

24.06.2015

# ... about our beautiful geometries...

Bugsquashing Talk

Esther Wild

... and some slides (#3-10) by Bastian Graser ...

**dkfz.**

GERMAN  
CANCER RESEARCH CENTER  
IN THE HELMHOLTZ ASSOCIATION

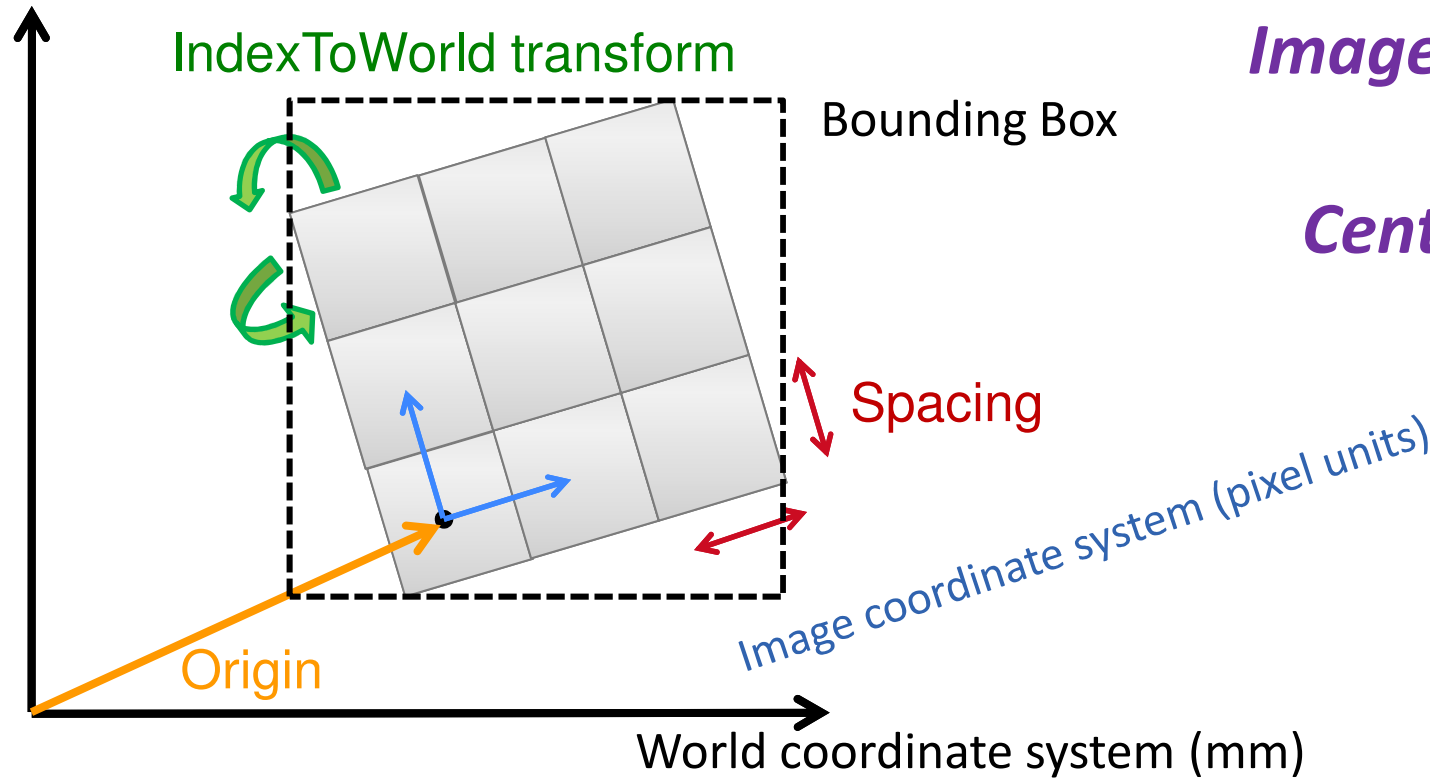


50 Years – Research for  
A Life Without Cancer

## ... about our beautiful geometries...

- Basics about geometries
- Different coordinate systems
- Trouble with 0.5
- DisplayGeometry and why we don't need it
- Funny Rotated Geometries

# Why are geometries so complicated?

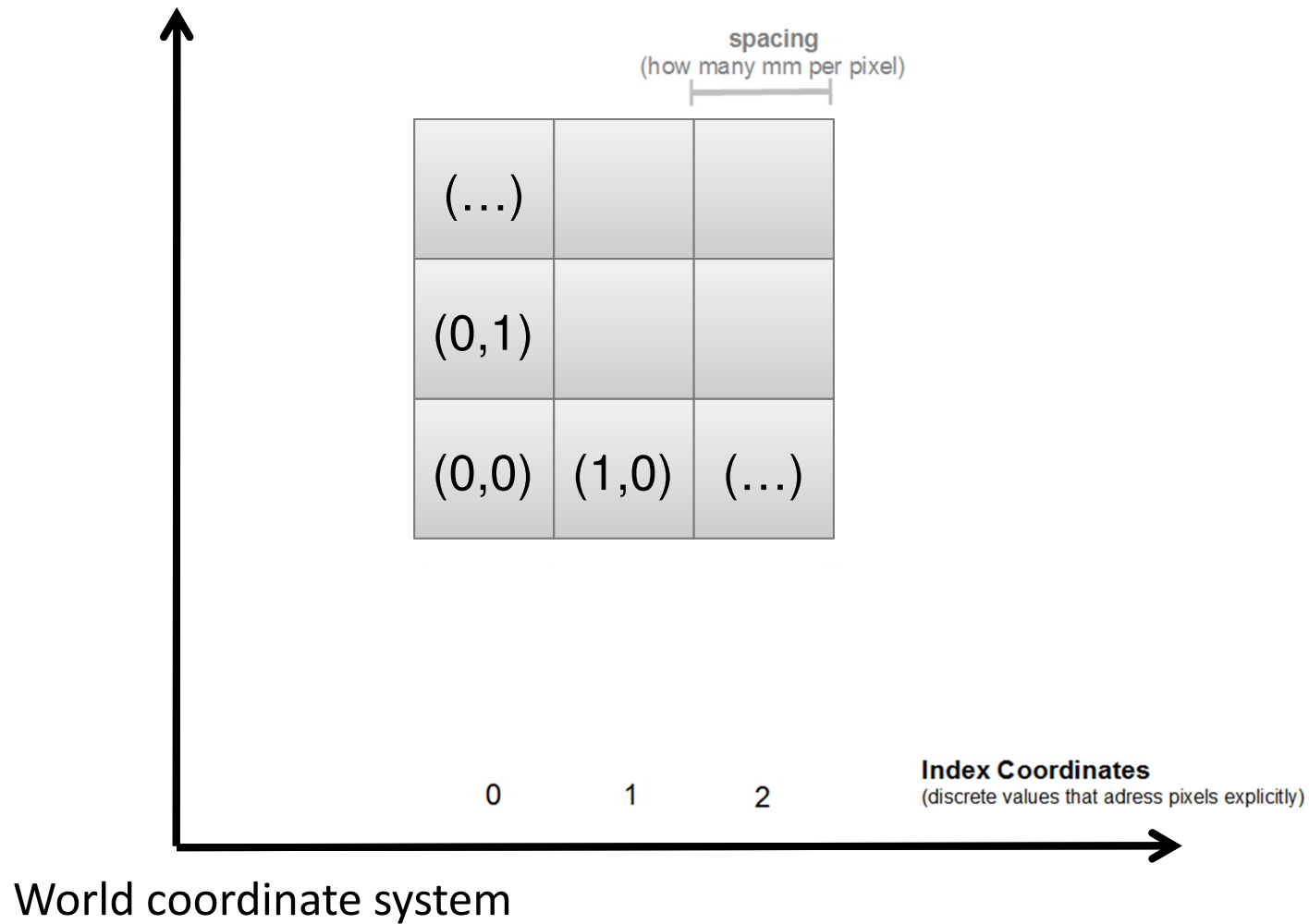


- ITK (image calculations) vs. VTK (rendering)
- Different handling of origin and transformations
- Always use Set-methods to change the geometries!

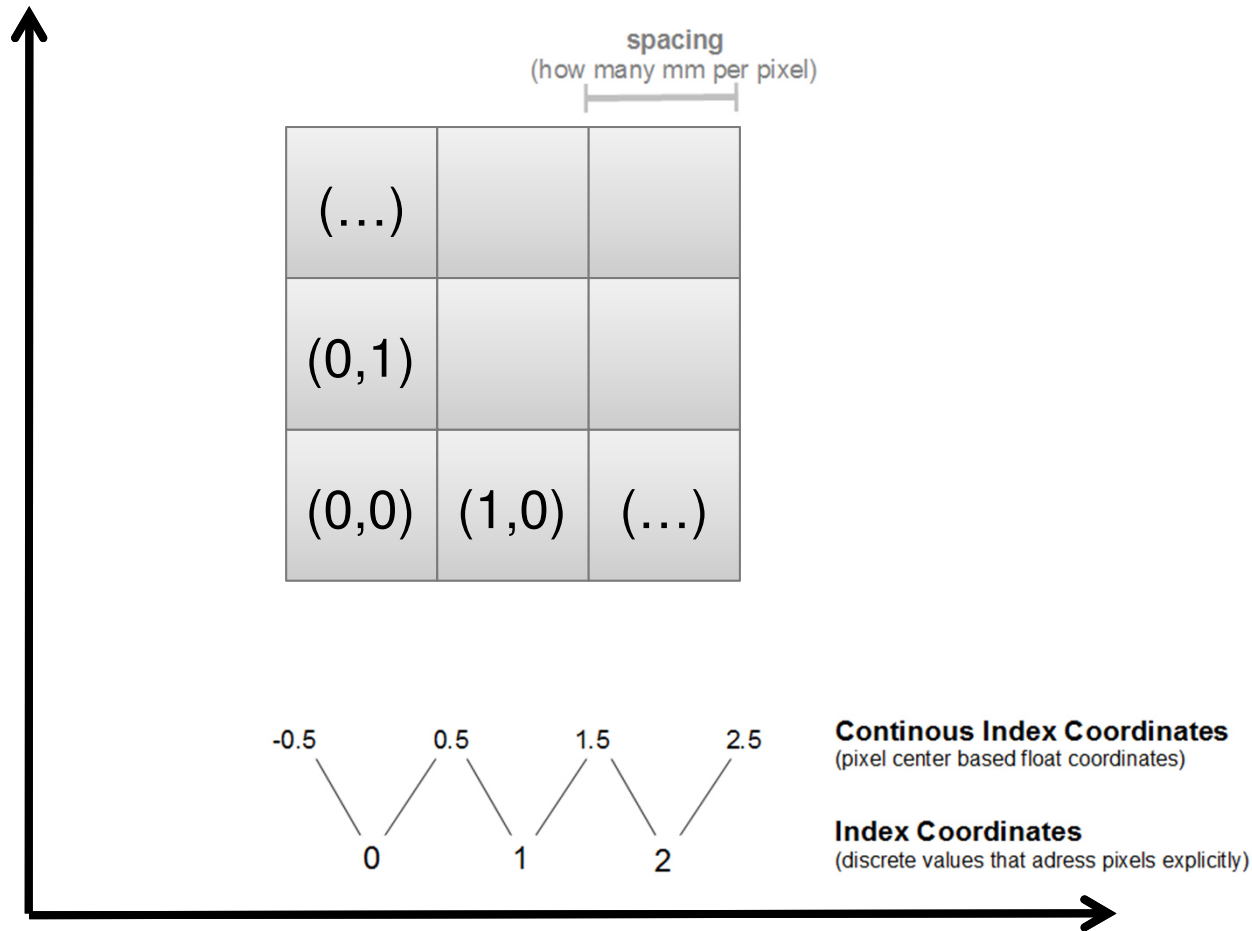
## ... about our beautiful geometries...

- Basics about geometries
- Different coordinate systems
- Trouble with 0.5
- DisplayGeometry and why we don't need it
- Funny Rotated Geometries

# Why are there different coordinate systems?

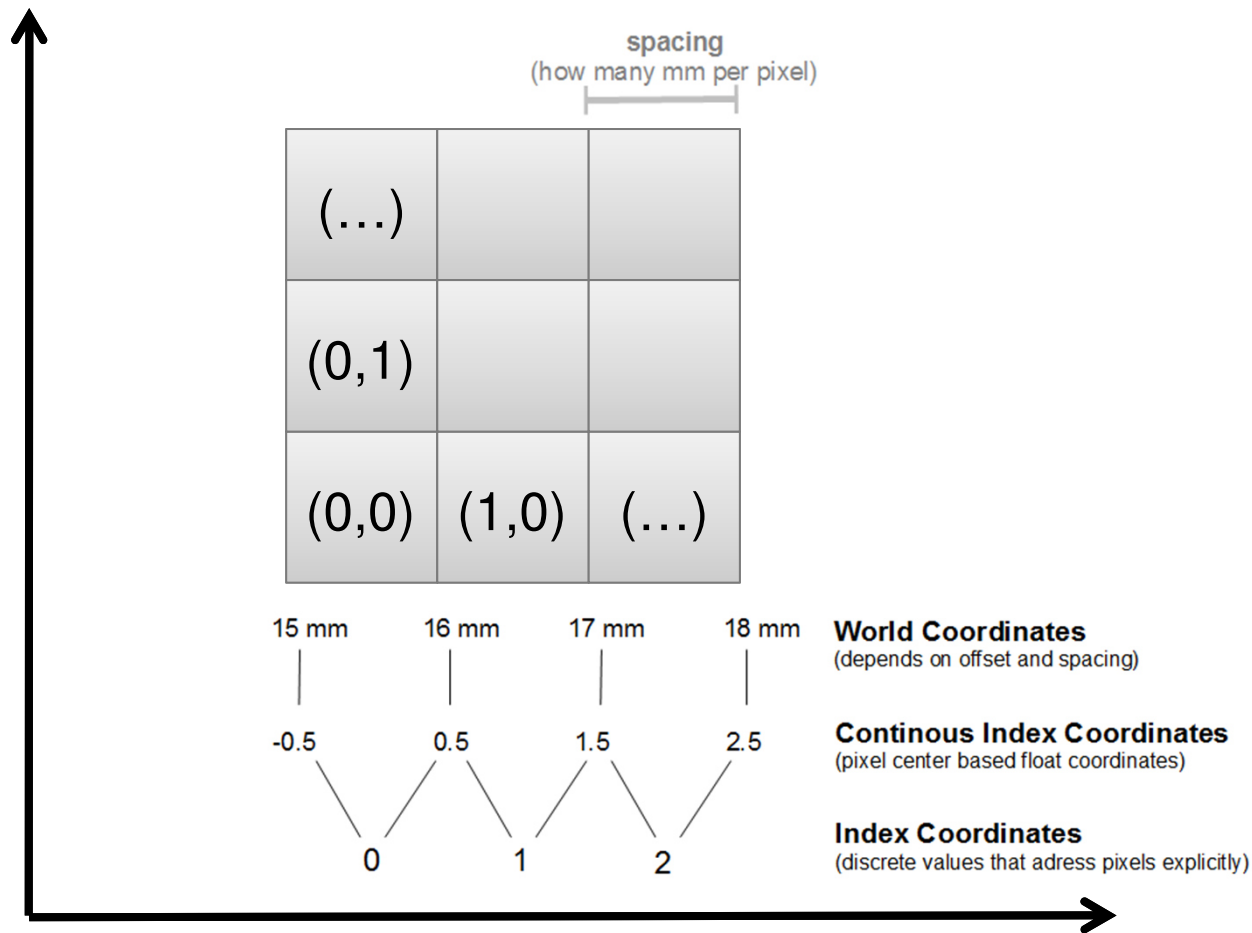


# Why are there different coordinate systems?



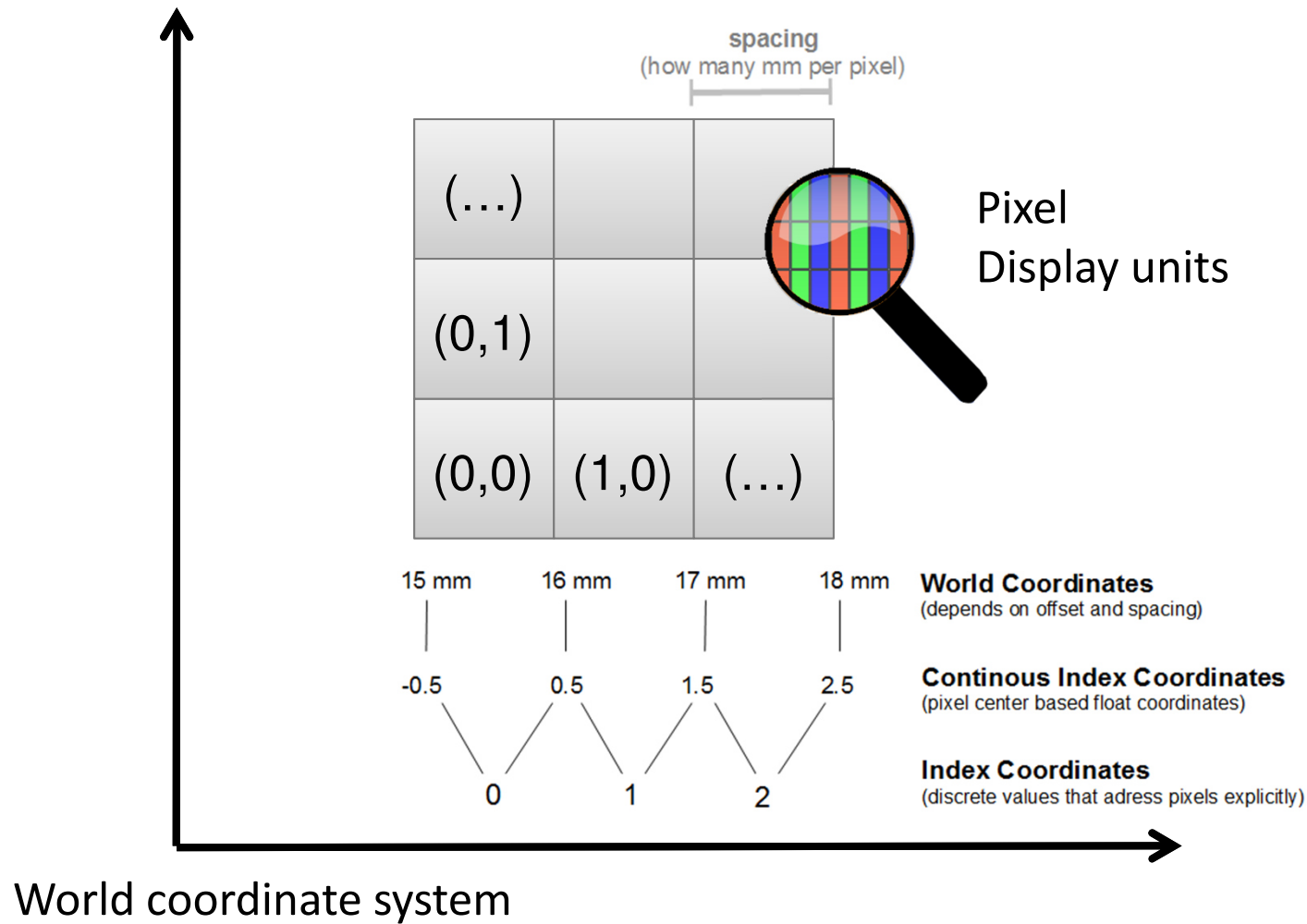
World coordinate system

# Why are there different coordinate systems?



World coordinate system

# Why are there different coordinate systems?



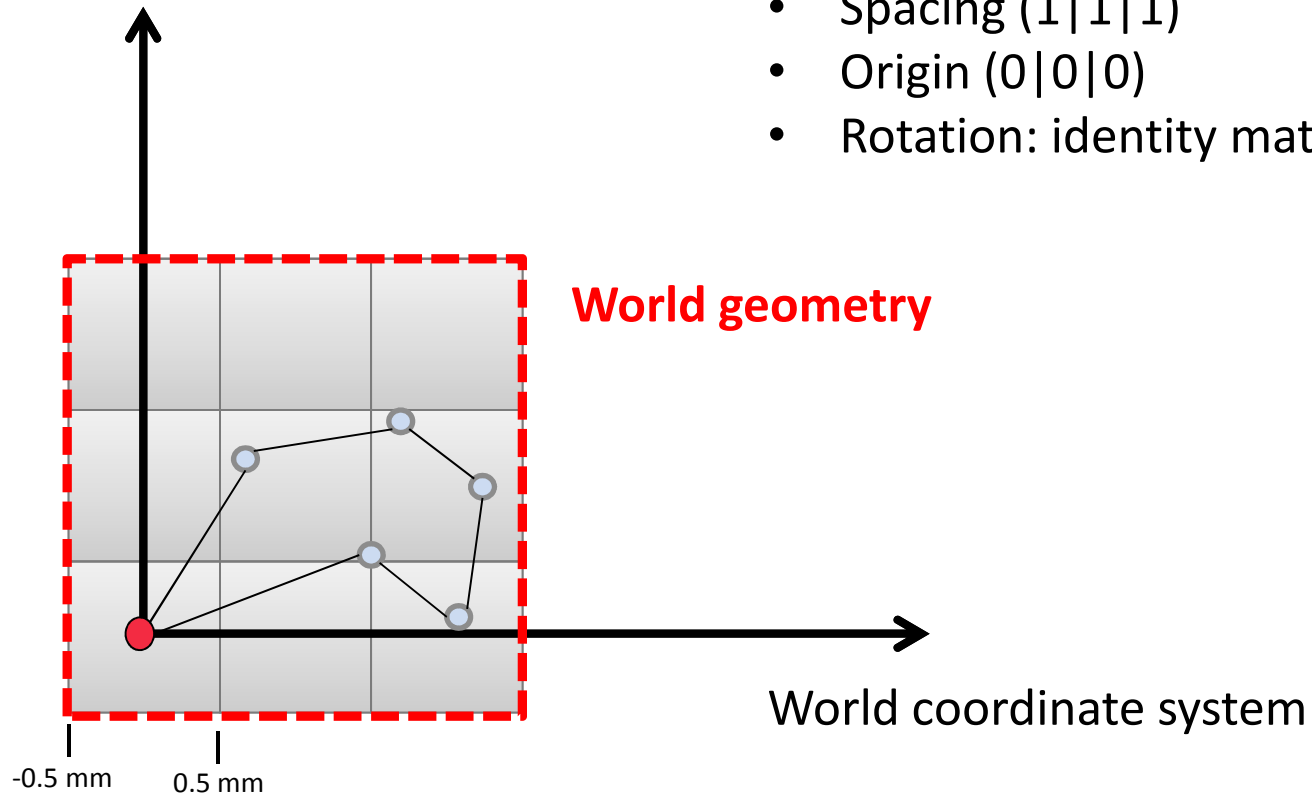


## ... about our beautiful geometries...

- Basics about geometries
- Different coordinate systems
- **Trouble with 0.5**
- DisplayGeometry and why we don't need it
- Funny Rotated Geometries

## Why do we have troubles with 0.5?

- Spacing (1|1|1)
- Origin (0|0|0)
- Rotation: identity matrix

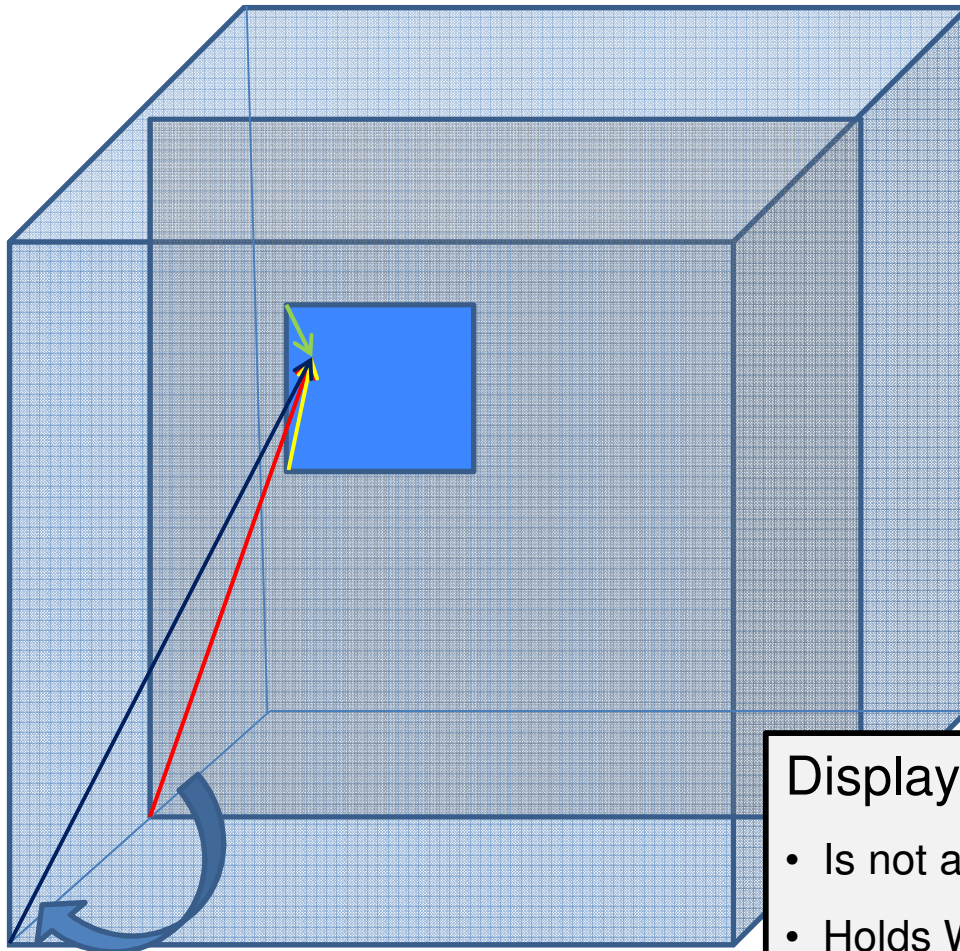


- Images are center-based
- For Pointsets, Meshes, etc... corner-based and center-based is the same
- The World geometry is corner-based
- ITK and DICOM is center based
- VTK is corner based

## ... about our beautiful geometries...

- Basics about geometries
- Different coordinate systems
- Trouble with 0.5
- **DisplayGeometry** and why we don't need it
- Funny Rotated Geometries

# What happens when I click in a render window with all coordinates?



IndexToWorldTransform  
of WorldPlaneGeometry



Imaging volume



Selected plane  
(WorldPlaneGeometry)



Render window



QT window coordinates



Display coordinates  
(displayPos in QmitkRenderWindow)



2D plane coordinates



World coordinates

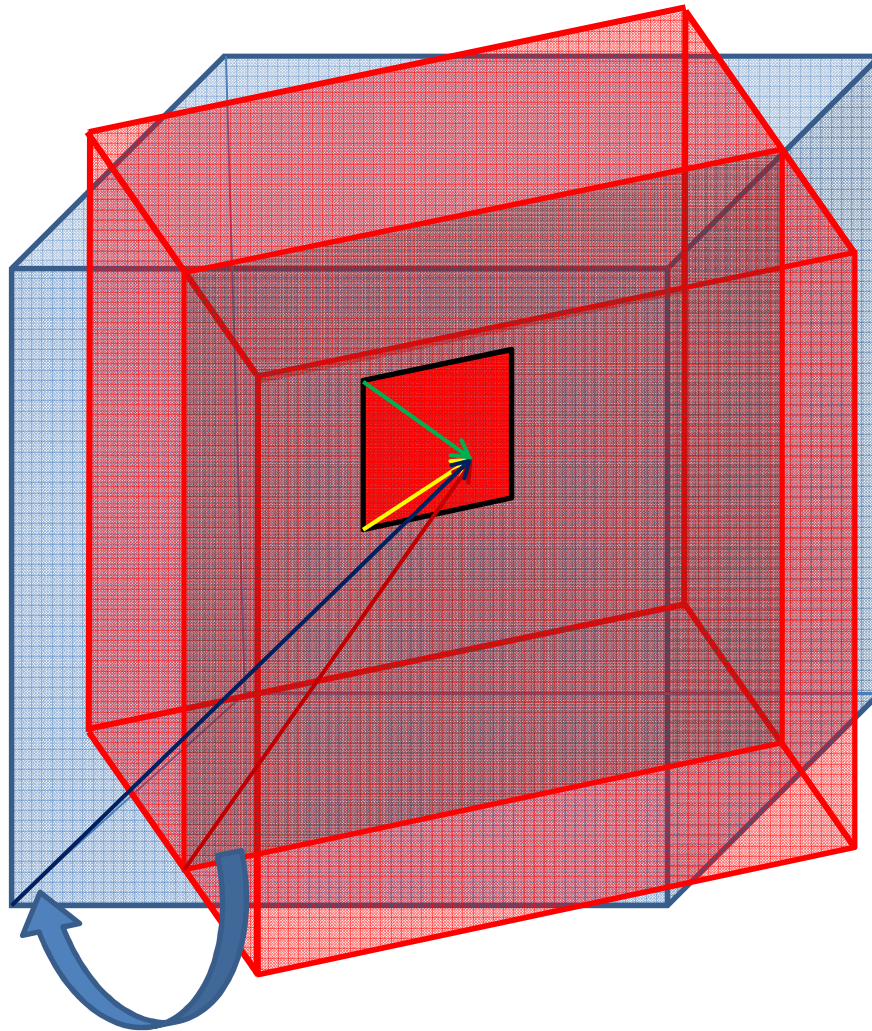
## Display Geometry:

- Is not a geometry!
- Holds WorldPlaneGeometry  
→ Is also available in BaseRenderer
- Converts Display coord. in 2D plane coordinates  
→ Can be done by vtk Camera

## ... about our beautiful geometries...

- Basics about geometries
- Different coordinate systems
- Trouble with 0.5
- DisplayGeometry and why we don't need it
- **Funny Rotated Geometries**

# ... and if I rotate the planes...?



IndexToWorldTransform  
of WorldPlaneGeometry



Imaging volume



Rotated volume



Selected plane  
(WorldPlaneGeometry)



Render window



QT window coordinates



Display coordinates  
(displayPos in QmitkRenderWindow)

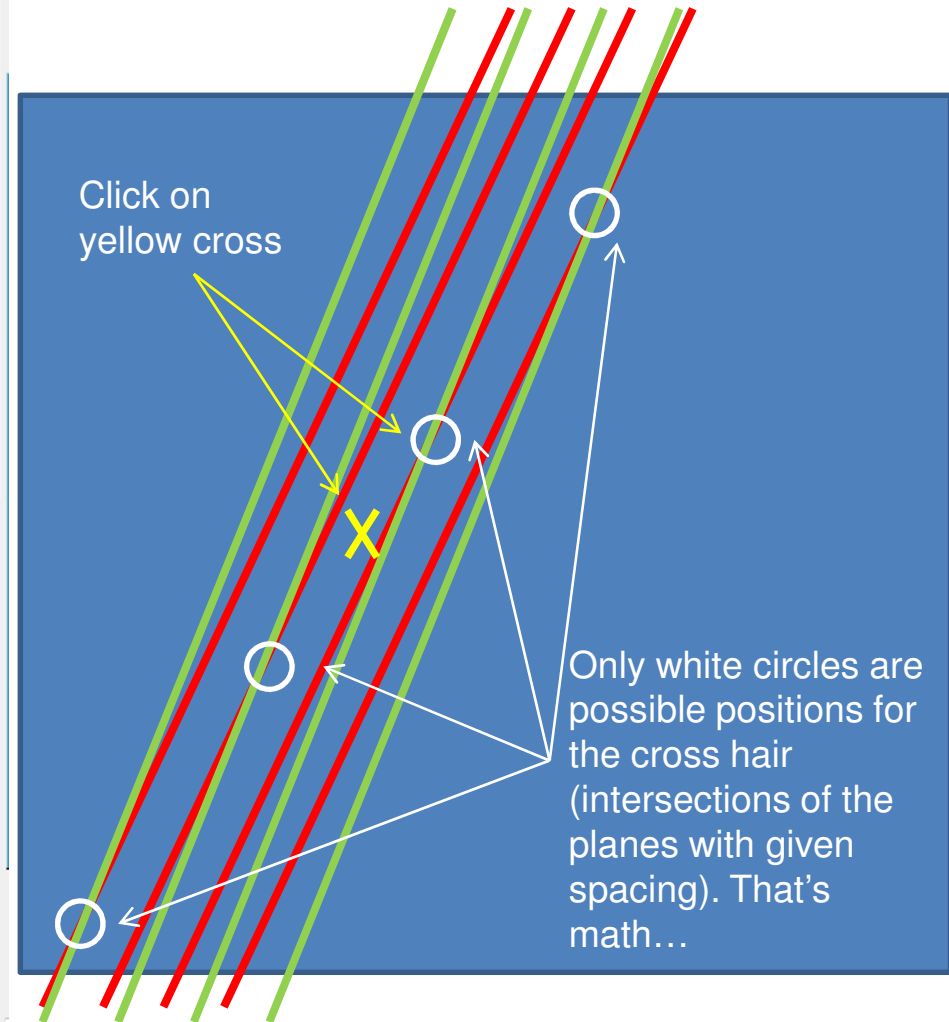
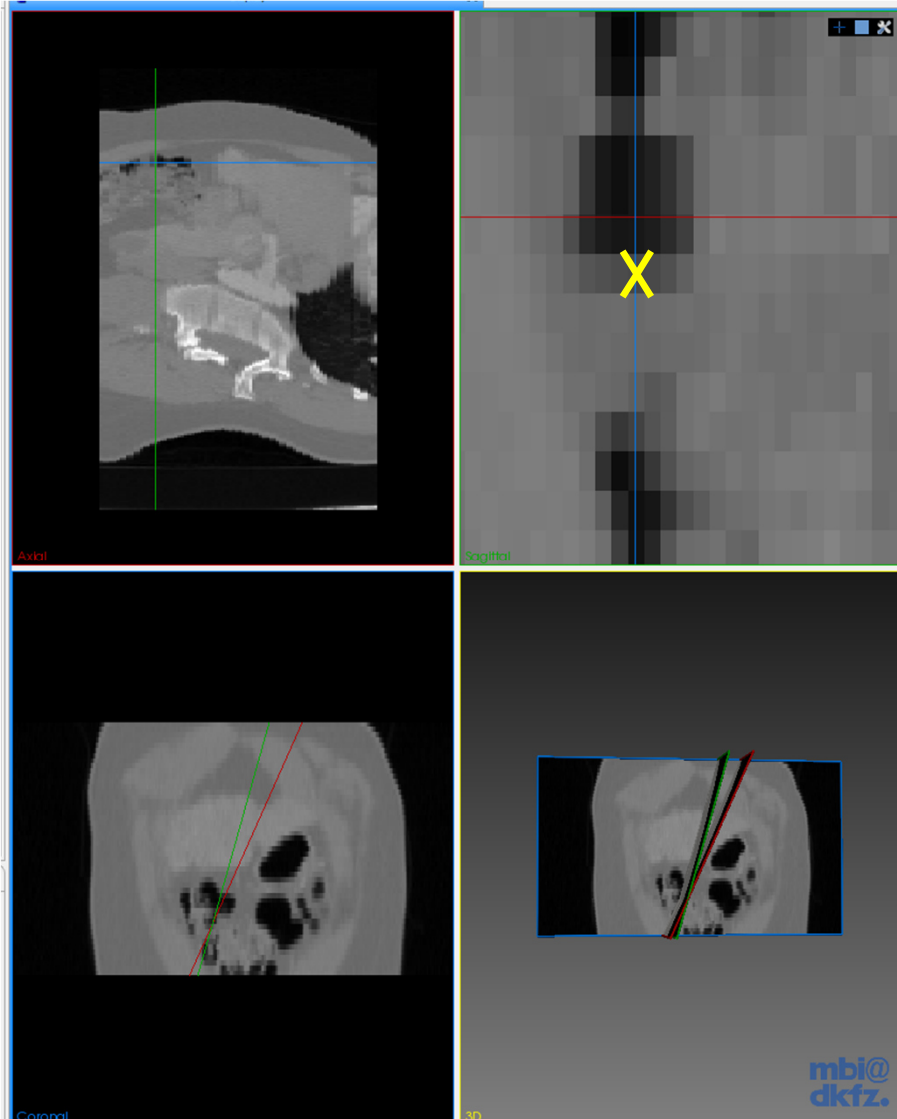


2D plane coordinates



World coordinates

# Why is my crosshair on the wrong position for extreme rotations?



# ...and if I can only remember one thing of this talk?

Always use Set-methods to change the geometries!

Thanks for your attention.