CS 2334: Project 5
Java Graphics

Project 4 Lessons

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- Get layout working first, then interaction
- May not have anything selected by a JList at a given instant in time: code must be robust to this
- Tracking down Exceptions in “tall” stack traces

Project 5

Animate the infant:

- Show top, side and rear view of the infant
- Allow user to select time instant to be displayed
- Animation using Timers

- Demonstration ….

Objectives

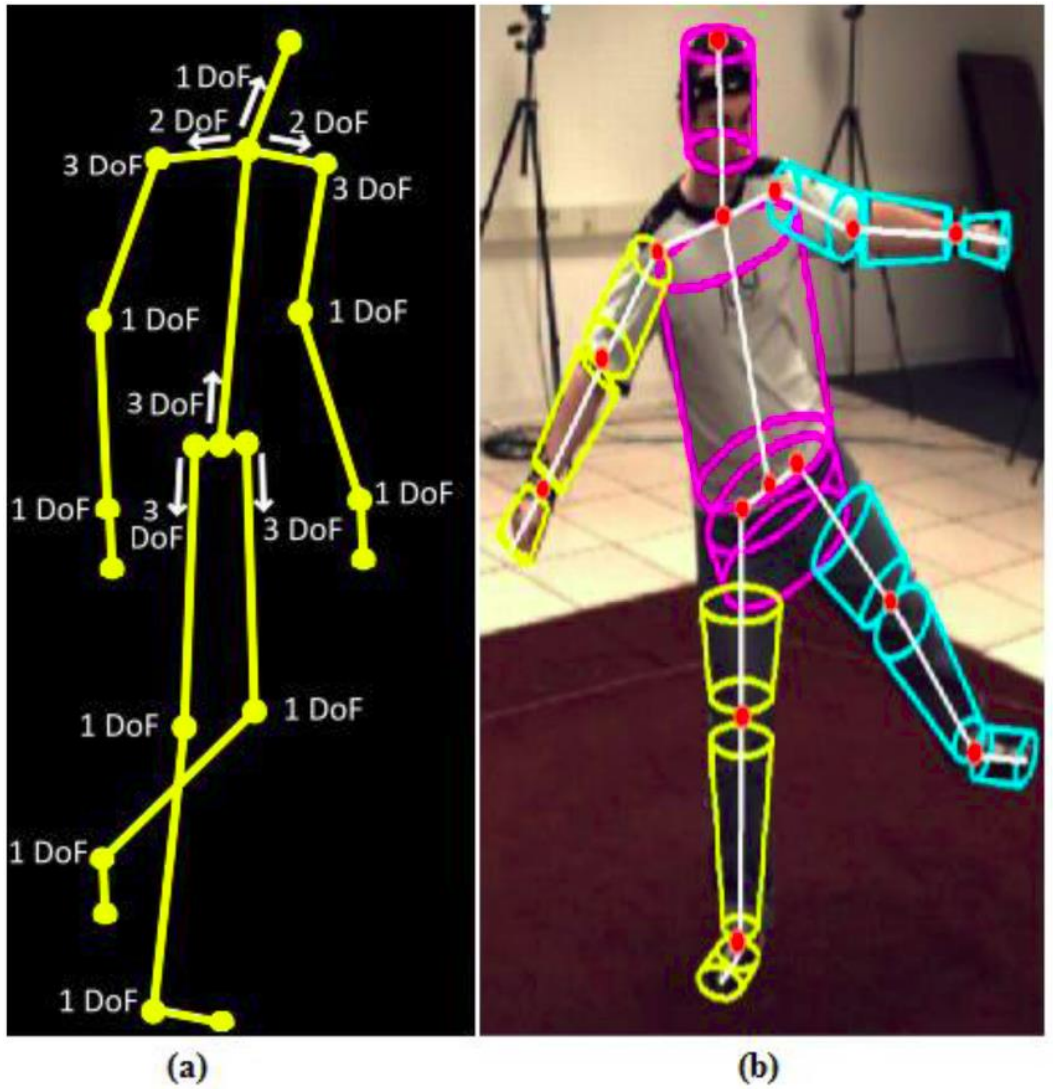
Create a Graphical User Interface for Animation

- Create a tree data structure for representing a kinematic tree
- Create a class for flexibly transforming 3D data into a 2D picture
- Use **JSliders** to accept input
- Use **Timers** to create animations
- Continue to exercise good coding practices for Javadoc and for testingDrop-down menus (JMenuBar)

Kinematic Tree

Representation of a biological or robot body. In our case:

- Rigid **links** connected by rotational **joints**
- Root point: base of the tree
  - For us: center point between hips



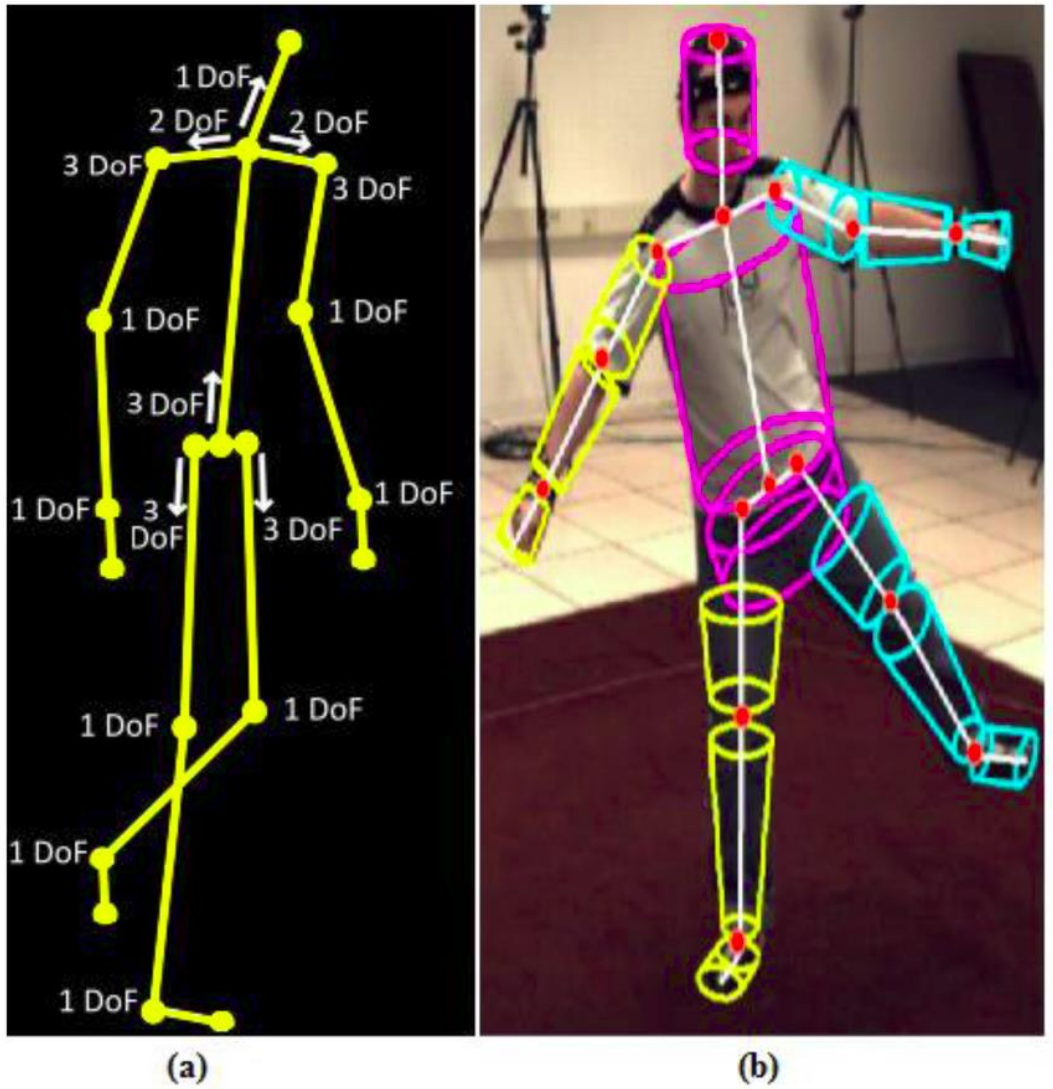
Sanini et al., 2015

Kinematic Tree

A single point can branch along multiple paths

- In this figure: the root point branches in three directions:
  - Left hip
  - Right hip
  - Point between the shoulder blades (the back)

We refer to these as the **children** of the root point

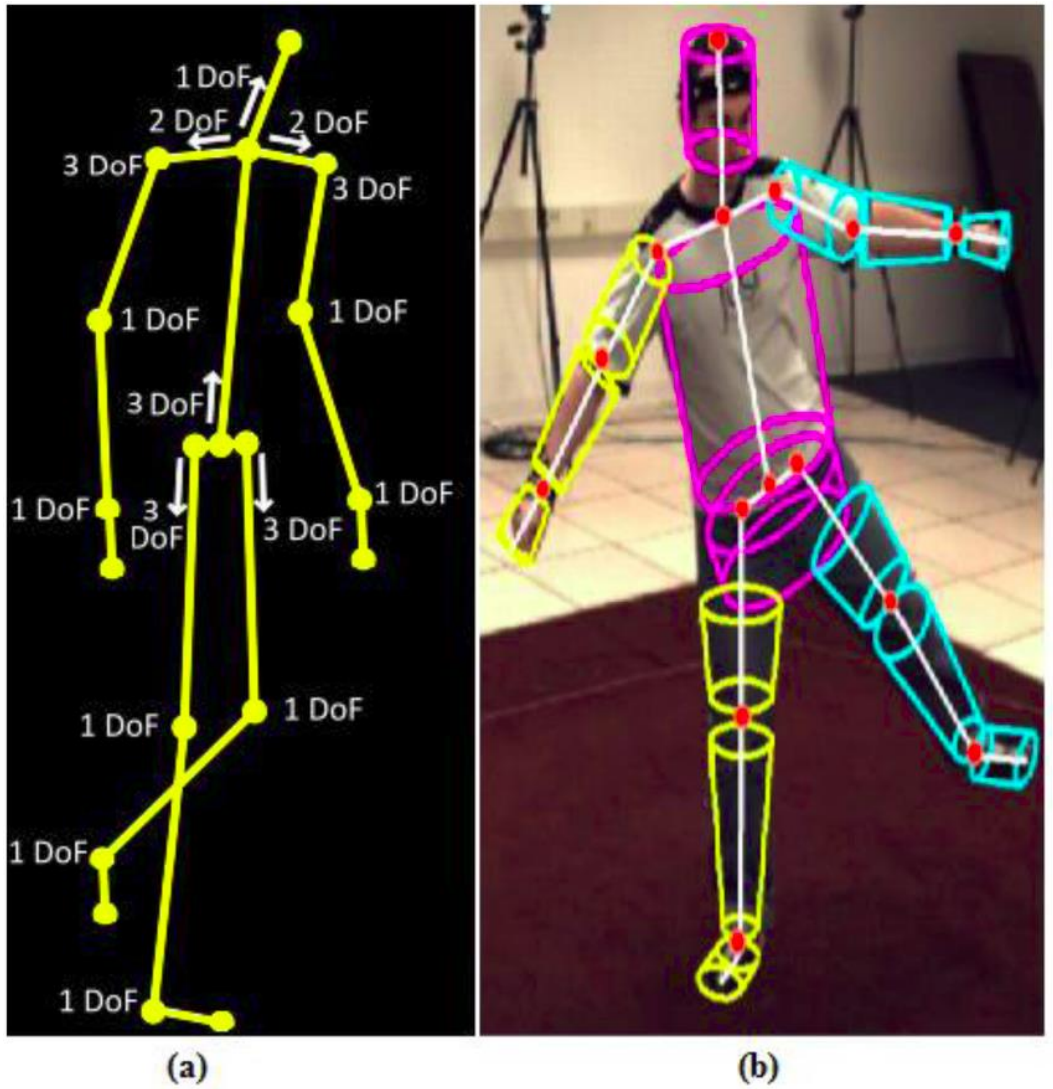


Sanini et al., 2015

Drawing a Kinematic Tree

Assume that we know the locations of all of the points

1. Start at the root point
2. For each child point:
    1. Draw a line from **this** point to the child
    2. Recursively draw the child

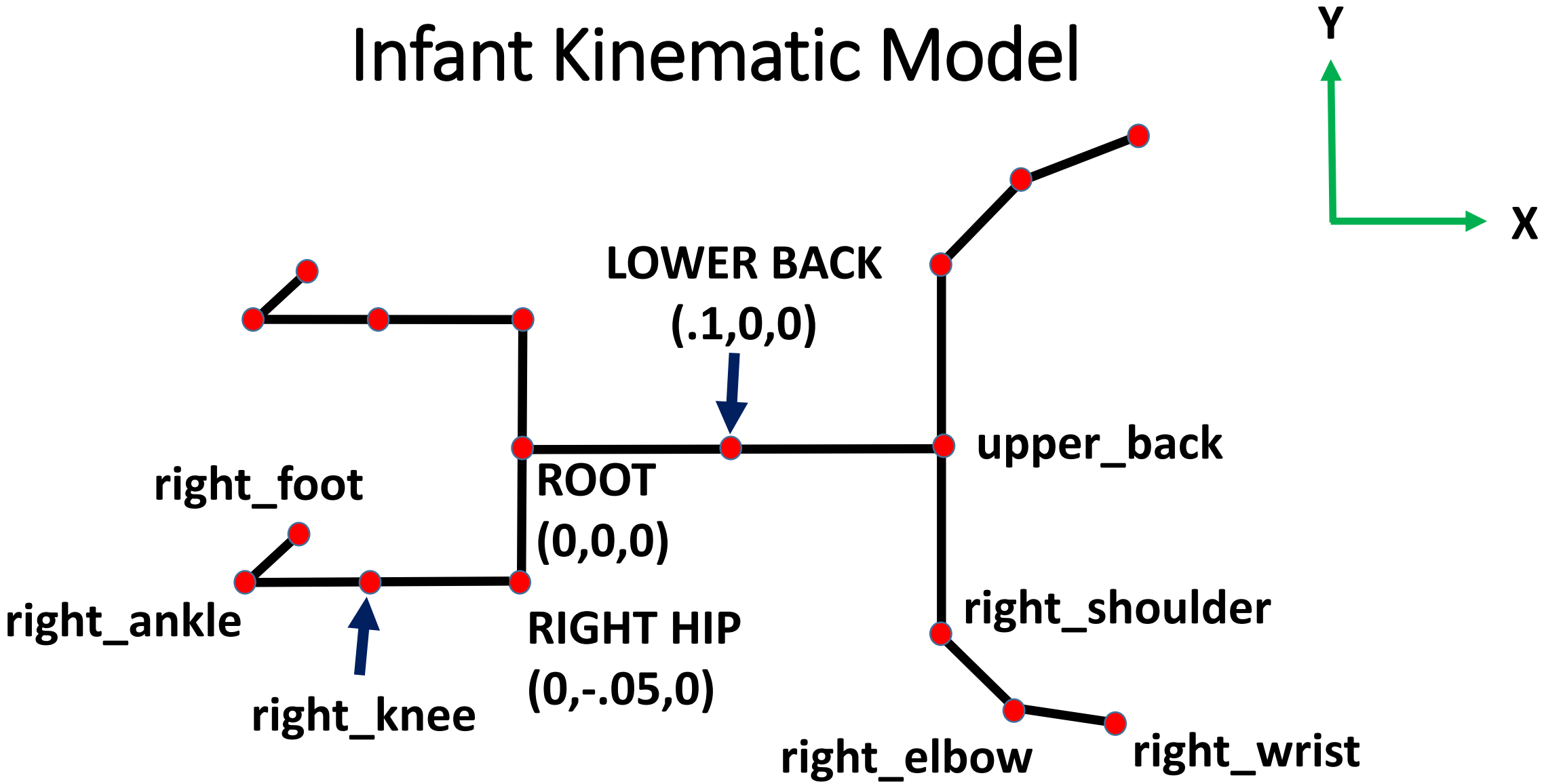


Sanini et al., 2015

Infant Model

- Our data structure contains most of the points we need within a single State
  - Back, shoulders, elbows, wrists, …
- Some points are not defined, but they are fixed
  - Location of the hip sockets
  - Location of the small of the back

Infant Kinematic Model



Rendering

We are not working in 3D, here. Instead: we are creating simple 2D projections

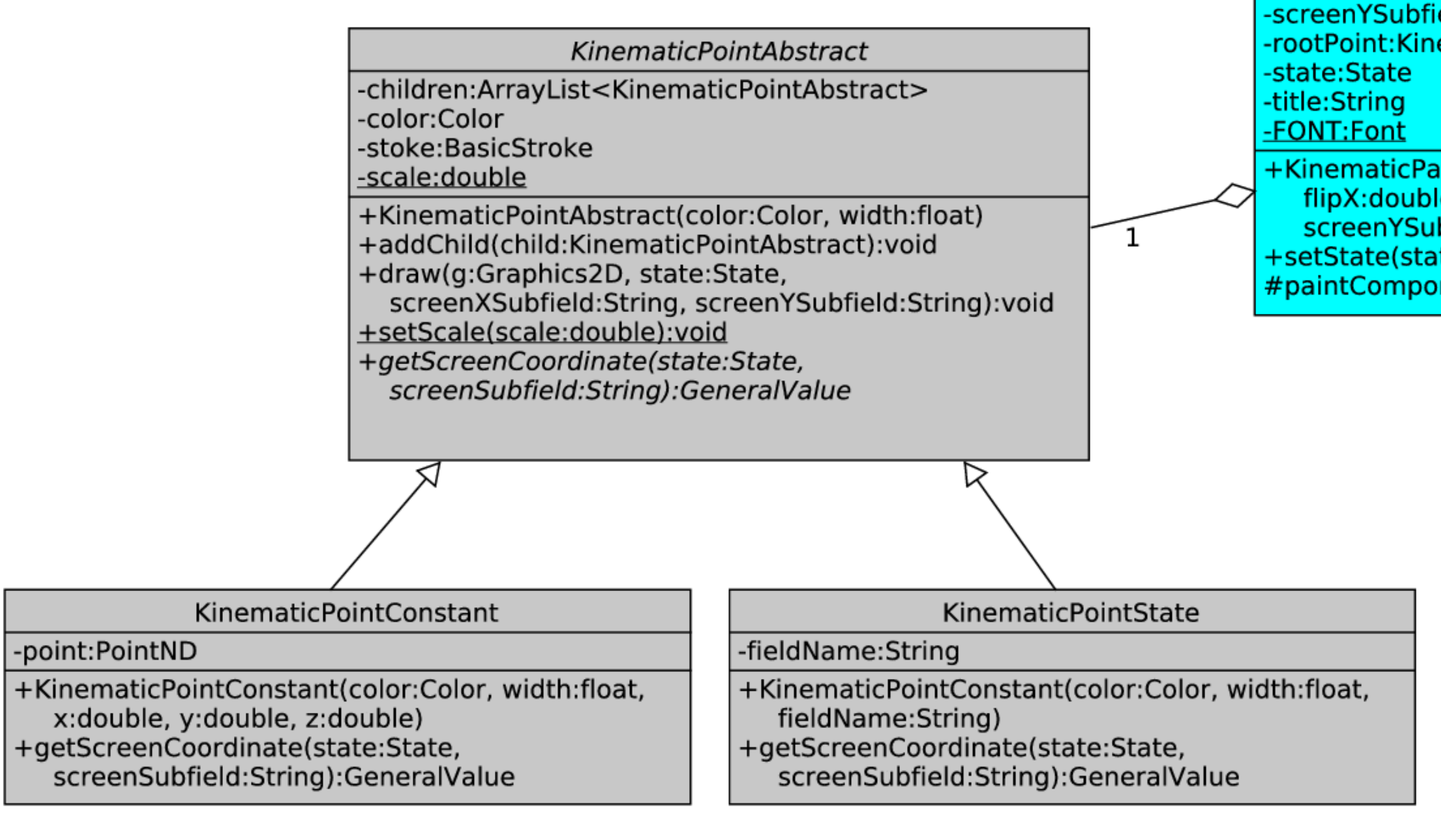
- Top view: Map X to screen X and Y to screen Y (flipped)
- Side view: Map X to screen X and Z to screen Y (flipped)
- Rear view: Map Y to screen X (flipped) and Z to screen Y (flipped)

Scaling: we must also translate from meters to pixels

KinematicPoint

A KinematicPoint must be able to:

- Describe the location of some specified dimension (subfield)
- Given subfields for each of the screen X and screen Y dimensions, draw the point and its children


KinematicPointAbstract
-children:ArrayList<KinematicPointAbstract>
-color:Color
-stoke:BasicStroke
-scale:double
+KinematicPointAbstract(color:Color, width:float)
+addChild(child:KinematicPointAbstract):void
+draw(g:Graphics2D, state:State,
screenXSubfield:String, screenYSubfield:String):void
+setScale(scale:double):void
+getScreenCoordinate(state:State,
screenSubfield:String):GeneralValue
1
-screenYSubfi
-rootPoint:Kine
-state:State
-title:String
-FONT:Font
+KinematicPa
flipX:doubl
screenYSub
+setState(sta
#paintCompo
KinematicPointConstant
-point:PointND
+KinematicPointConstant(color:Color, width:float,
x:double, y:double, z:double)
+getScreenCoordinate(state:State,
screenSubfield:String):GeneralValue
KinematicPointState
-fieldName:String
+KinematicPointConstant(color:Color, width:float,
fieldName:String)
+getScreenCoordinate(state:State,
screenSubfield:String):GeneralValue

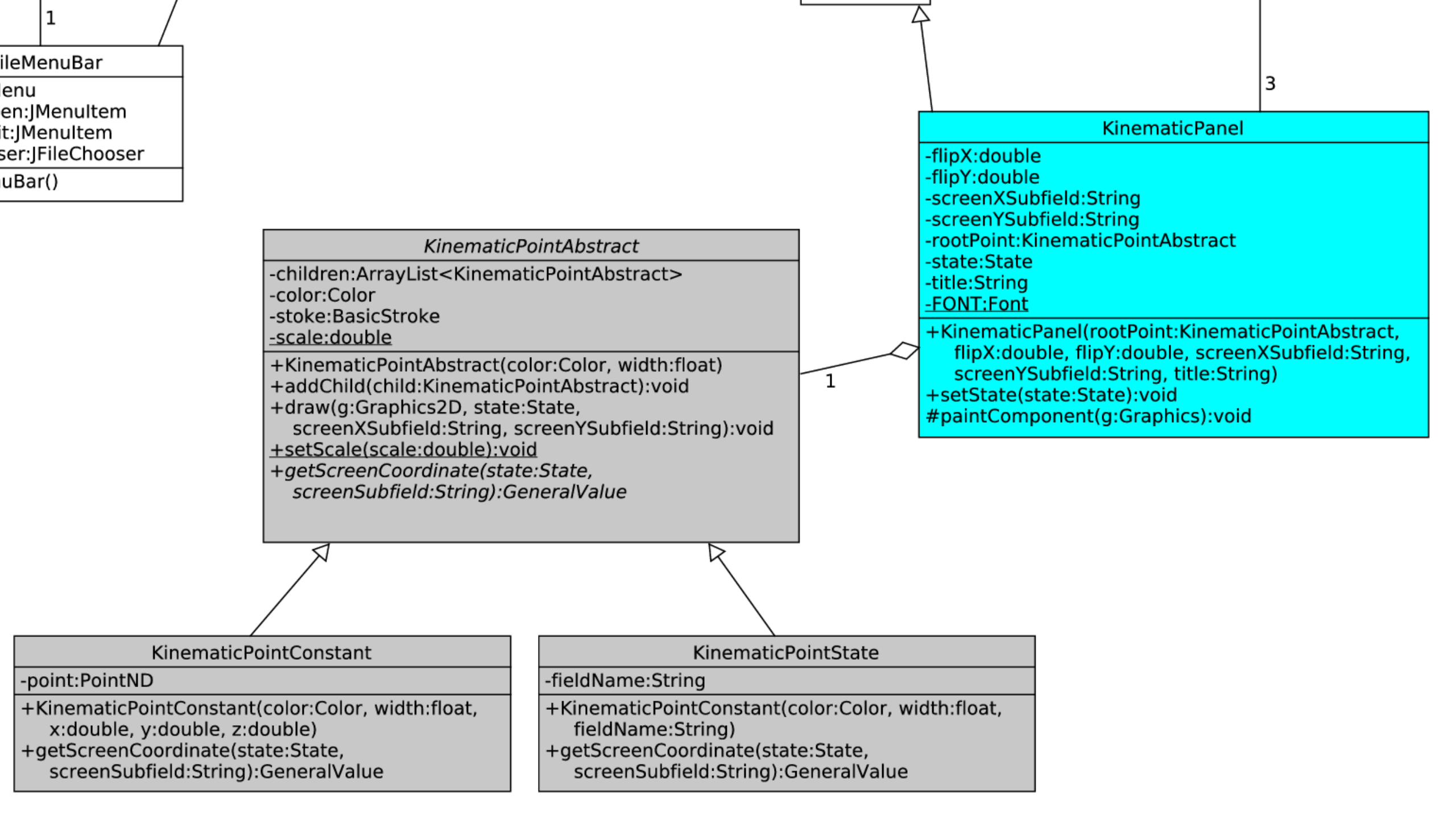
Drawing a Single KinematicPointAbstract

- Extract the GeneralValue for the screen X and screen Y subfields
- For each child:
  - Extract the GeneralValue for the screen X and screen Y subfields
  - If all GeneralValues are valid, then draw a line from this point to the child point (specifically, we are drawing a BasicStroke)
  - Draw the child

KinematicPanel

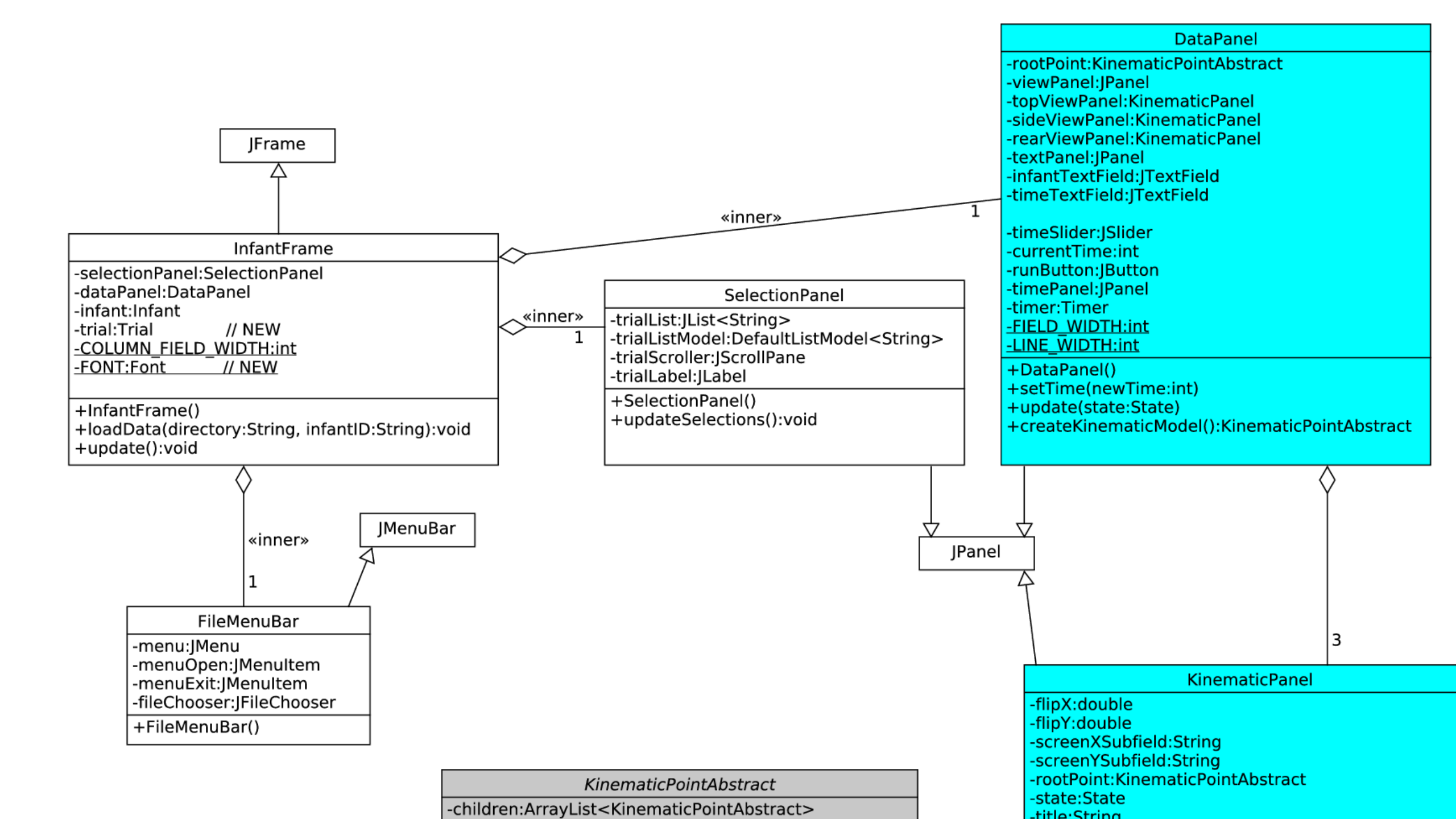
JPanel that renders a single view of the kinematic model

- Maps from 3D point to 2D screen coordinates
- Scale translates from real coordinates (meters) to pixels
- In some cases, flips the sign of the pixel coordinates


1
ileMenuBar
lenu
en:JMenuItem
it:JMenuItem
ser:JFileChooser
uBar()
3
KinematicPanel
-flipX:double
-flipY:double
-screenXSubfield:String
-screenYSubfield:String
-rootPoint:KinematicPointAbstract
-state:State
-title:String
-FONT:Font
+KinematicPanel(rootPoint:KinematicPointAbstract, flipX:double, flipY:double, screenXSubfield:String, screenYSubfield:String, title:String)
+setState(state:State):void
#paintComponent(g:Graphics):void
KinematicPointAbstract
-children:ArrayList<KinematicPointAbstract>
-color:Color
-stoke:BasicStroke
-scale:double
+KinematicPointAbstract(color:Color, width:float)
+addChild(child:KinematicPointAbstract):void
+draw(g:Graphics2D, state:State, screenXSubfield:String, screenYSubfield:String):void
+setScale(scale:double):void
+getScreenCoordinate(state:State, screenSubfield:String):GeneralValue
1
KinematicPointConstant
-point:PointND
+KinematicPointConstant(color:Color, width:float, x:double, y:double, z:double)
+getScreenCoordinate(state:State, screenSubfield:String):GeneralValue
KinematicPointState
-fieldName:String
+KinematicPointConstant(color:Color, width:float, fieldName:String)
+getScreenCoordinate(state:State, screenSubfield:String):GeneralValue

Graphical User Interface

- Menu is the same
- Selection of week only
- DataPanel:
  - Three different views
  - Textual information
  - Control of time step to render


JFrame
InfantFrame
-selectionPanel:SelectionPanel
-dataPanel:DataPanel
-infant:Infant
-trial:Trial // NEW
-COLUMN_FIELD_WIDTH:int
-FONT:Font // NEW
+InfantFrame()
+loadData(directory:String, infantID:String):void
+update():void
«inner»
1
«inner»
1
SelectionPanel
-trialList:JList<String>
-trialListModel:DefaultListModel<String>
-trialScroller:JScrollPane
-trialLabel:JLabel
+SelectionPanel()
+updateSelections():void
DataPanel
-rootPoint:KinematicPointAbstract
-viewPanel:JPanel
-topViewPanel:KinematicPanel
-sideViewPanel:KinematicPanel
-rearViewPanel:KinematicPanel
-textPanel:JPanel
-infantTextField:JTextField
-timeTextField:JTextField
-timeSlider:JSlider
-currentTime:int
-runButton:JButton
-timePanel:JPanel
-timer:Timer
-FIELD_WIDTH:int
-LINE_WIDTH:int
+DataPanel()
+setTime(newTime:int)
+update(state:State)
+createKinematicModel():KinematicPointAbstract
«inner»
1
JMenuBar
FileMenuBar
-menu:JMenu
-menuOpen:JMenuItem
-menuExit:JMenuItem
-fileChooser:JFileChooser
+FileMenuBar()
JPanel
3
KinematicPanel
-flipX:double
-flipY:double
-screenXSubfield:String
-screenYSubfield:String
-rootPoint:KinematicPointAbstract
-state:State
KinematicPointAbstract
-children:ArrayList<KinematicPointAbstract>

Deadlines

- Project must be submitted by Friday, Dec 1st @6:00pm
- Code review must be completed by Friday, Dec 8th
  - This is an absolute deadline