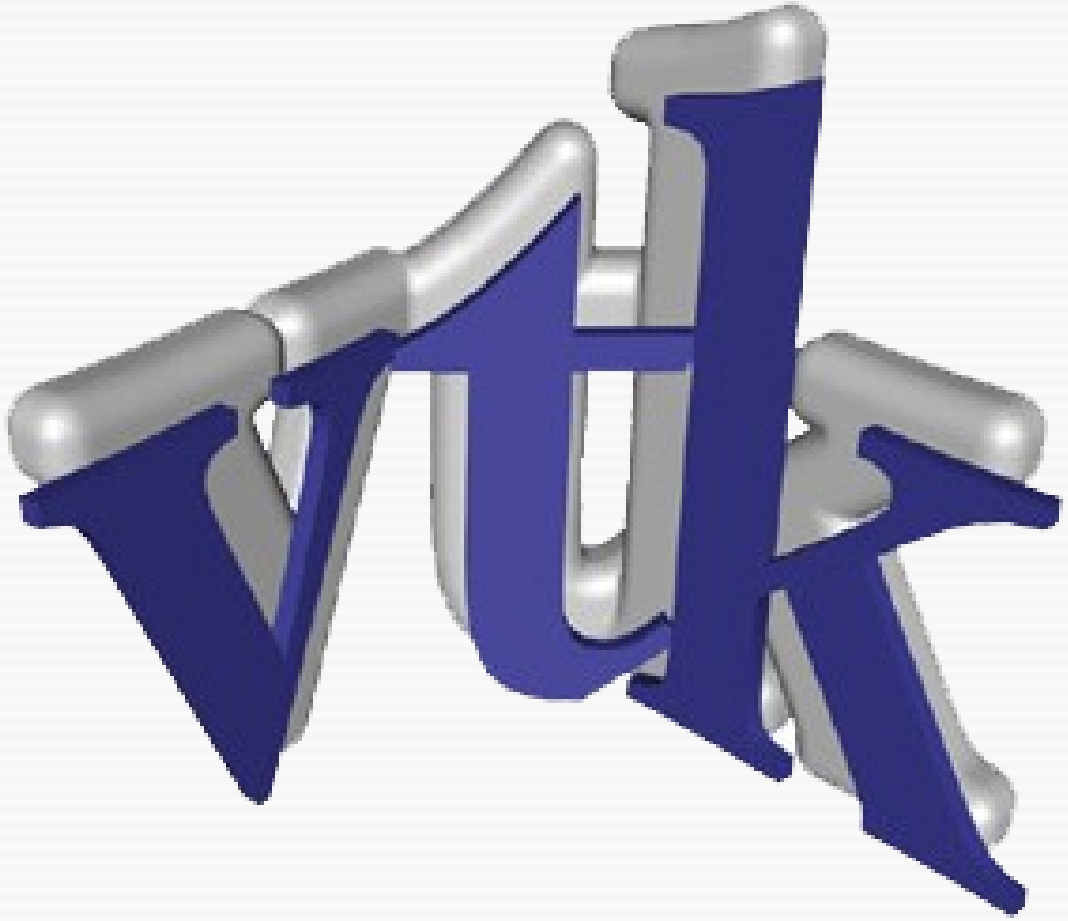
Introdução à computação Gráfica com Python e VTK

Paulo Henrique Junqueira Amorim

paulojamorim@gmail.com

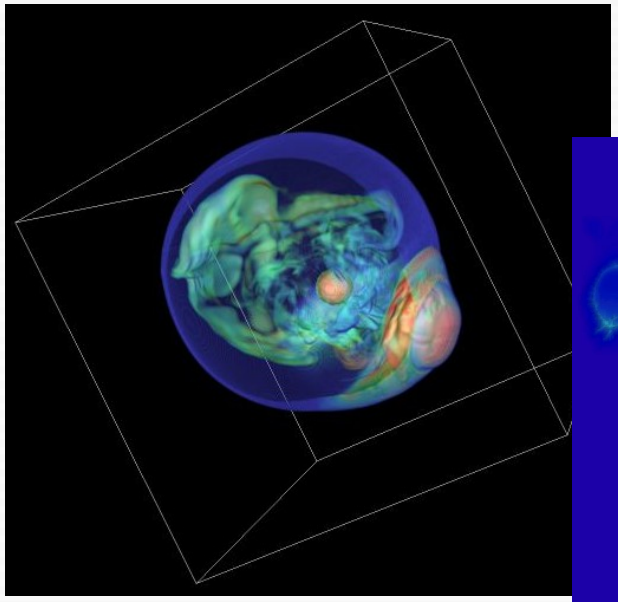


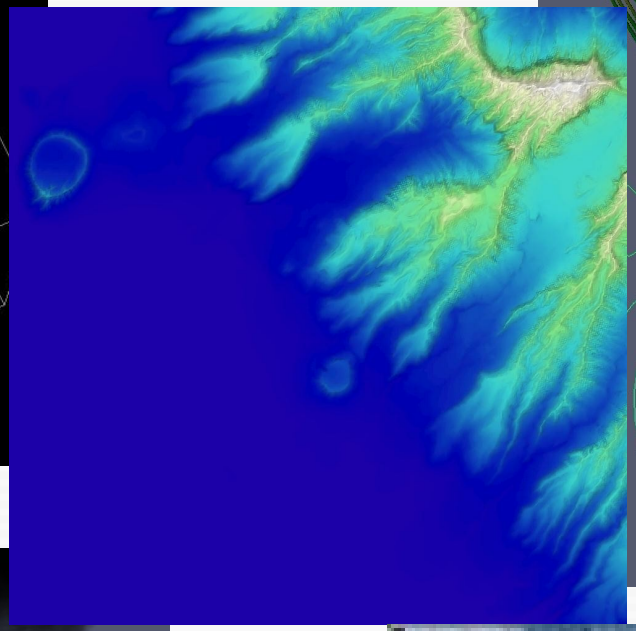
Visualization ToolKit

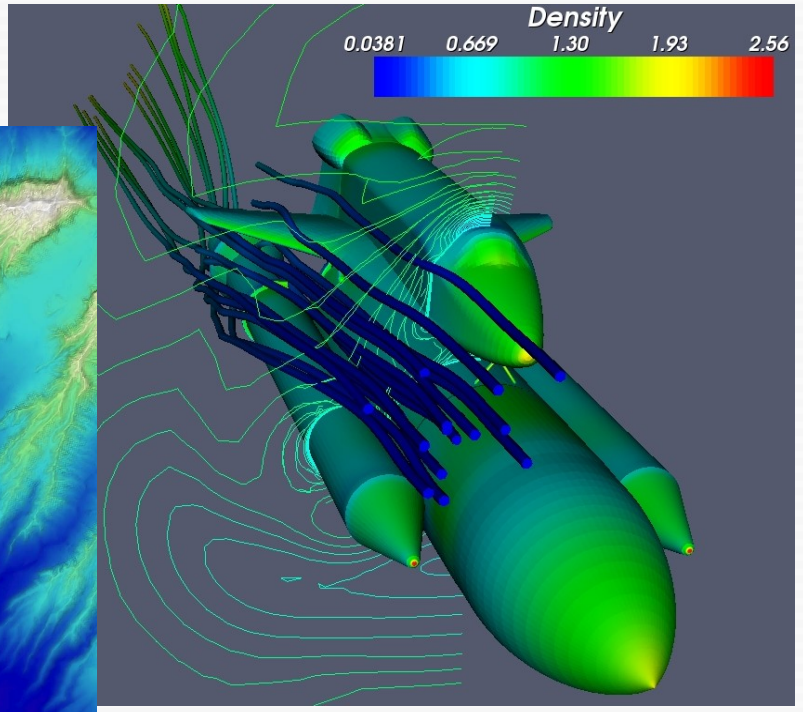
VTK

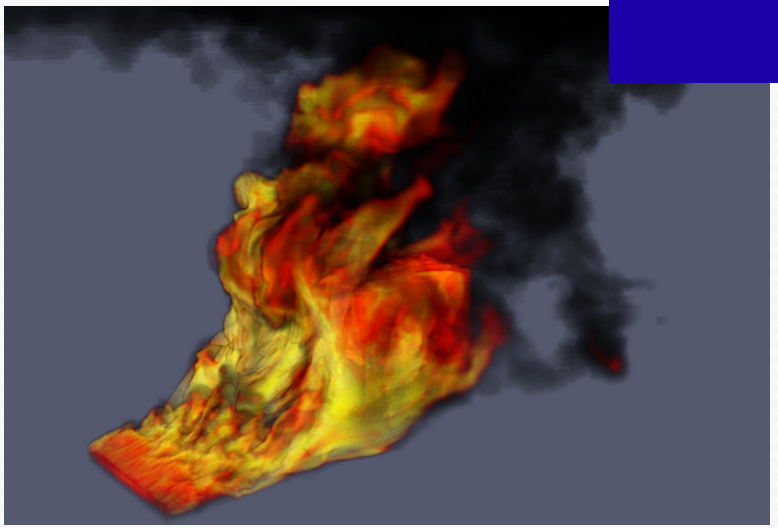
- **Biblioteca de Visualização Gráfica**
- **Também possui o básico de PDI**
- **Abstração OpenGL**
- **Escrita C++**
- **Possível utilizar a partir de Python, TCL, Java...**
- **Várias empresas e centros de pesq. usam como: GE, LosAlamos, CTI, Petrobrás, DuPont...**

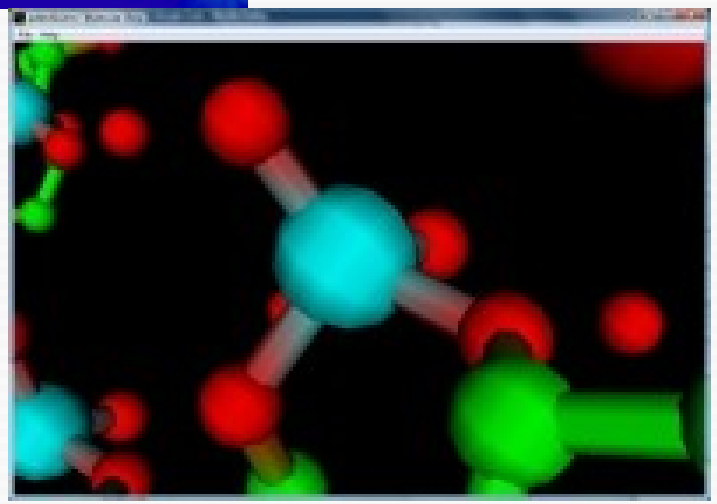
VTK



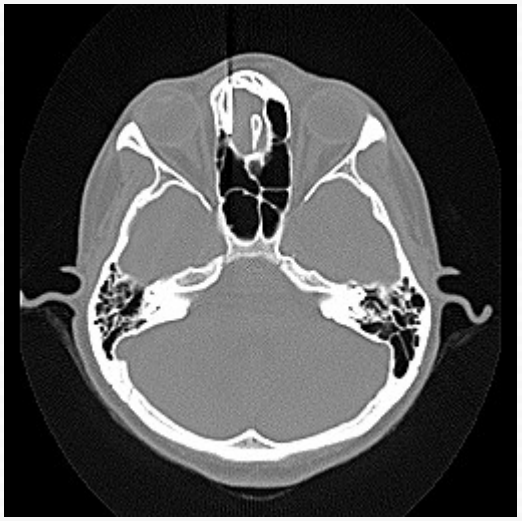


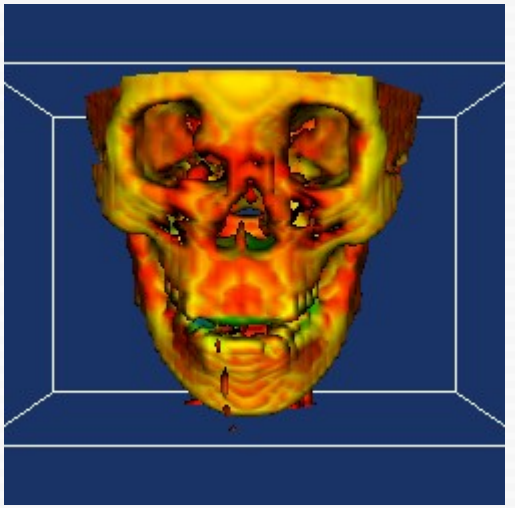


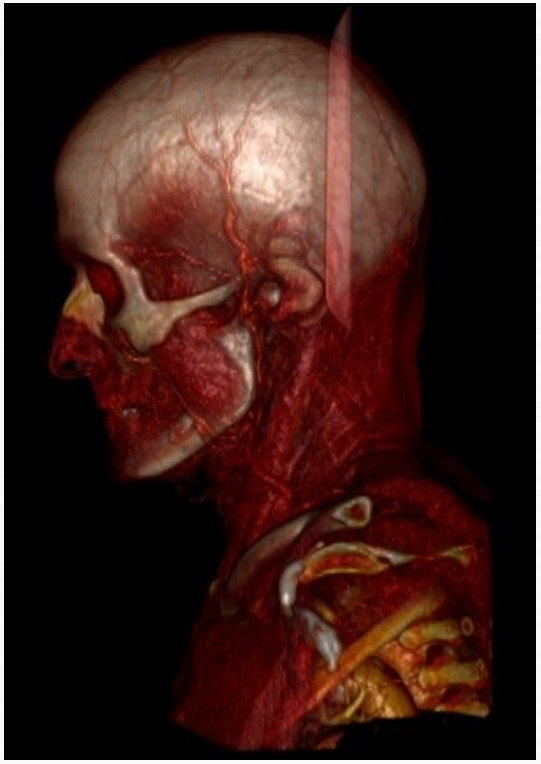


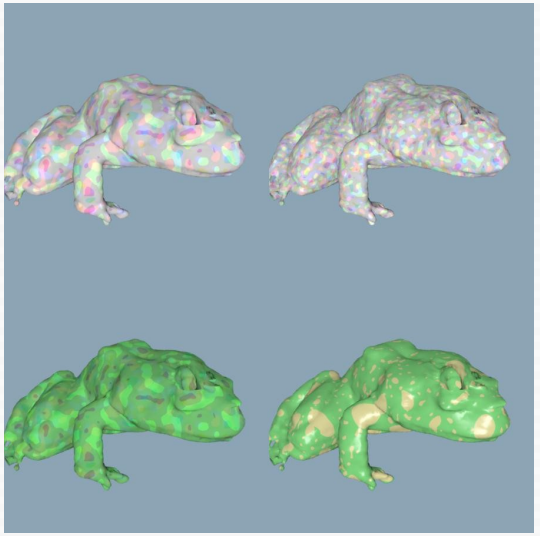


VTK





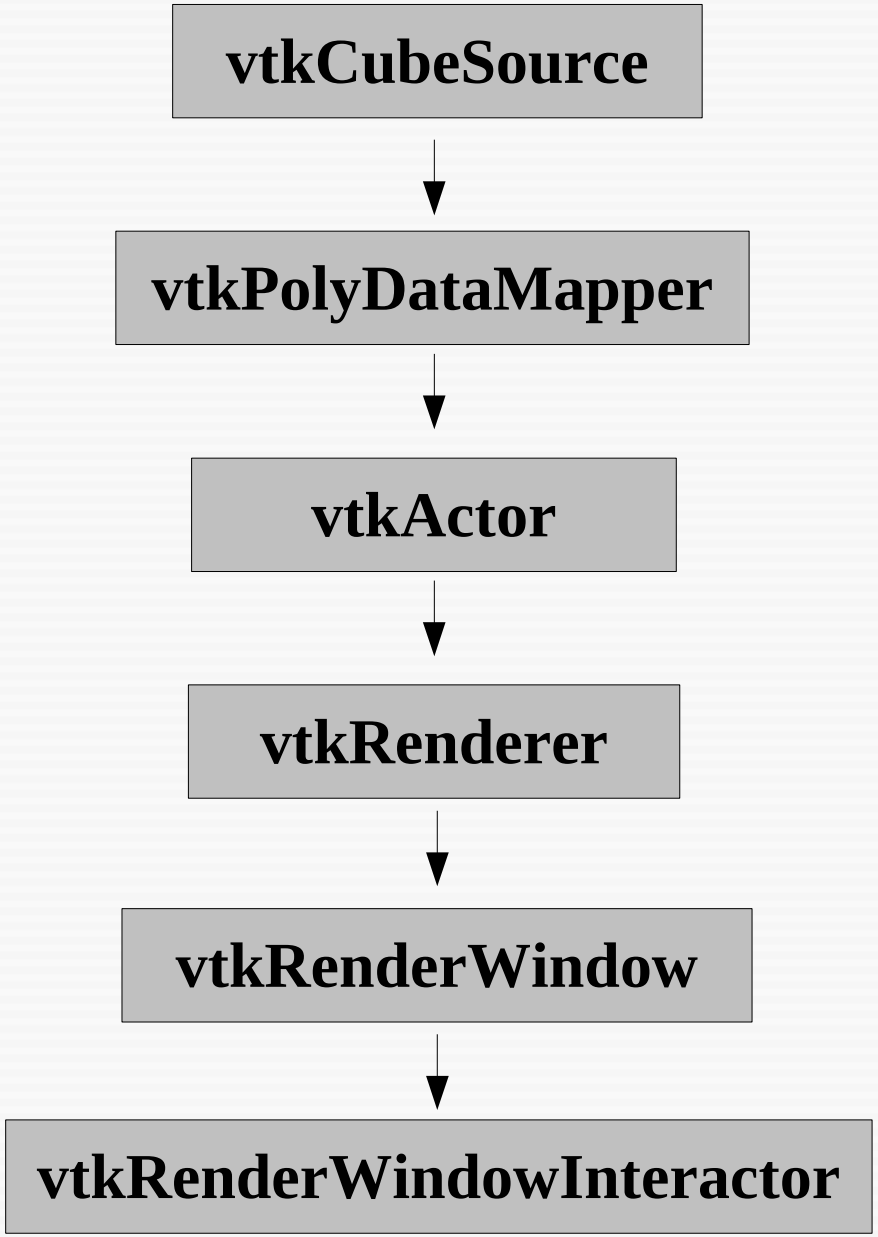


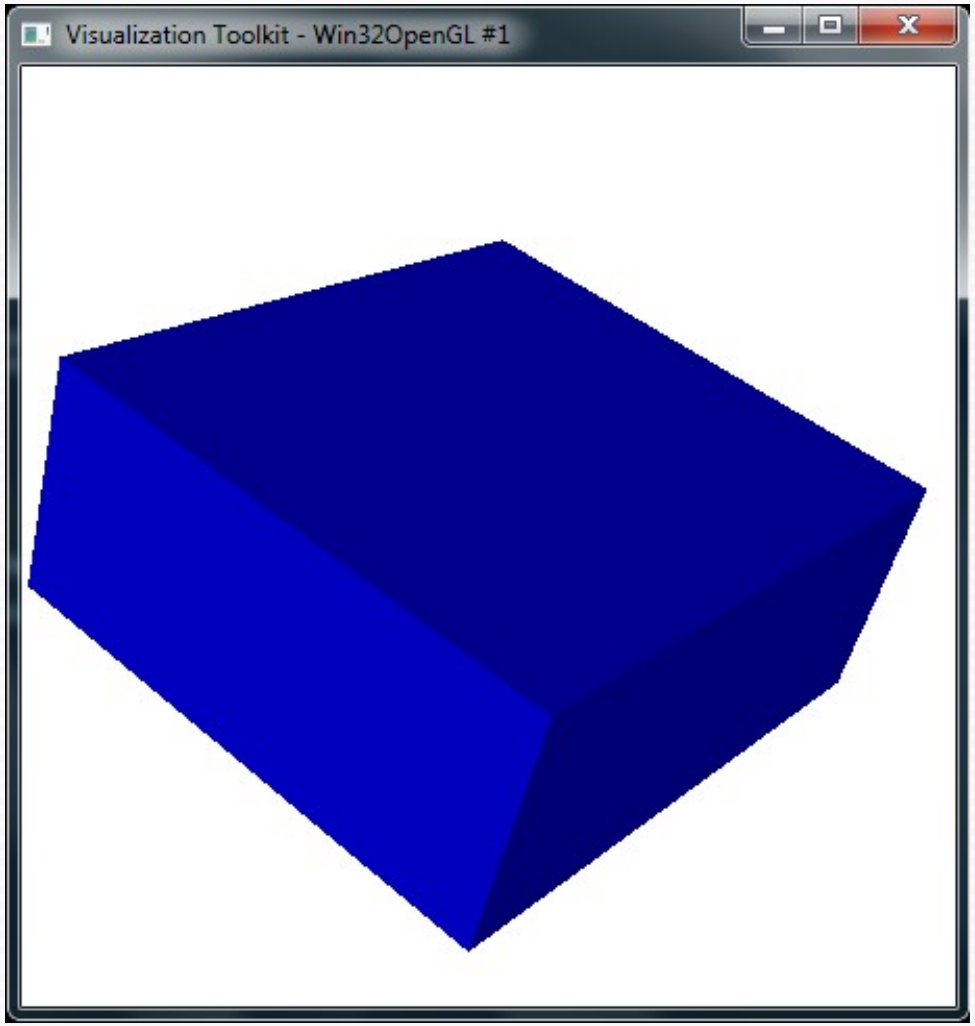


Retângulo

VTK

- **Mão na massa**





VTK

- **Mão na massa**

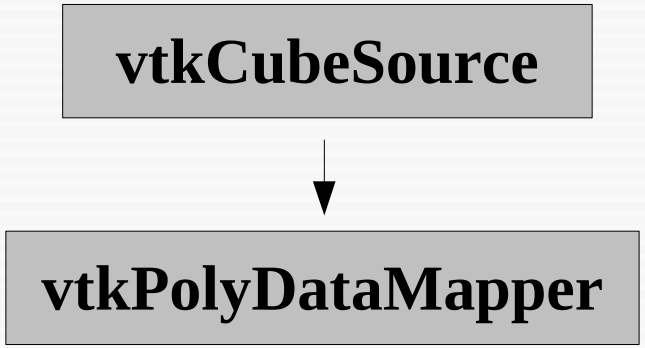
vtkCubeSource

```
# -*- coding: cp1252 -*-
import vtk

cs = vtk.vtkCubeSource()
cs.SetXLength(5.0)
cs.SetYLength(2.0)
cs.SetZLength(4.5)
cs.Update()
```

Cria as propriedades matematica do Cubo

VTK

- **Mão na massa**

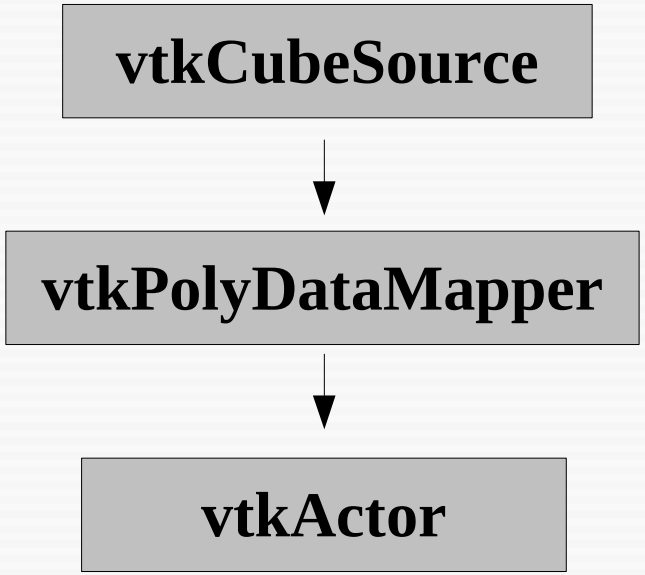



```
m = vtk.vtkPolyDataMapper()
m.SetInput(cs.GetOutput())
m.Update()
```

Mapeia os dados poligonais para primitivas gráficas

VTK

- **Mão na massa**

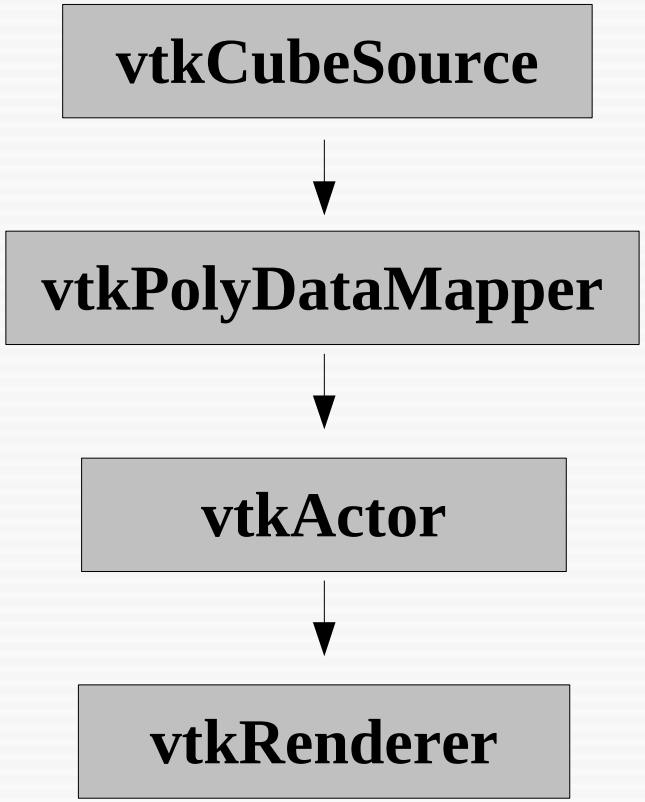



```
a = vtk.vtkActor()
a.SetMapper(m)
a.GetProperty().SetColor(0,0,1)
```

É uma entidade para representar a geometria do objeto e as propriedades na cena.

VTK

- **Mão na massa**

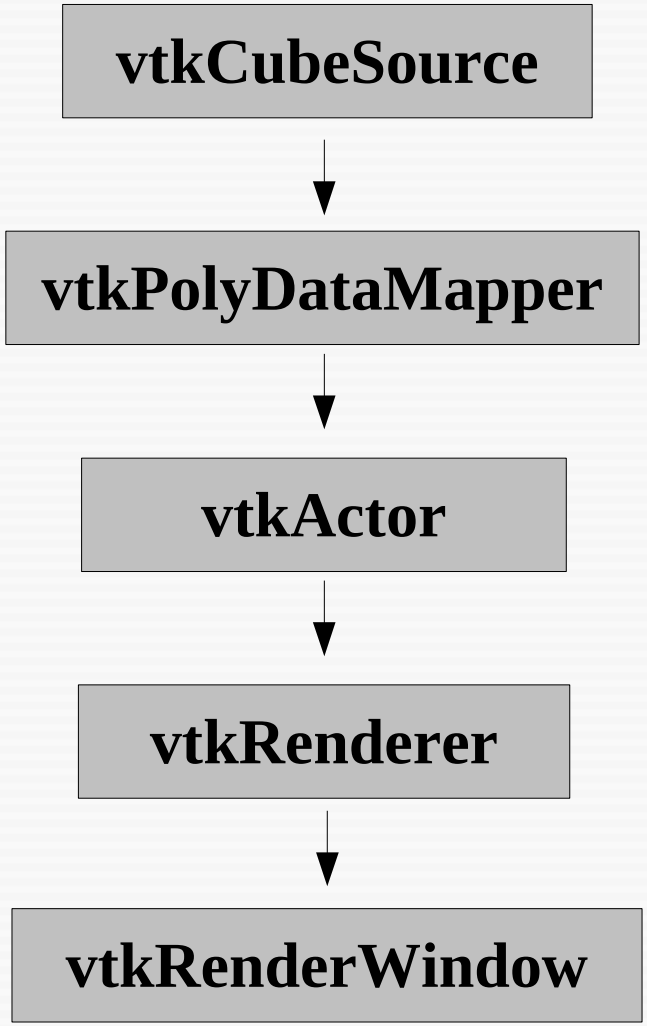



```
ren = vtk.vtkRenderer()
ren.SetBackground(1, 1, 1)
ren.AddActor(a)
ren.ResetCamera()
```

Controla o processo de renderização.

VTK

- **Mão na massa**

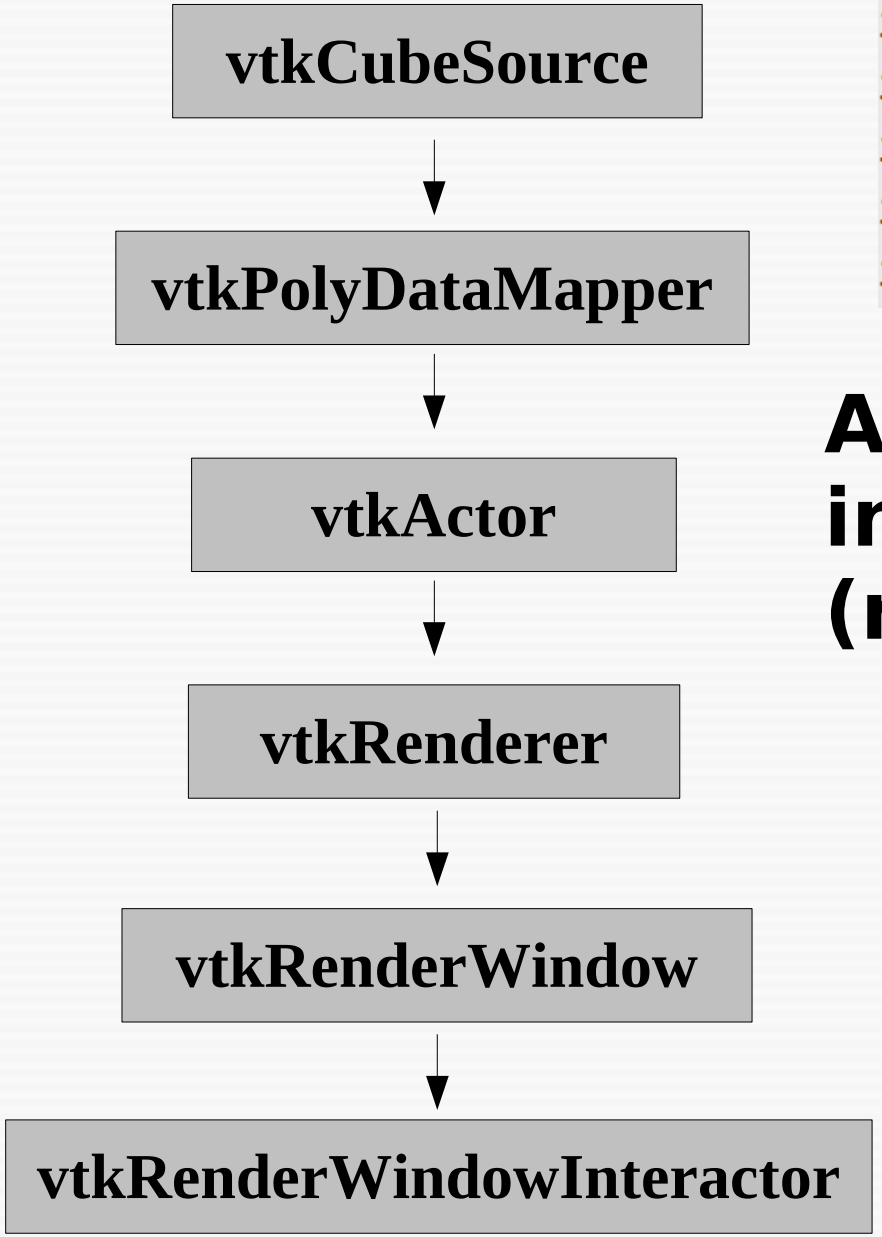



```
renWin = vtk.vtkRenderWindow()
renWin.AddRenderer(ren)
```

GUI padrão do VTK

VTK

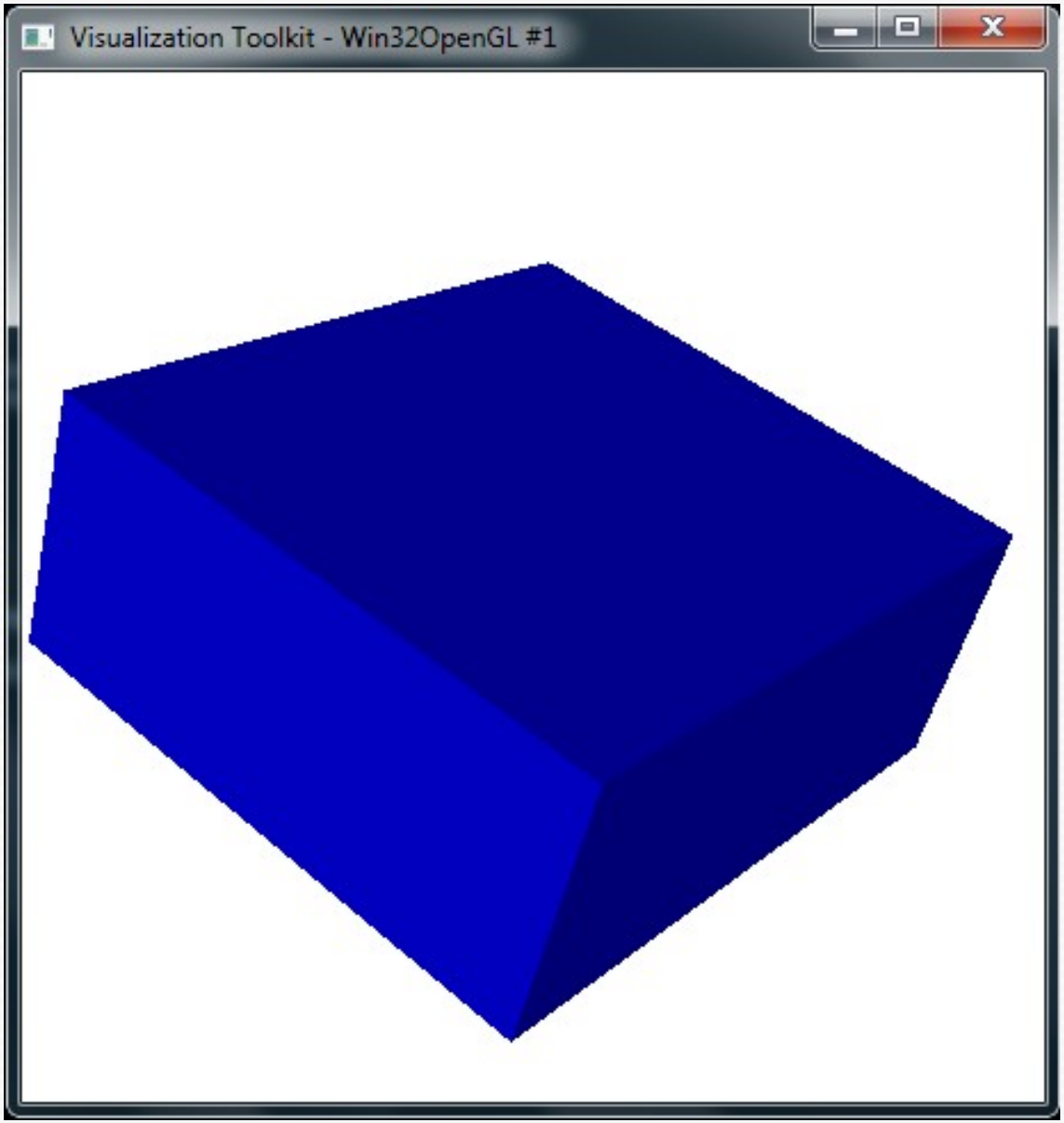
- **Mão na massa**




```
rwi = vtk.vtkRenderWindowInteractor()
rwi.SetRenderWindow(renWin)
rwi.Initialize()
rwi.Render()
rwi.Start()
```

Adiciona suporte interação na janela (mouse, teclado (w,s))

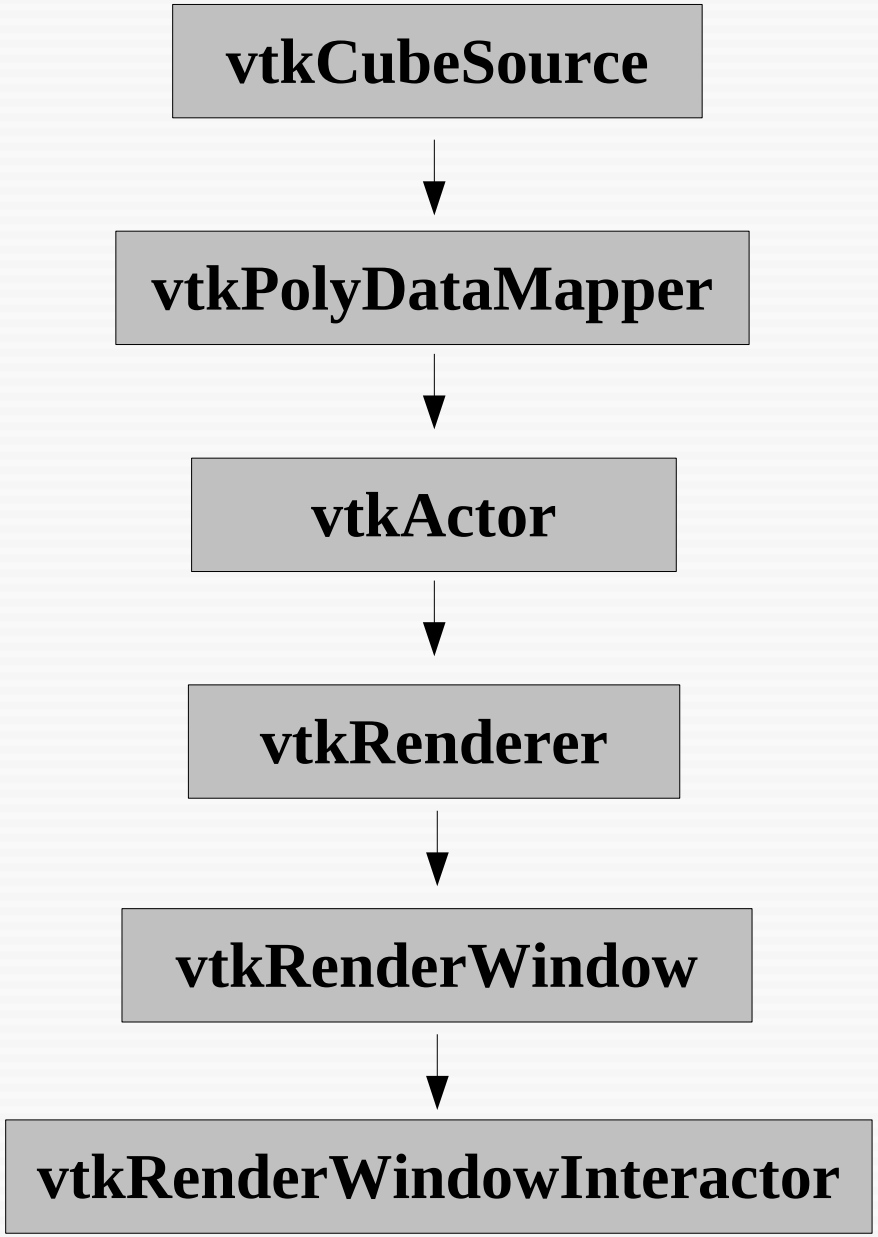
VTK

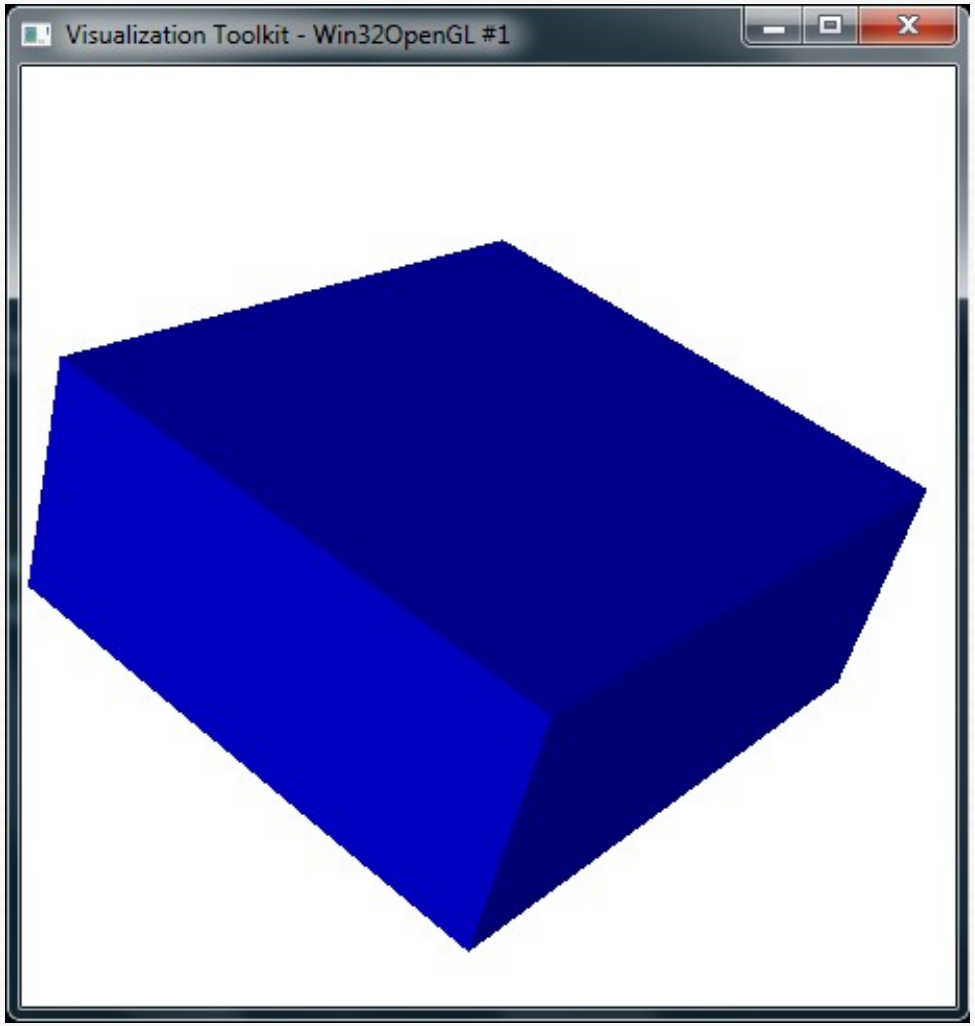


Textura

VTK

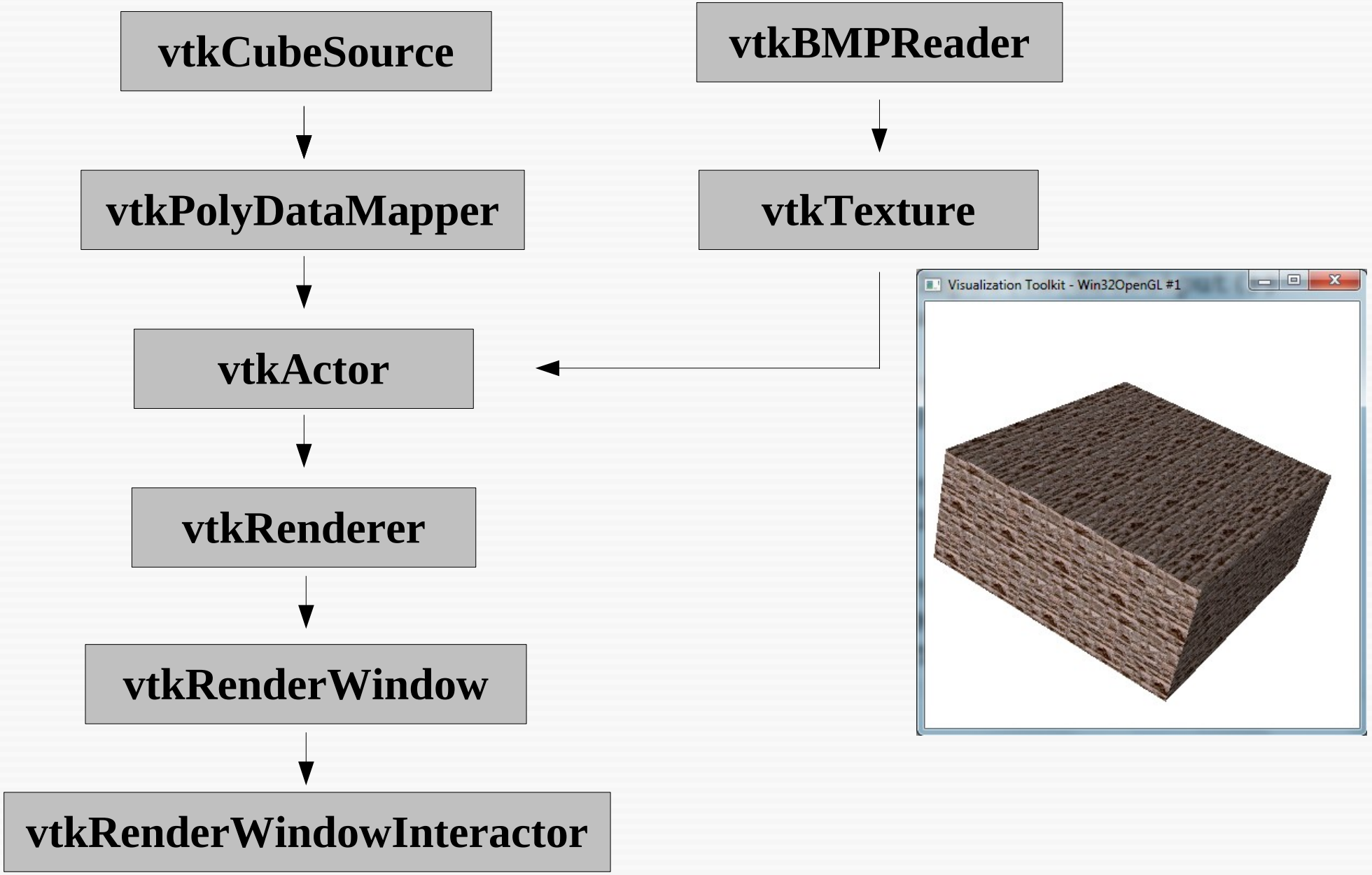
- **Mão na massa**





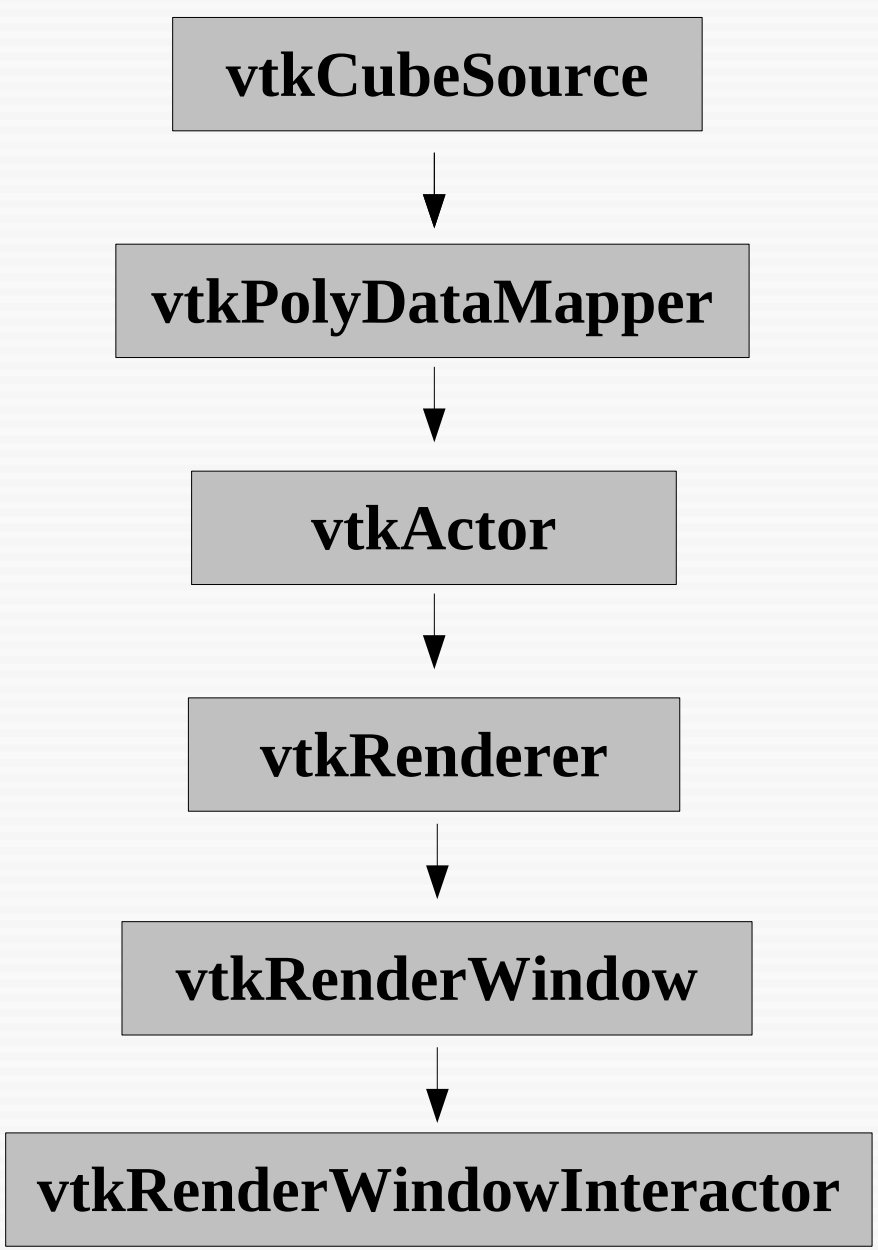
VTK

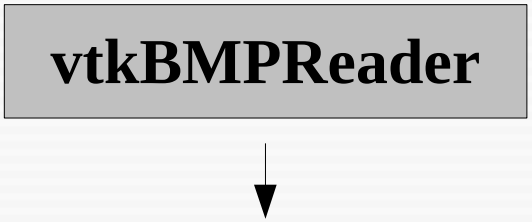
- **Mão na massa**



VTK

- **Mão na massa**

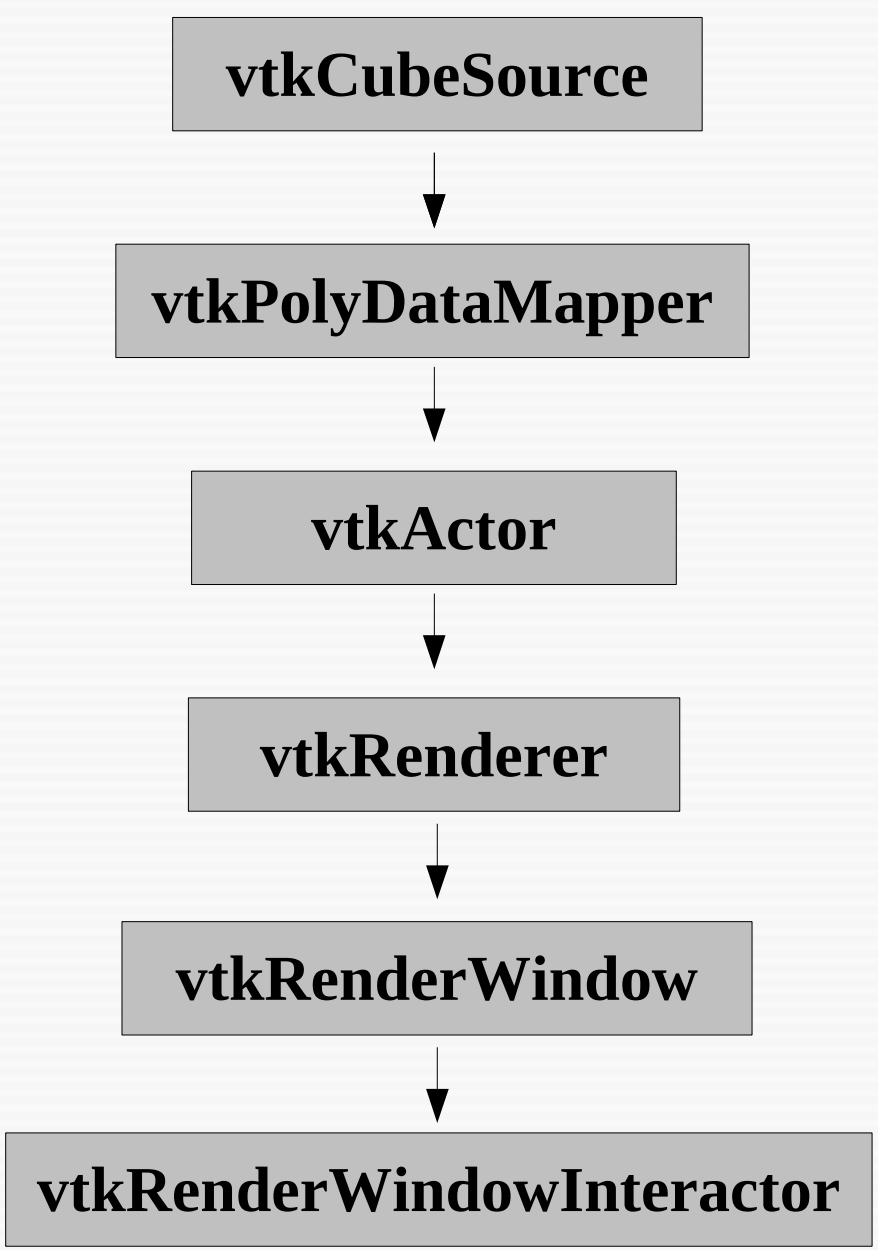


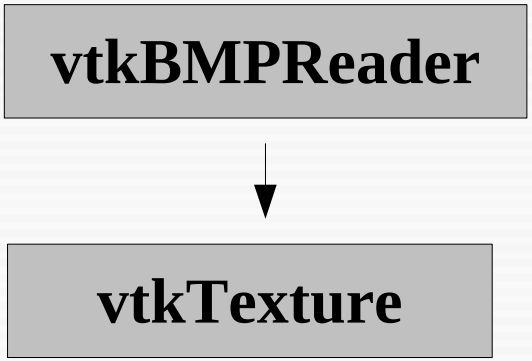



```
b = vtk.vtkBMPReader()
b.SetFileName("pedra.bmp")
```

VTK

- **Mão na massa**

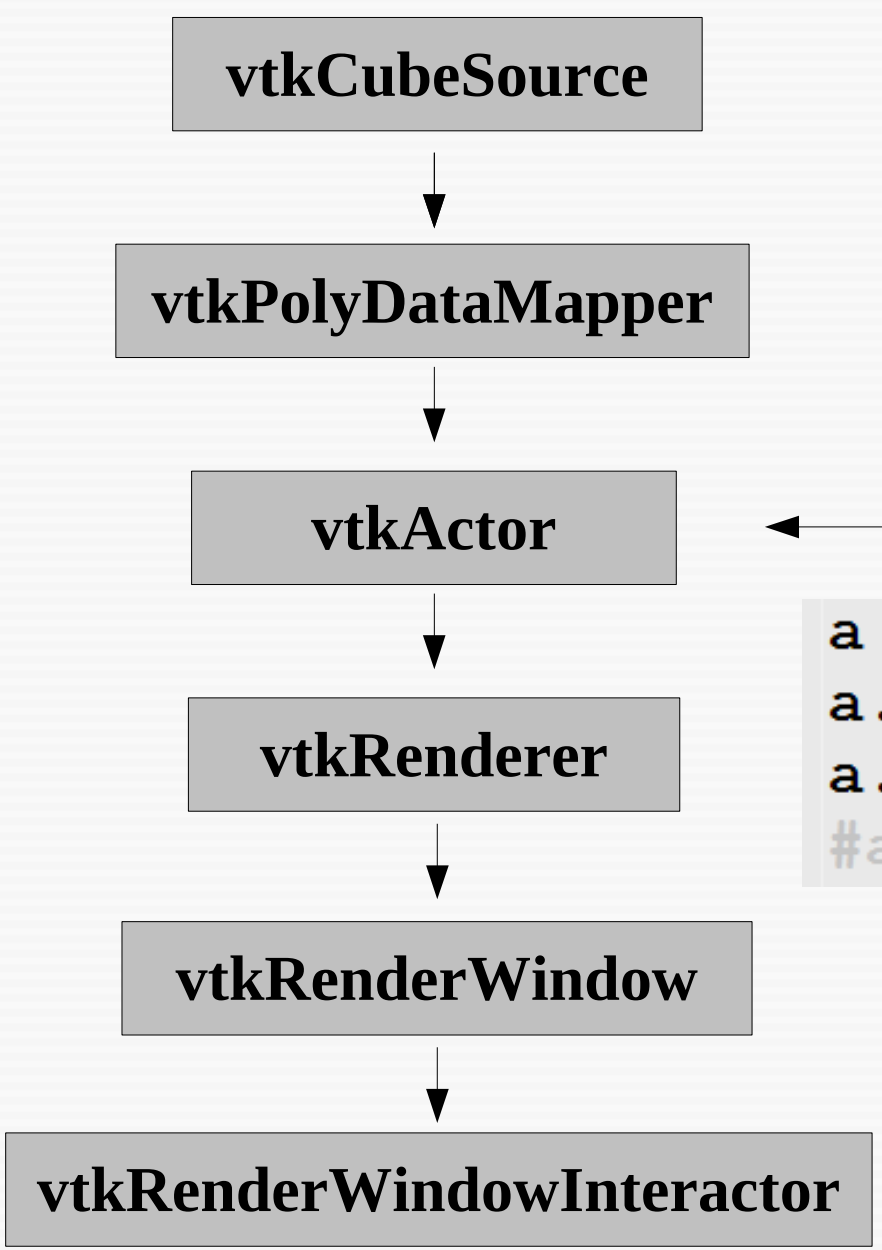





```
t = vtk.vtkTexture()
t.SetInput(b.GetOutput())
```

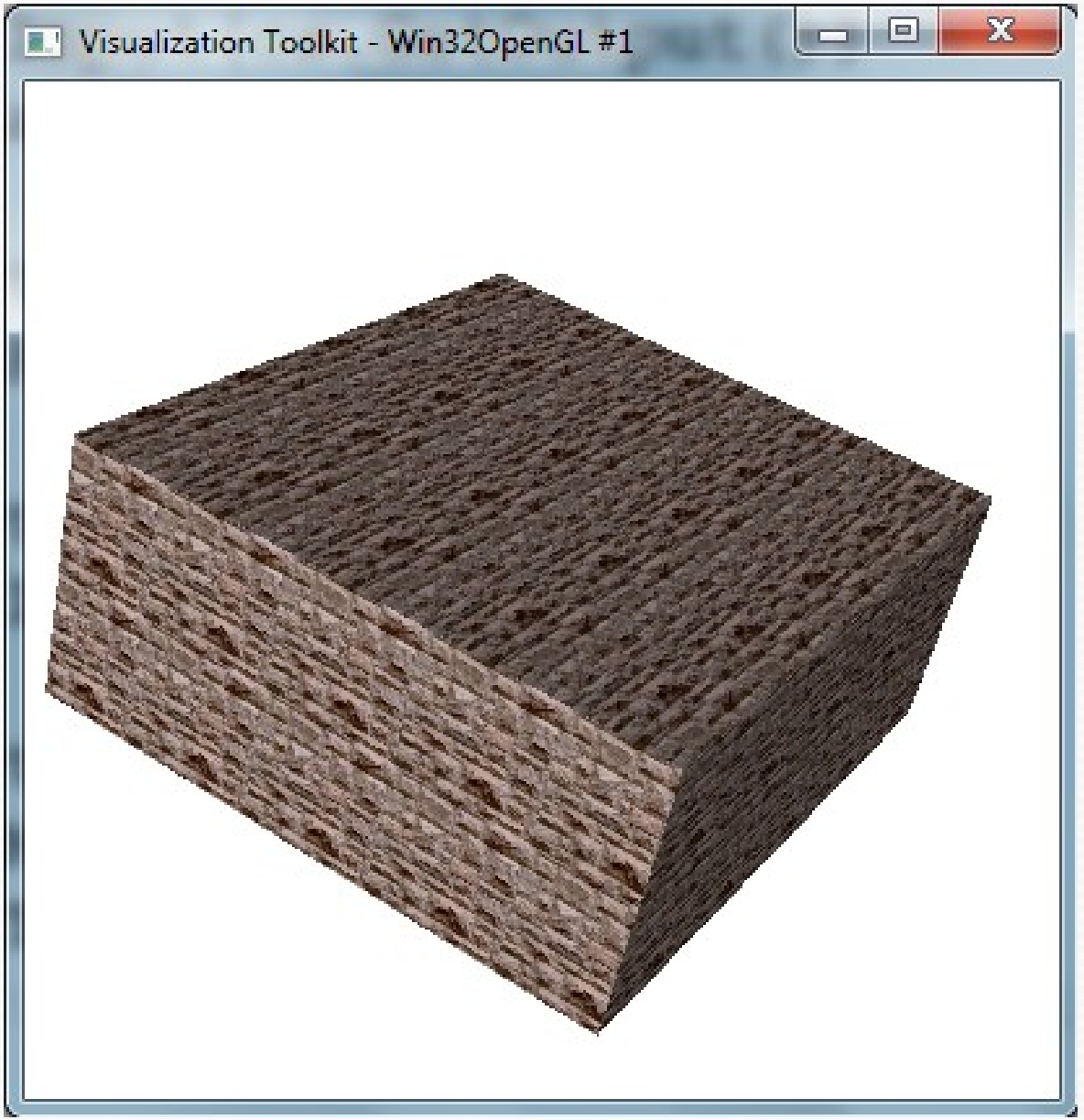
VTK

- Mão na massa




```
a = vtk.vtkActor()
a.SetMapper(m)
a.SetTexture(t)
#a.GetProperty().SetColor(0,0,1)
```

VTK

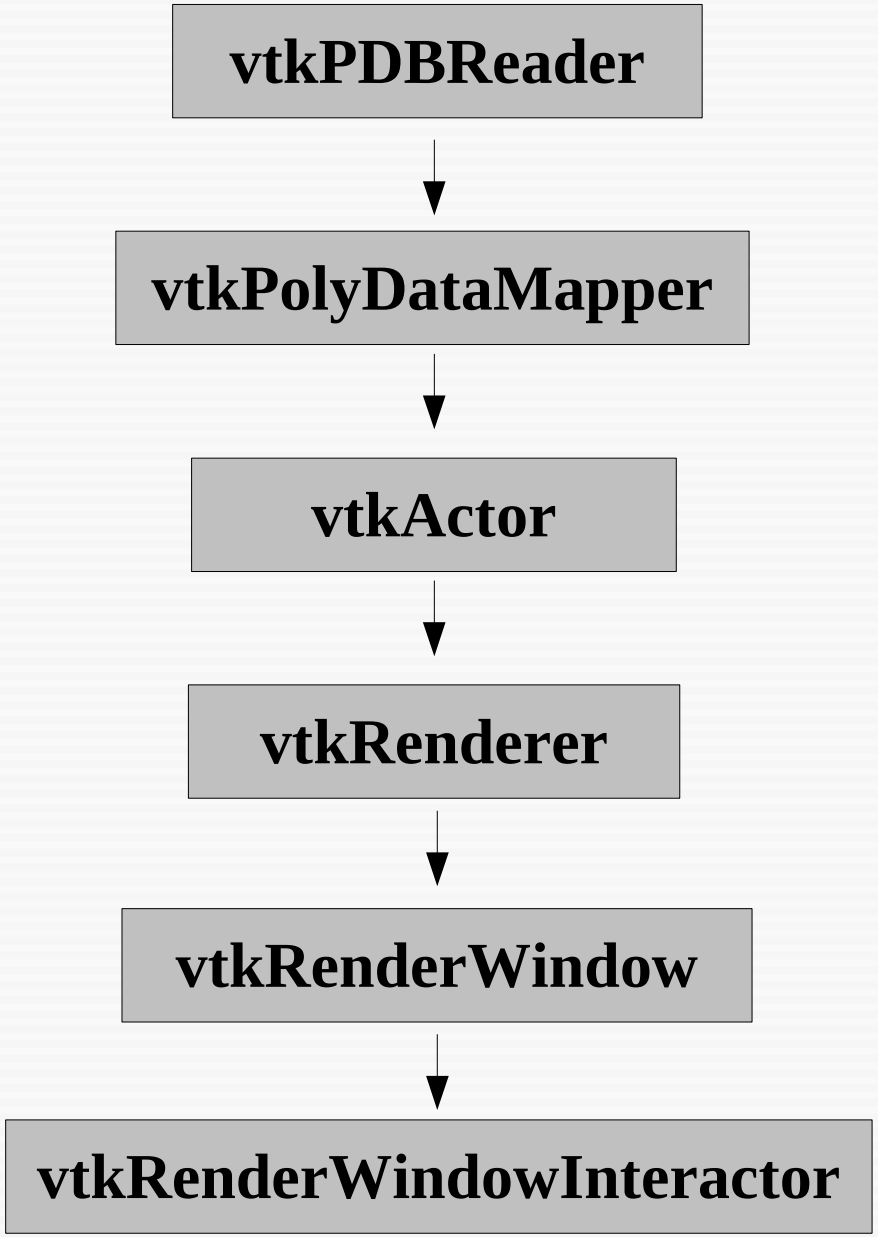


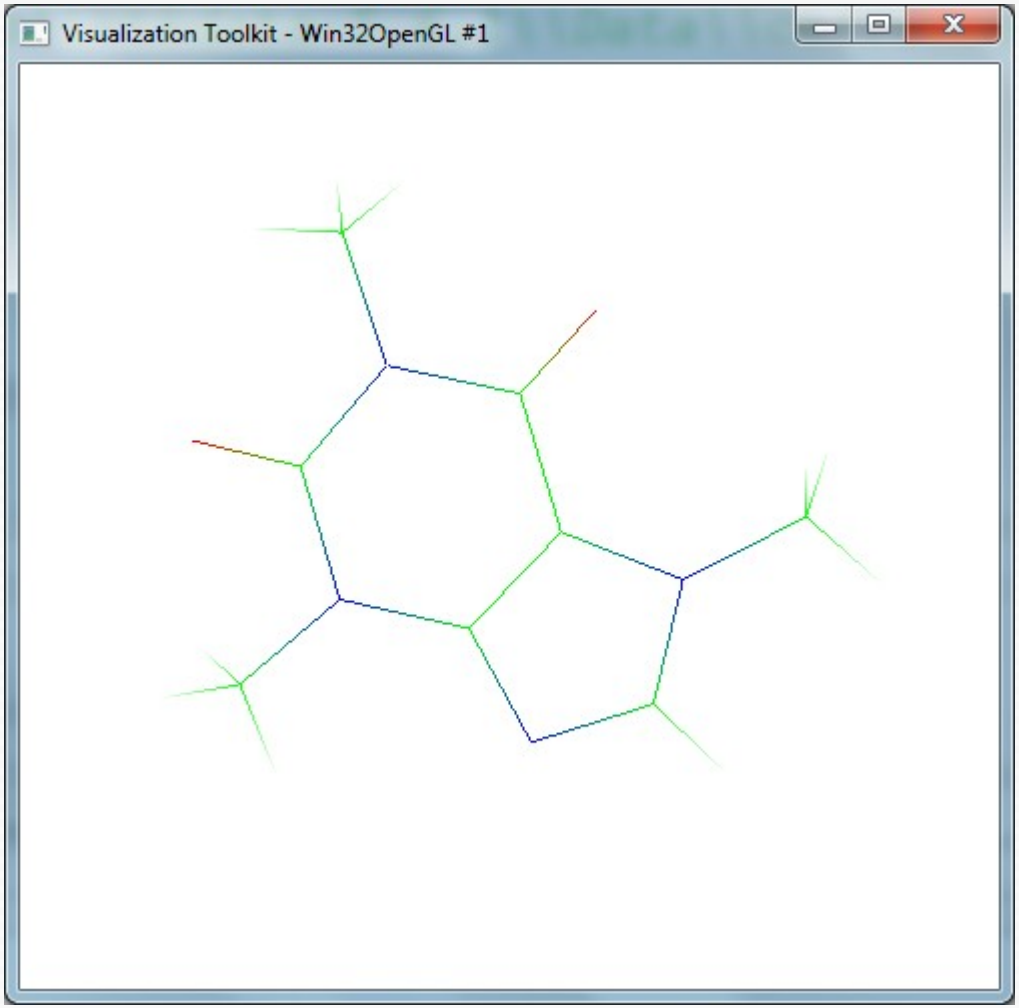
Representação Moléculas .pdb (*protein data bank*)

www.pdb.org

VTK

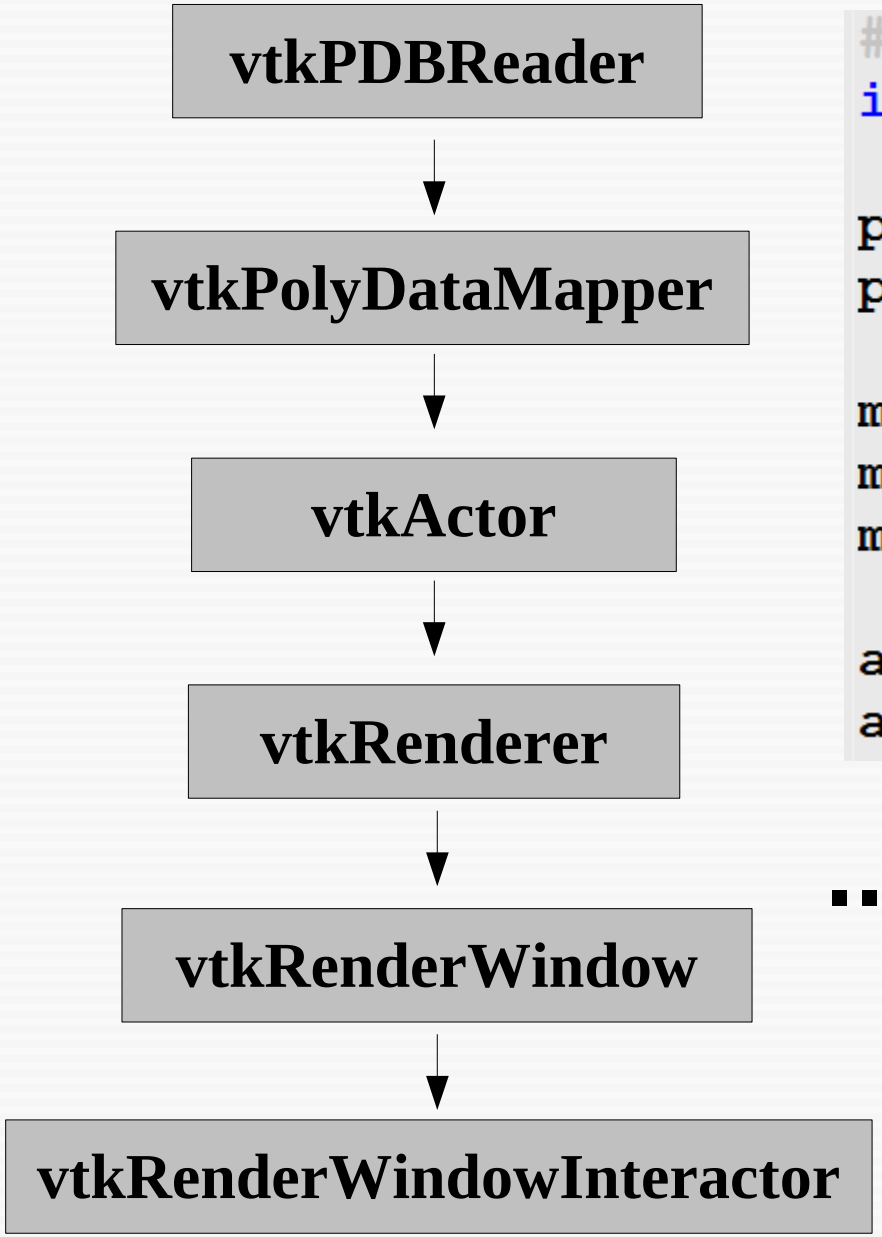
- **Mão na massa**





VTK

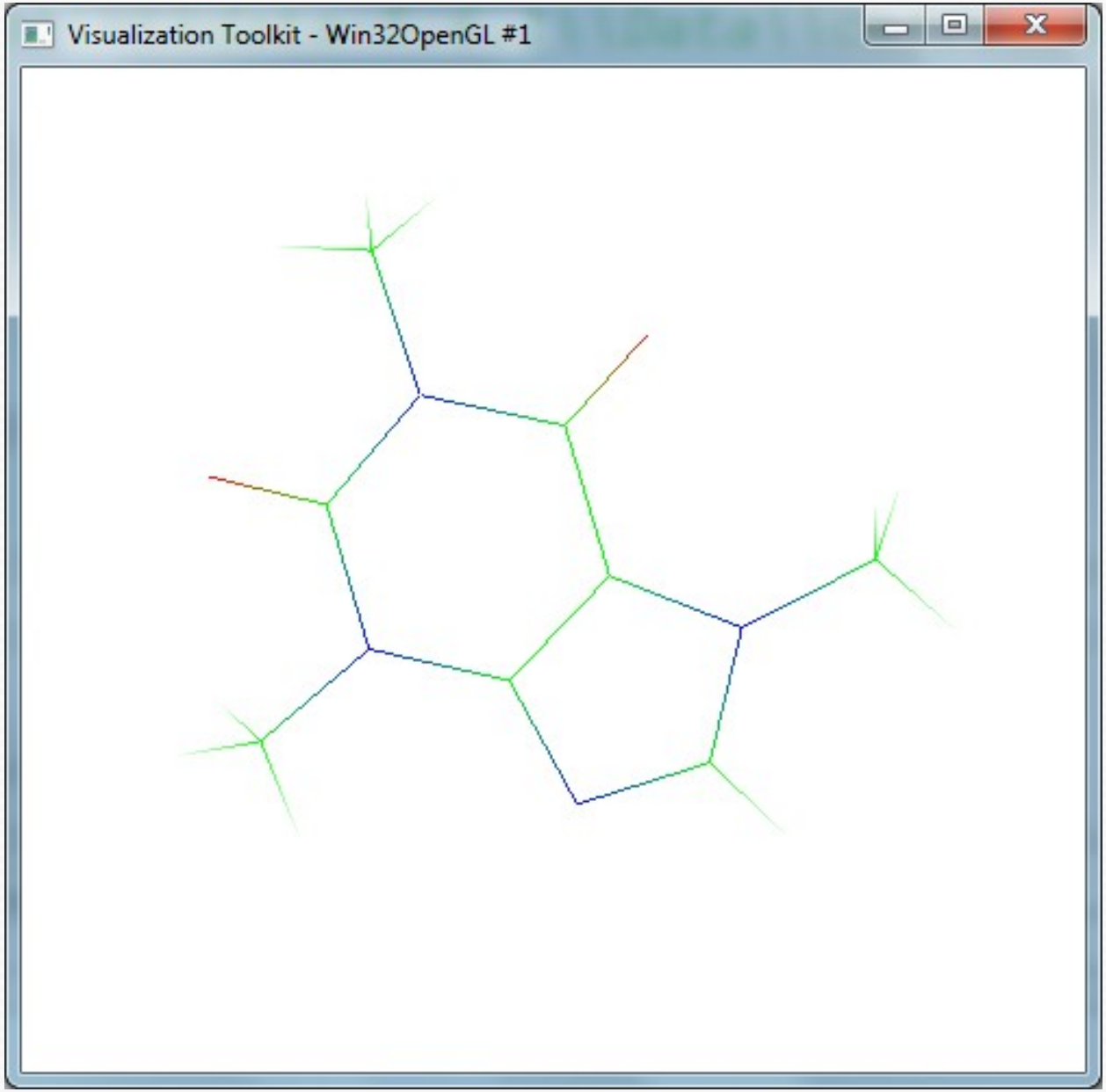
- **Mão na massa**




```
# -*- coding: cp1252 -*-
import vtk

pdb0 = vtk.vtkPDBReader()
pdb0.SetFileName("caffeine.pdb")

m = vtk.vtkPolyDataMapper()
m.SetInput(pdb0.GetOutput())
m.Update()

a = vtk.vtkActor()
a.SetMapper(m)
```

....

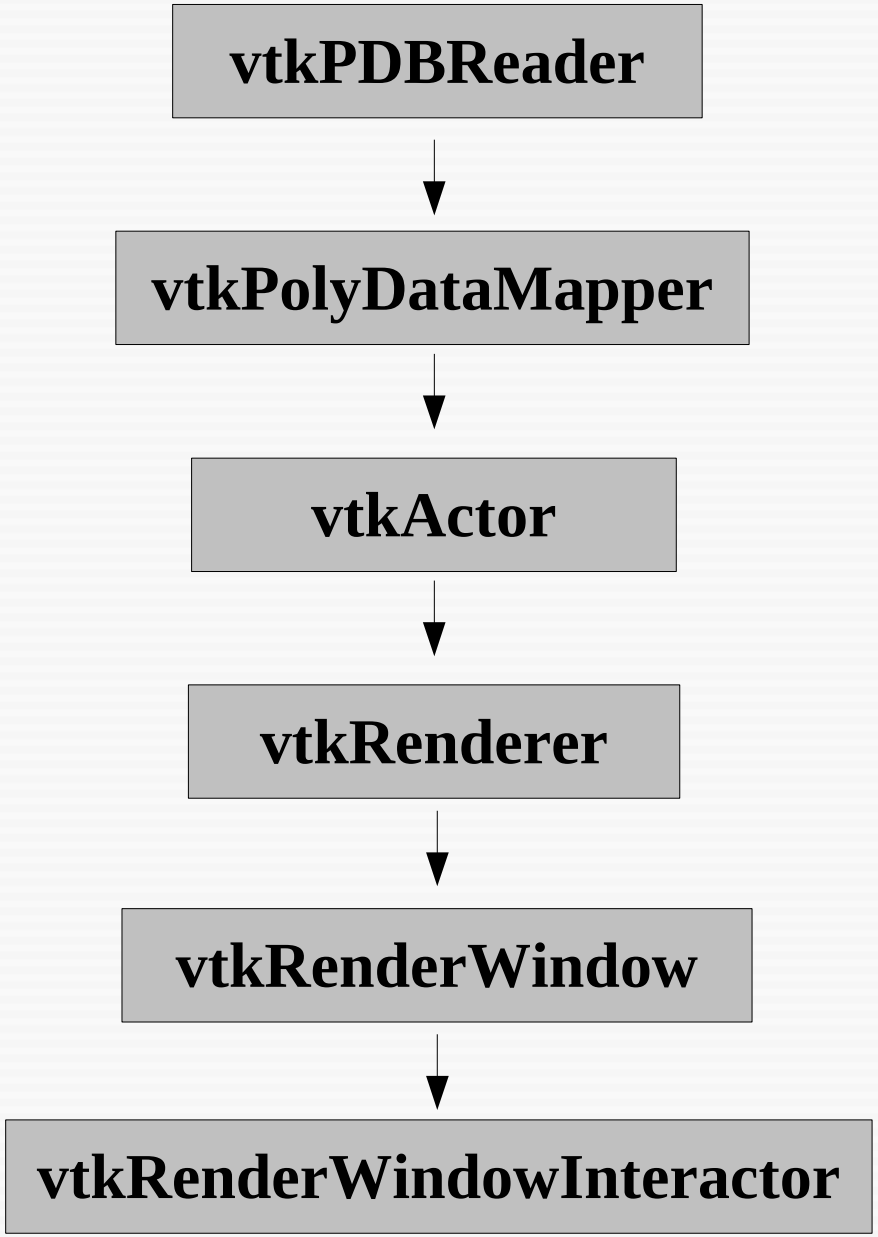
VTK

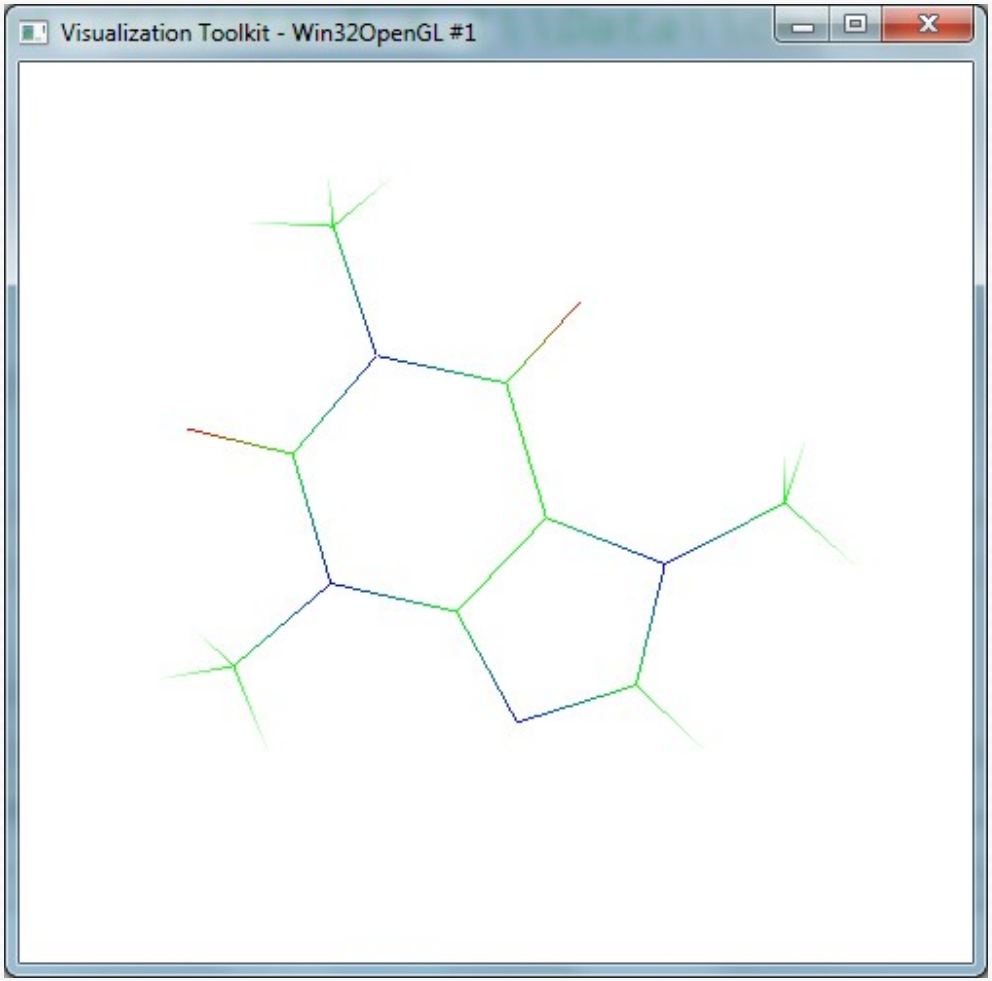


Vamos melhorar isso...

VTK

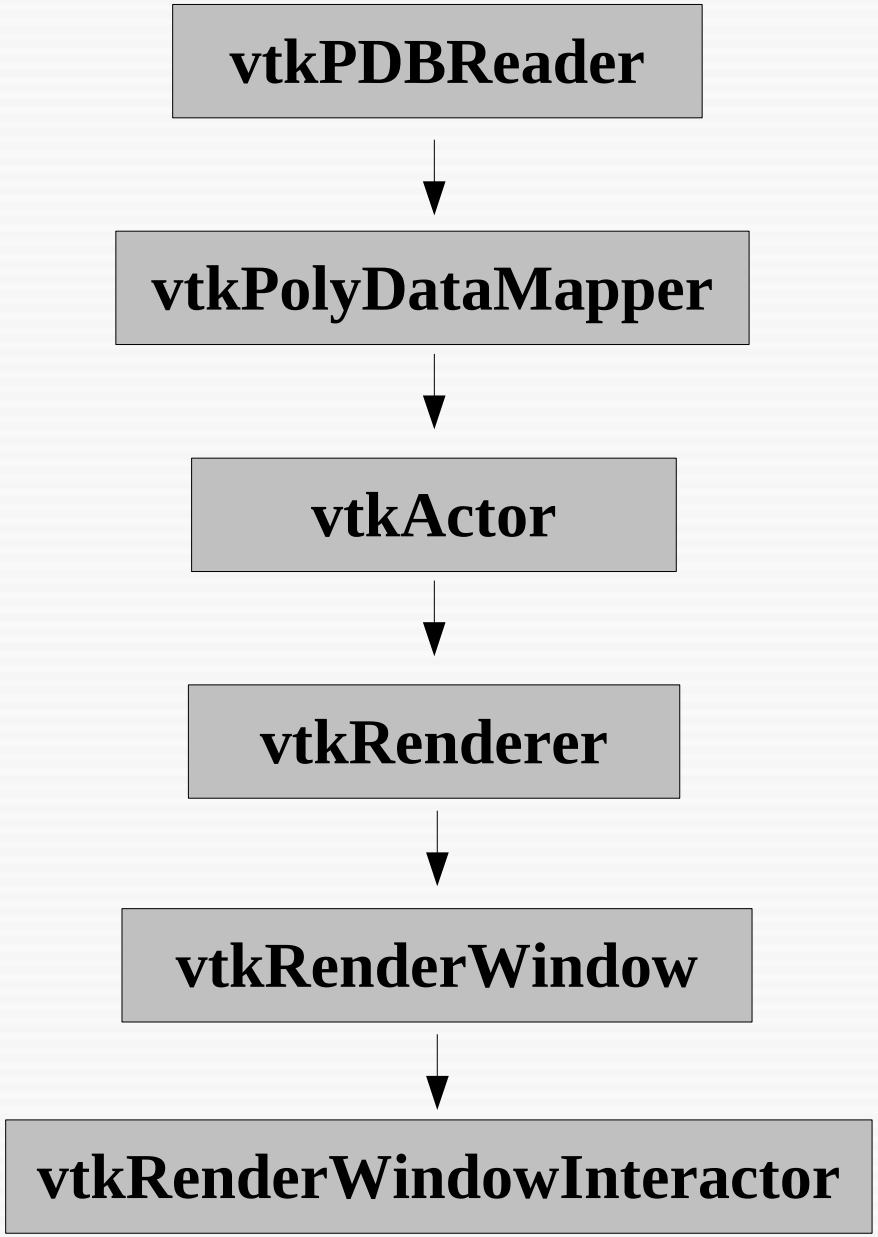
- **Mão na massa**





VTK

- **Mão na massa**

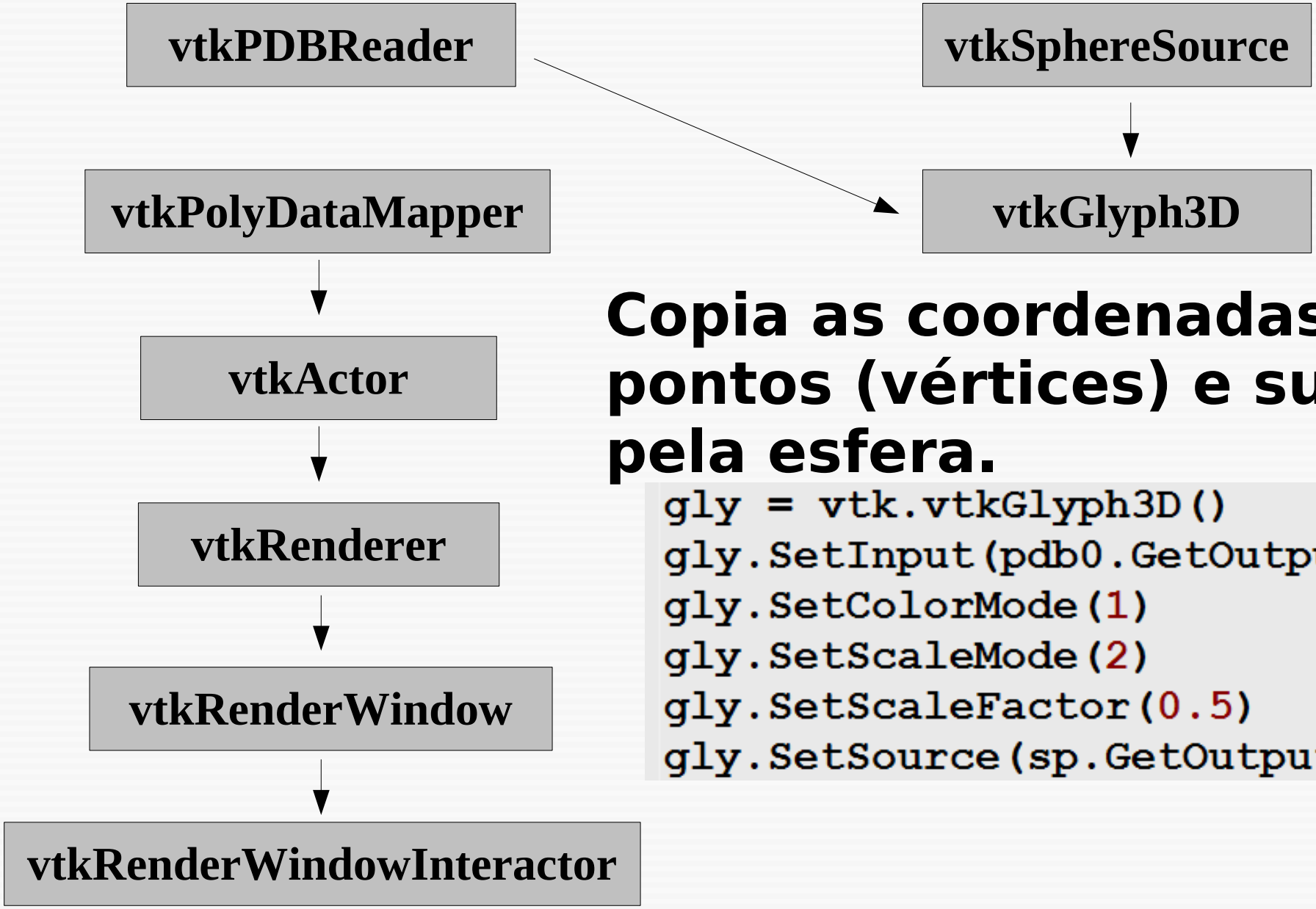


vtkSphereSource

```
sp = vtk.vtkSphereSource()
```

VTK

- **Mão na massa**

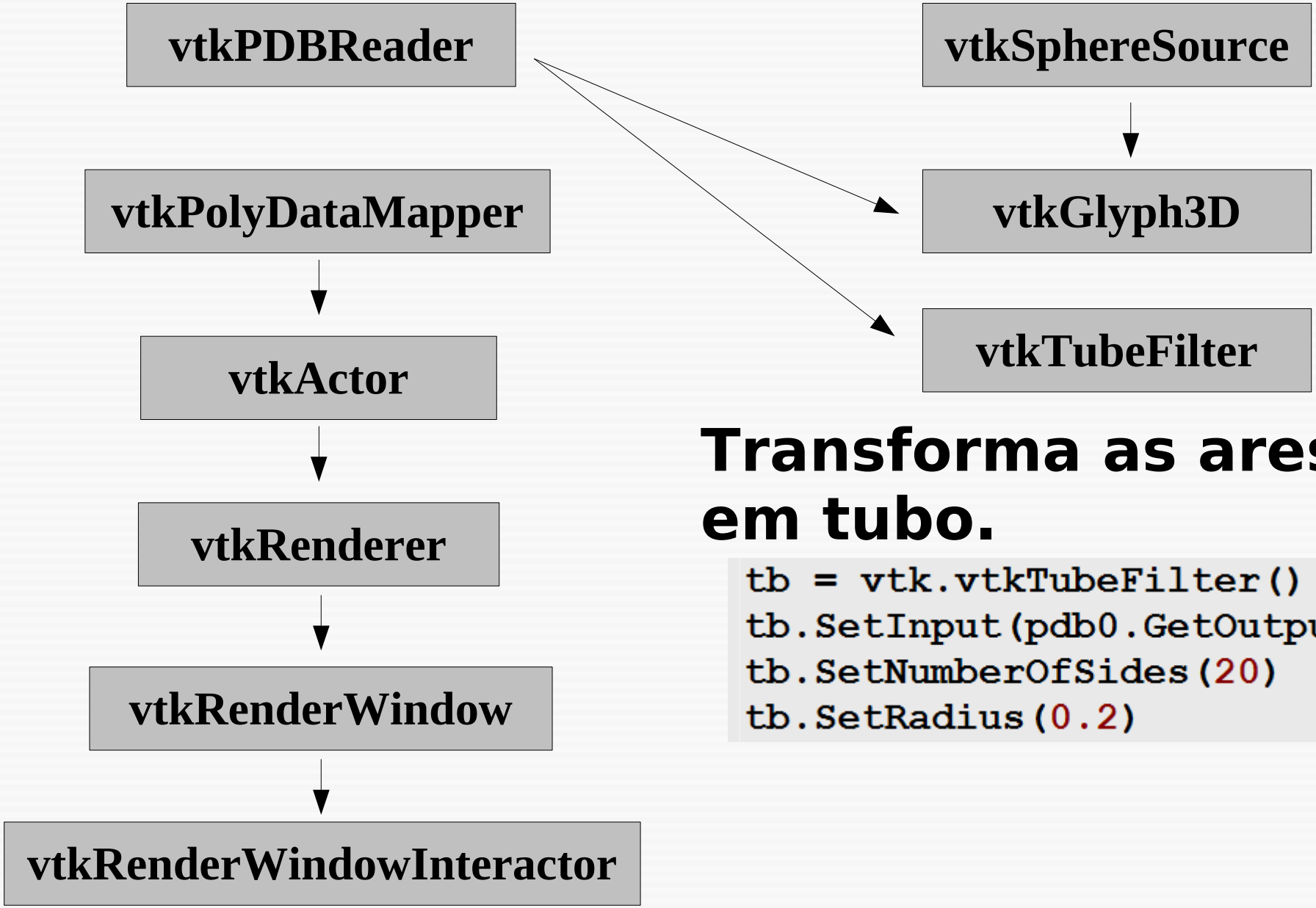


Copia as coordenadas dos pontos (vértices) e subs. pela esfera.

```
gly = vtk.vtkGlyph3D()
gly.SetInput(pdb0.GetOutput())
gly.SetColorMode(1)
gly.SetScaleMode(2)
gly.SetScaleFactor(0.5)
gly.SetSource(sp.GetOutput())
```

VTK

- **Mão na massa**

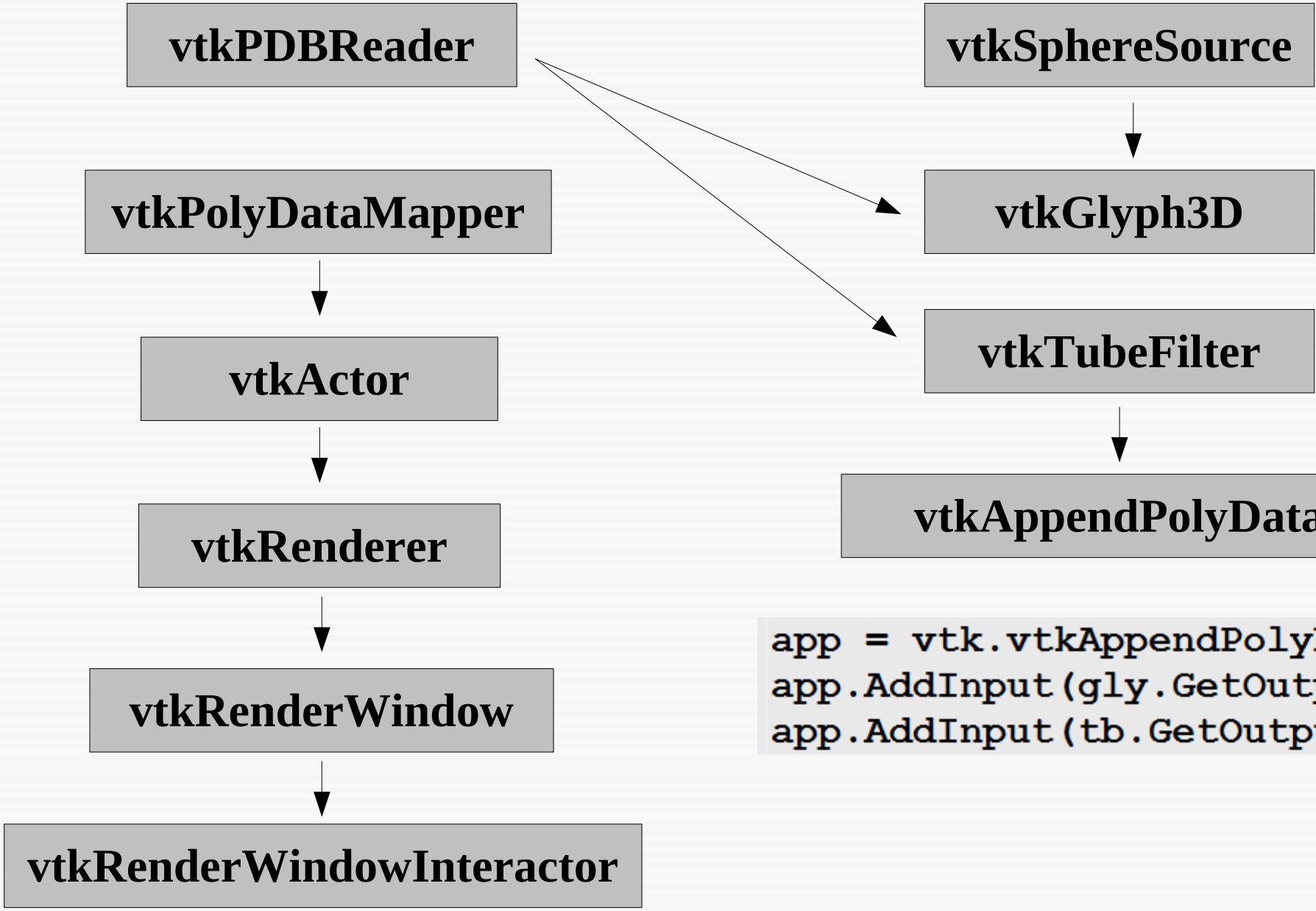


Transforma as arestas em tubo.

```
tb = vtk.vtkTubeFilter()
tb.SetInput(pdb0.GetOutput())
tb.SetNumberOfSides(20)
tb.SetRadius(0.2)
```

VTK

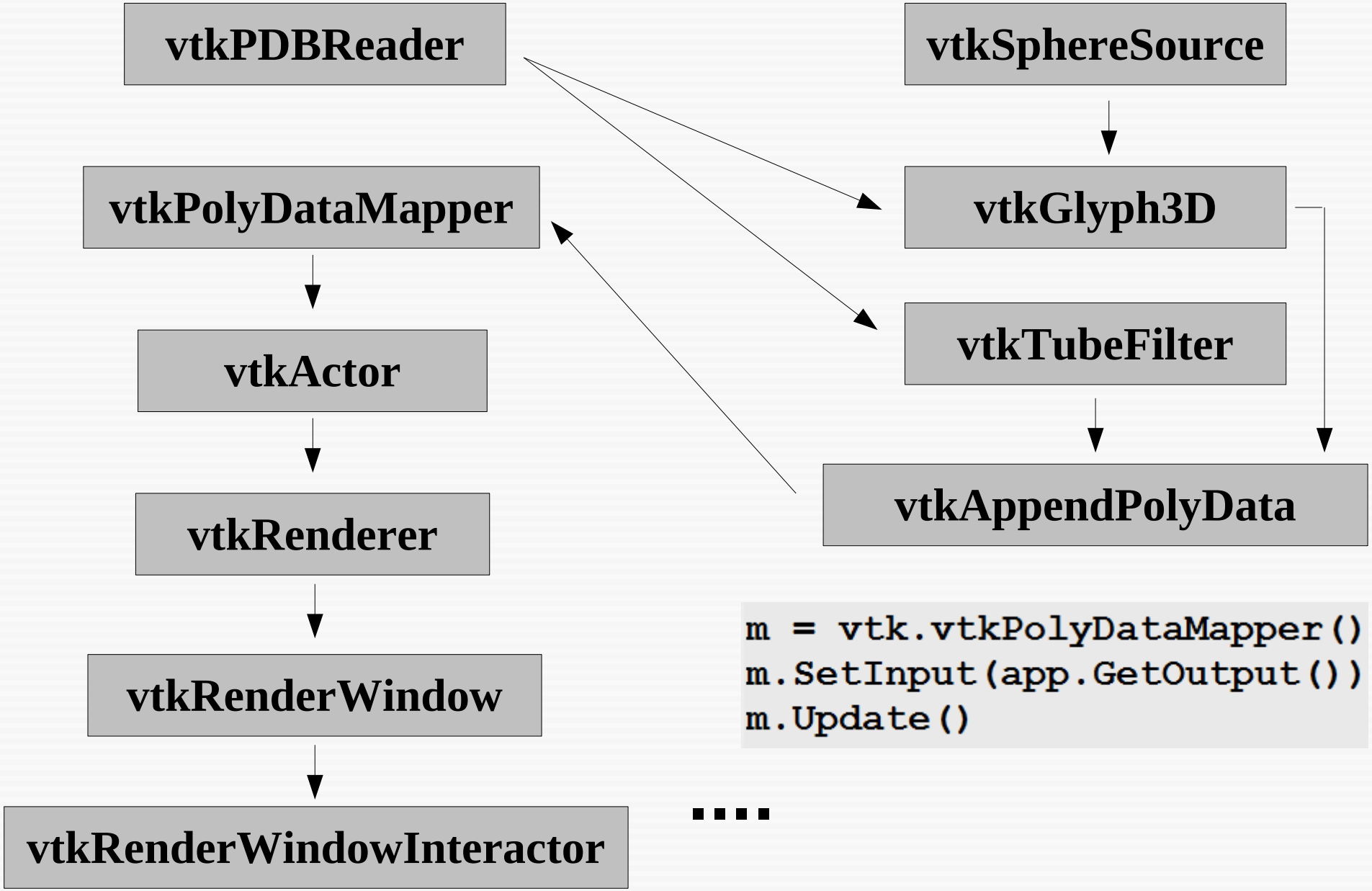
- Mão na massa




```
app = vtk.vtkAppendPolyData()
app.AddInput(gly.GetOutput())
app.AddInput(tb.GetOutput())
```

VTK

- Mão na massa

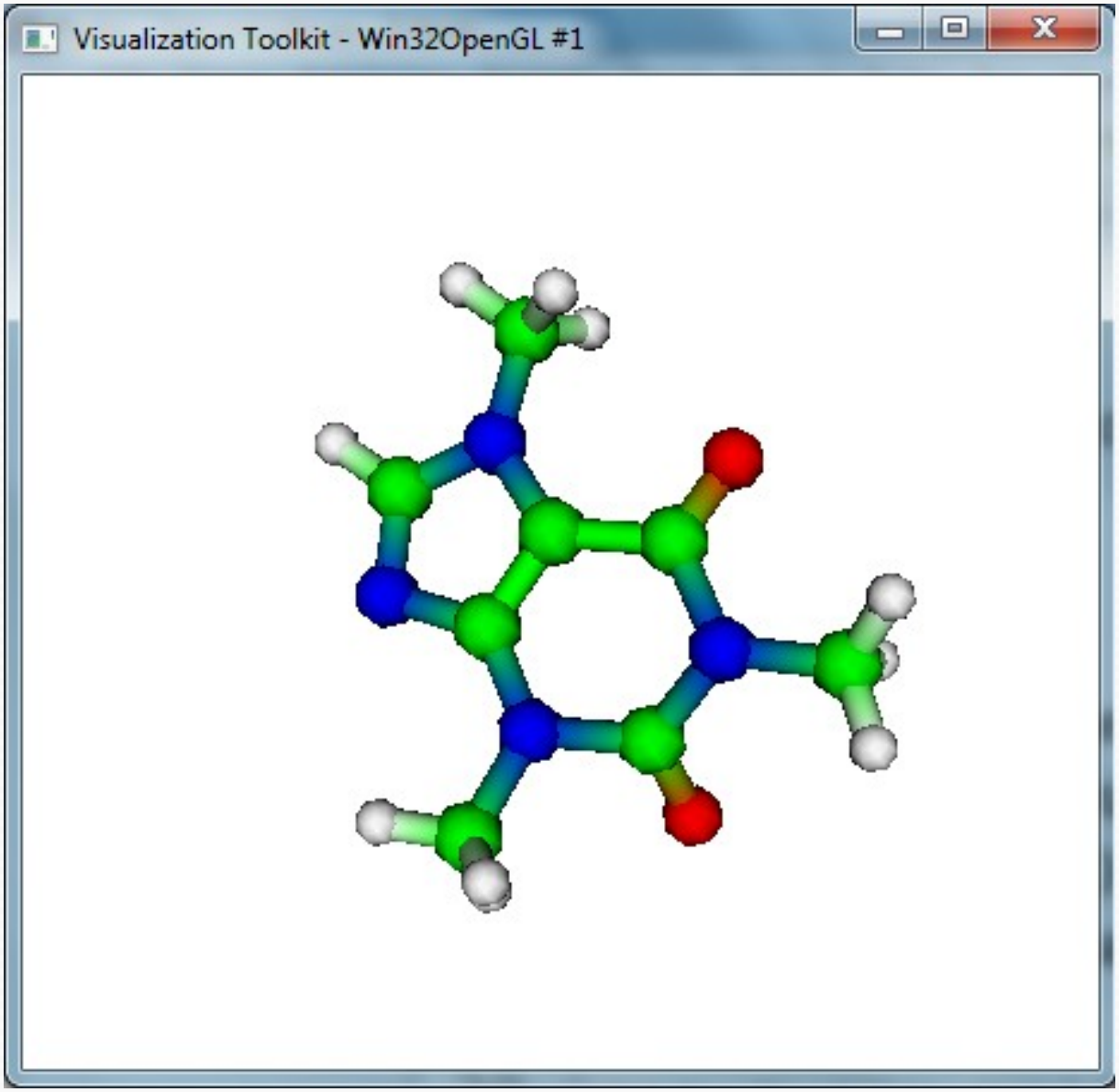



```
m = vtk.vtkPolyDataMapper()
m.SetInput(app.GetOutput())
m.Update()
```

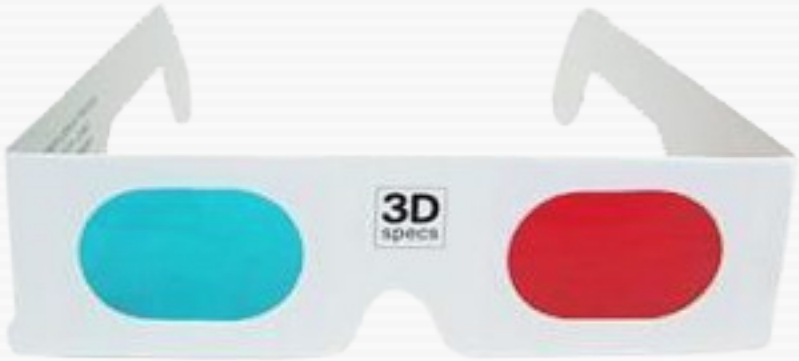
....

VTK

- **Mão na massa**

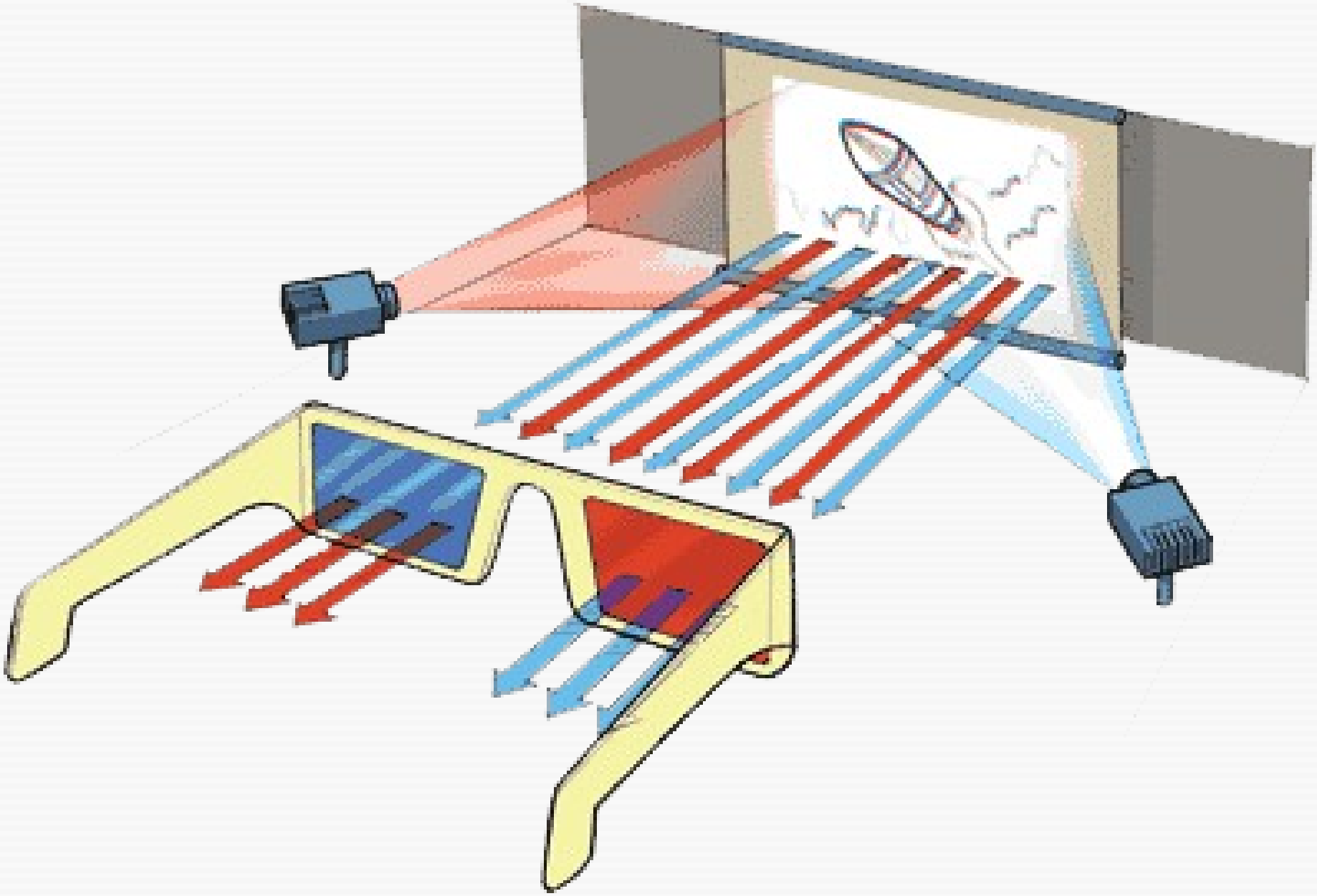


Deixando mais 3D ainda...



VTK

- **Um pouco de teoria...**



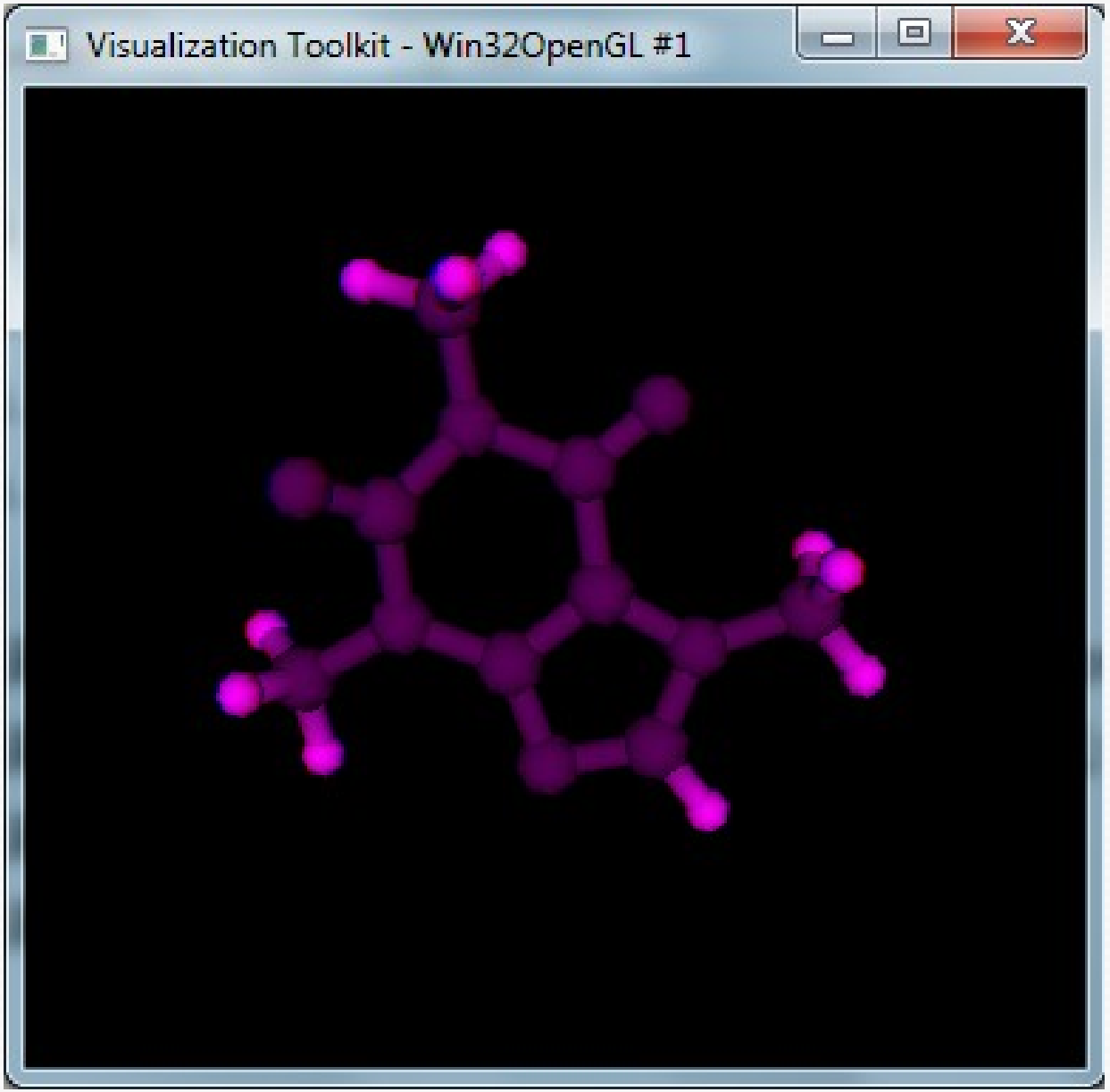
VTK

- **Mão na massa**

```
ren = vtk.vtkRenderer()
ren.SetBackground(0, 0, 0)
ren.AddActor(a)
ren.ResetCamera()

renWin = vtk.vtkRenderWindow()
renWin.SetStereoTypeToRedBlue()
renWin.StereoRenderOn()
renWin.AddRenderer(ren)
```

VTK

- **Funcionamento**



Obrigado!!!

paulojamorim@gmail.com