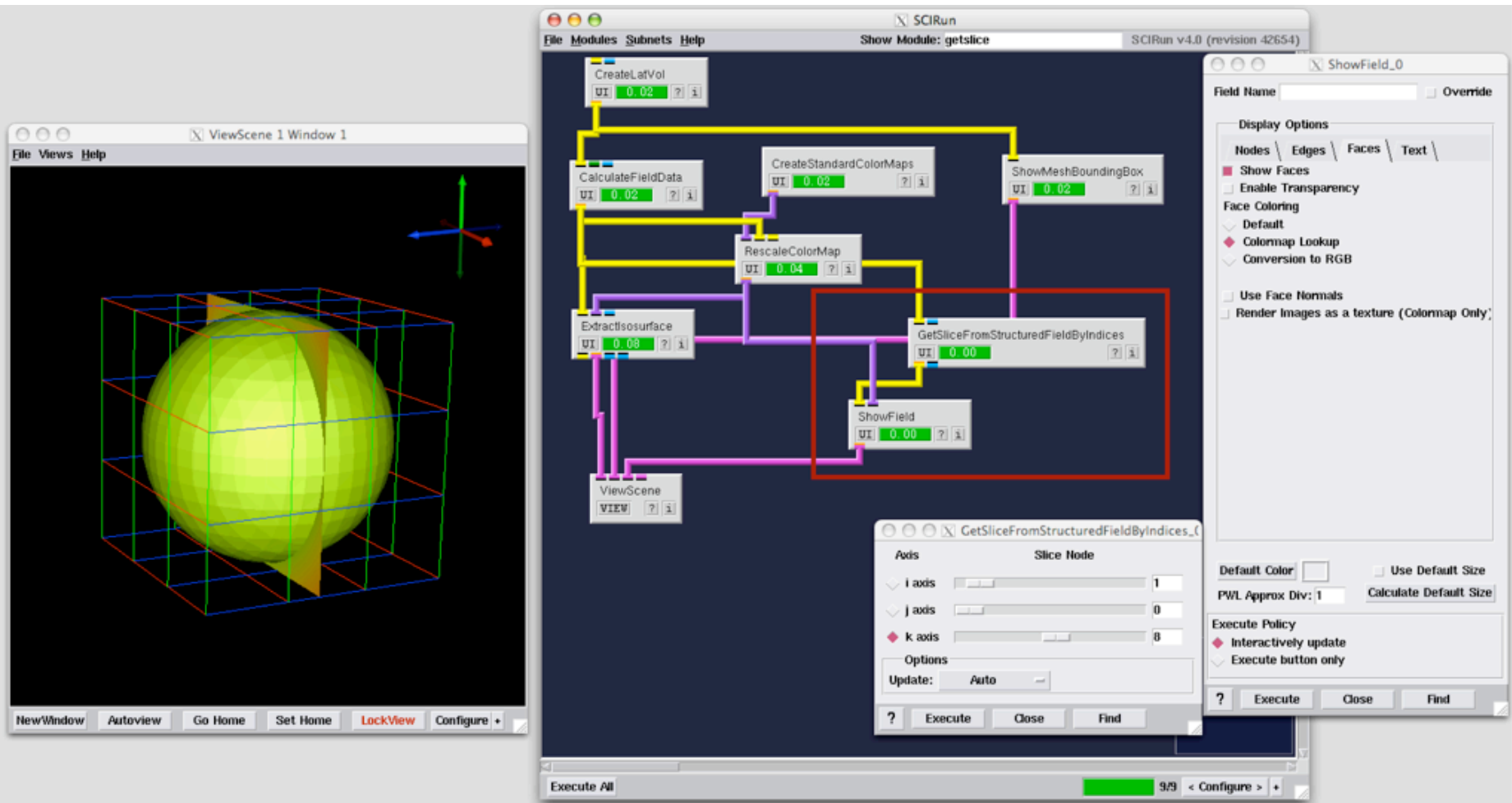
ShowMeshBoundingBox UI 0.00 ? |

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:

CreateLatVol UI: 0.02

CalculateFieldData UI: 0.02

CreateStandardColorMaps UI: 0.02

ShowMeshBoundingBox UI: 0.02

RescaleColorMap UI: 0.04

ConvertMeshToUnstructuredMesh

ExtractIsosurface UI: 0.08

GetSliceFromStructuredFieldByIndices UI: 0.00

ShowField UI: 0.00

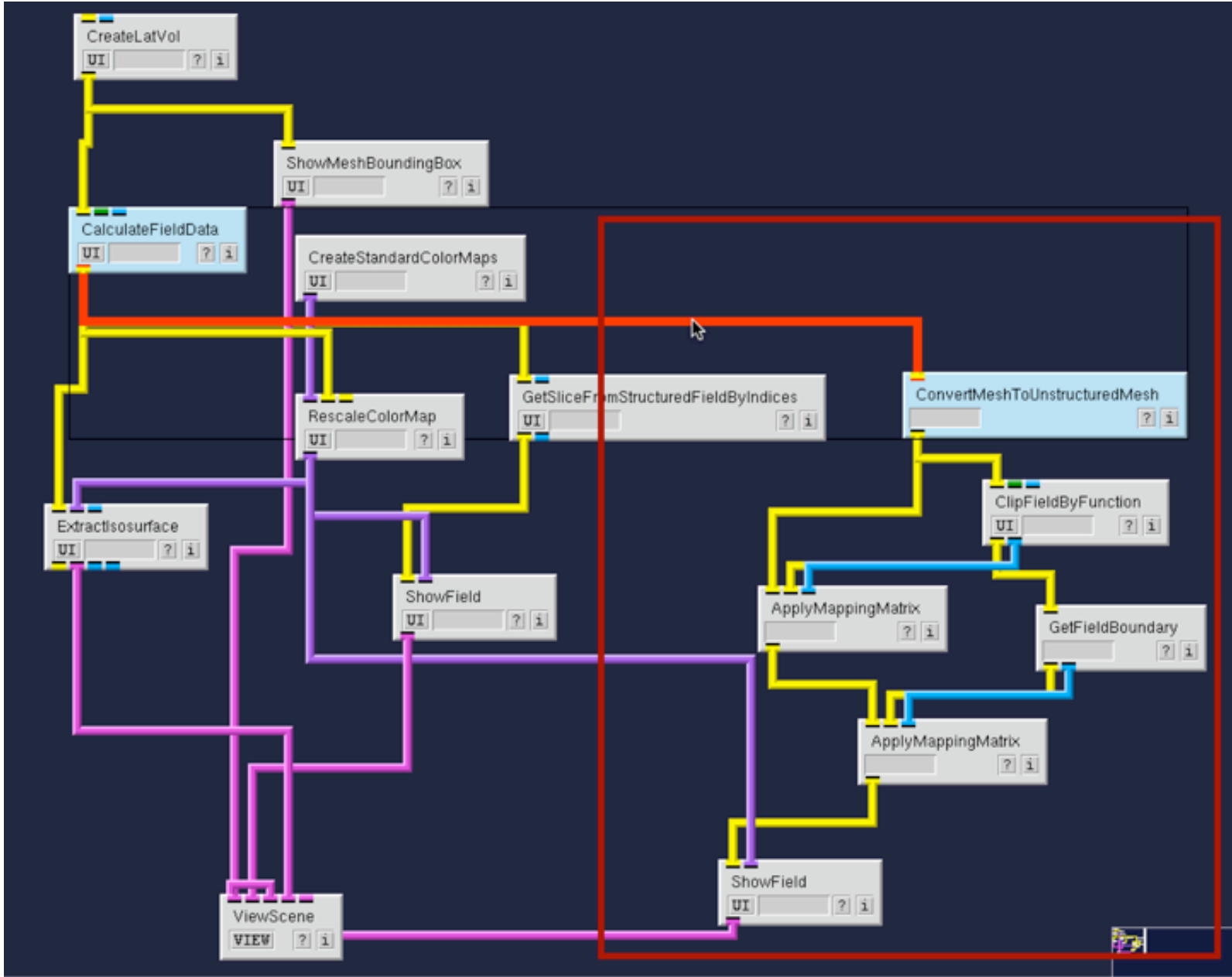
ClipFieldByFunction UI: []

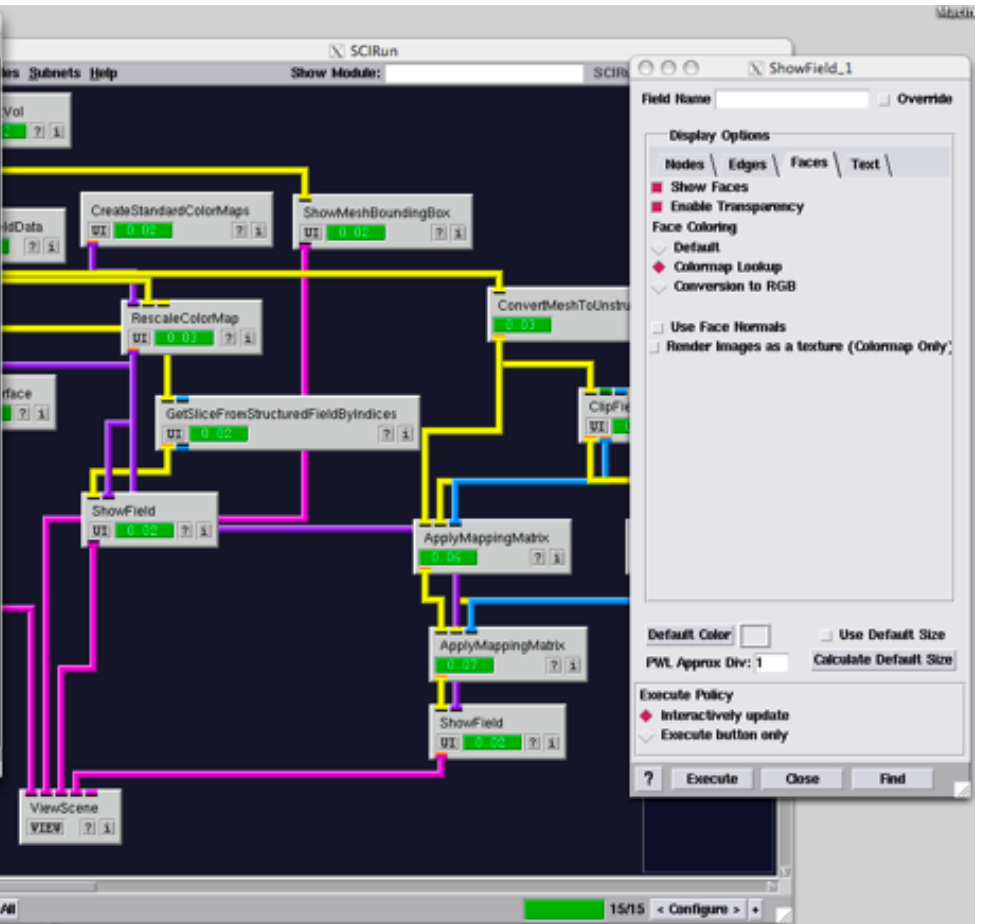
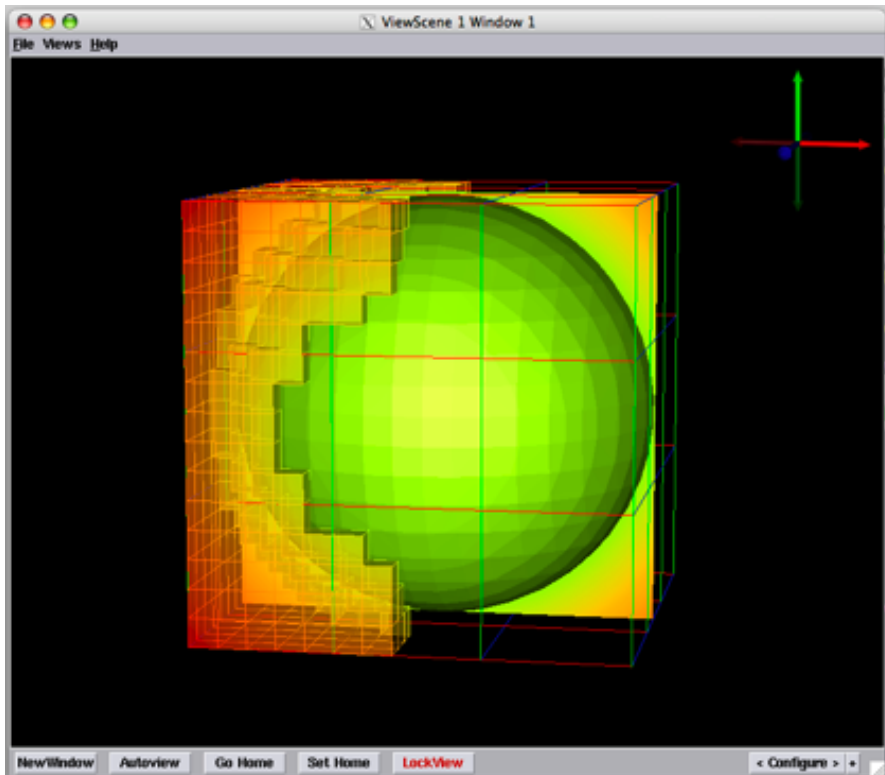
ApplyMappingMatrix

ViewScene VIEW: []

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

Execute Policy

- Interactively update
- Execute button only

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)

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

