



Medical Fusion Viewer

SEP – Final Presentation

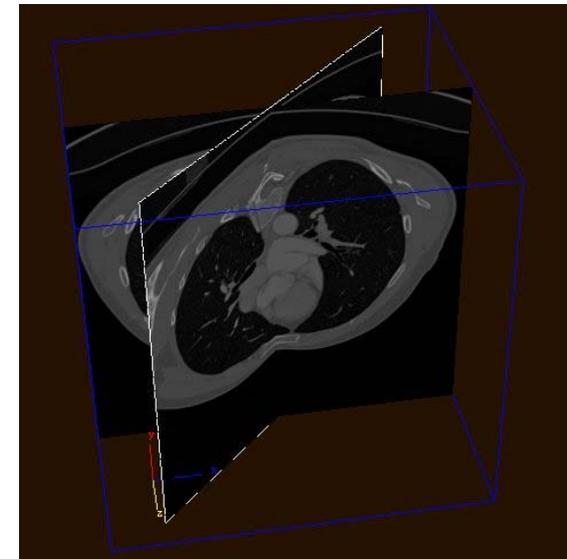
10th of February 2006

Chair for Computer Aided Medical Procedures & Augmented Reality

Department of Computer Science | Technische Universität München

What's it all about?

- Rigid transformations on set of Slice-Renderers
- Fused visualization of numerous volumes
- Ability of manual registration

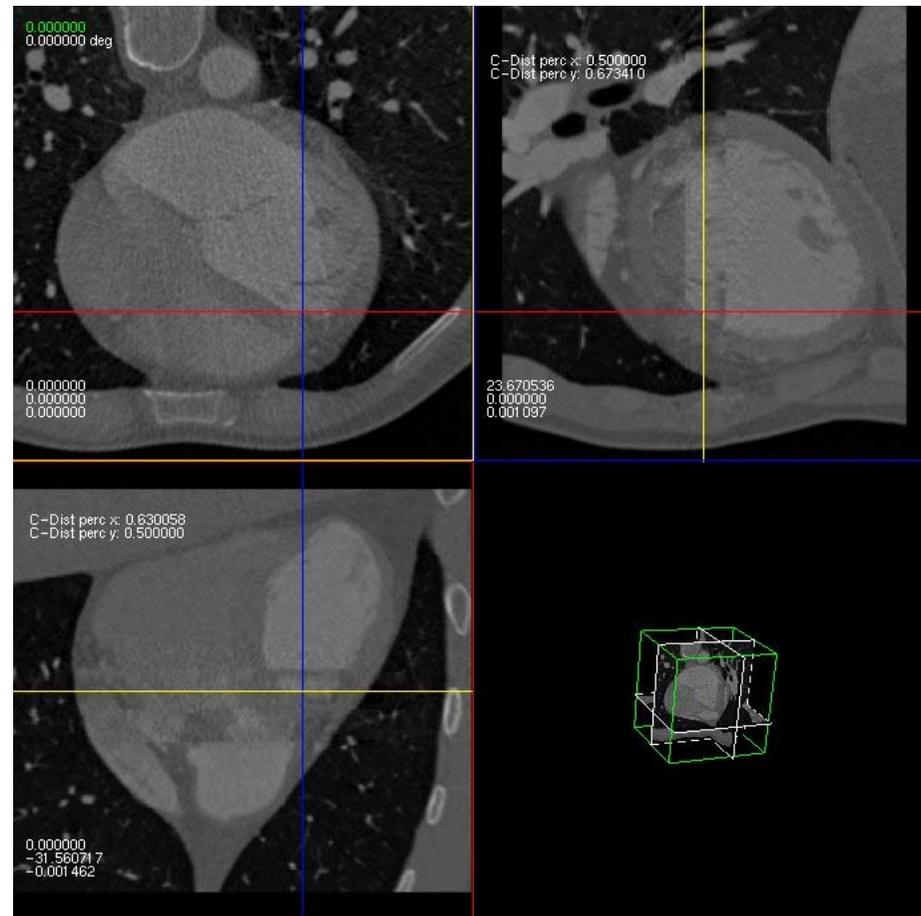


Requirements

- Based on common 3-Slice-View
- Ability to define Rotation while orthogonality is kept
- Ability to define
 - Global translations on all slices (Registration)
 - Local translations (shift through slices)
- Visualize several images fused

The Slice View

- 3 orthogonal Slice Renderers that can be modified rigidly
- Orthogonally is always kept upright
- Works in 3 modes
- Fused visualization of different images



Rigid transformation on Renderer

$$H_i = \begin{bmatrix} R_i & \vec{t}_i \\ \vec{0}^T & 1 \end{bmatrix} \quad i \in \{1 \dots 3\}$$

- is applied on the three Slice Renderer
- consist of part valid for the whole model
(rotation and translation)
and part dependent of renderer
(leaf through slices, translation)

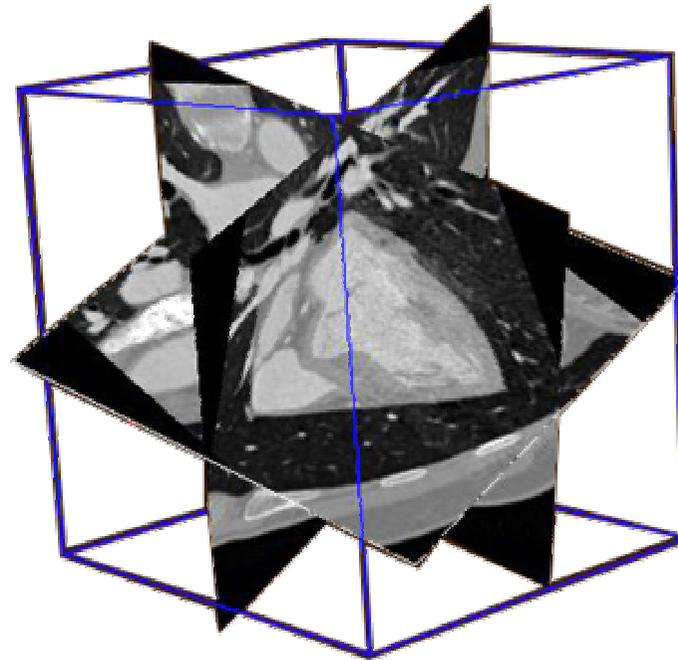
Rotational part

For all renderers i ,

$$i \in \{1 \dots 3\}$$

$$R_i = R_M B_i$$

$$R_M = \text{rot}_z \text{rot}_y \text{rot}_x$$

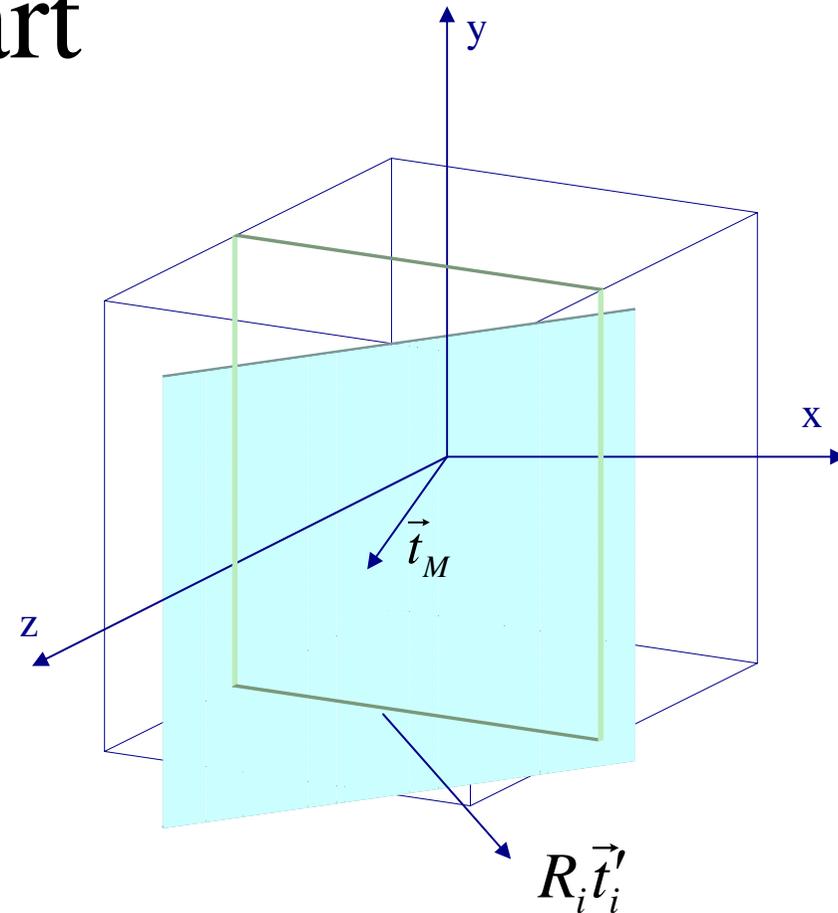


$$B_1 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = [b_1 b_2 b_3] \quad B_2 = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix} = [b_3 b_1 b_2] \quad B_3 = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} = [b_2 b_3 b_1]$$

Translational part

$$\vec{t}_i = \vec{t}_M + R_i \vec{t}'_i$$

$$\vec{t}'_i = \begin{bmatrix} 0 \\ 0 \\ \lambda_i \end{bmatrix}$$



$\lambda_i =$ out of plane translation for renderer i , $i \in \{1...3\}$

Relationship between volumes

- Relative Pose is consistently kept
- Consists of Rotation and Renderer-independent Translation

$$H_{rel} = \begin{bmatrix} R_M & \vec{t}_M \\ \vec{0}^T & 1 \end{bmatrix}$$

- Defines transformation for Registration of two volumes

Realignment of heart CT data

- Difference in alignment between modalities
 - Tomographic images aligned along long axis of body
 - Echographic images aligned along long axis of left ventricle
- Standards necessary for diagnosis
- Realignment by visual features (apex, center of mitral planes...)

