



Project Management and Software Development
for Medical Applications - WS 15

Visualizing the Volumetric Accuracy of Medical Tracking Solutions

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Intermediate Presentation

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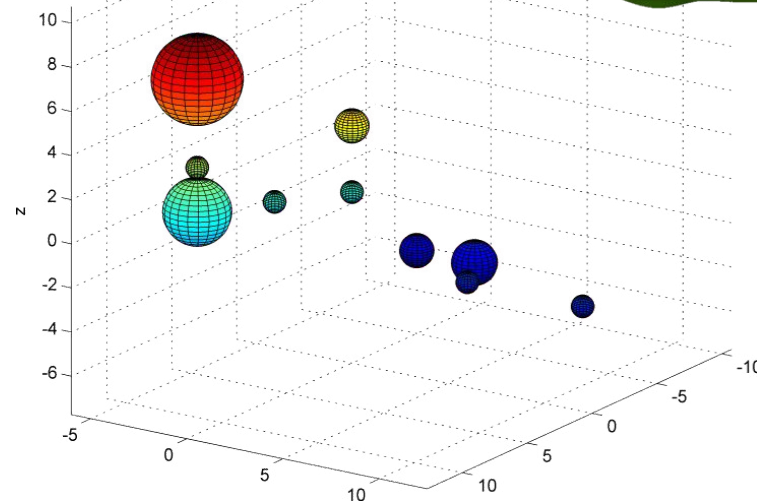
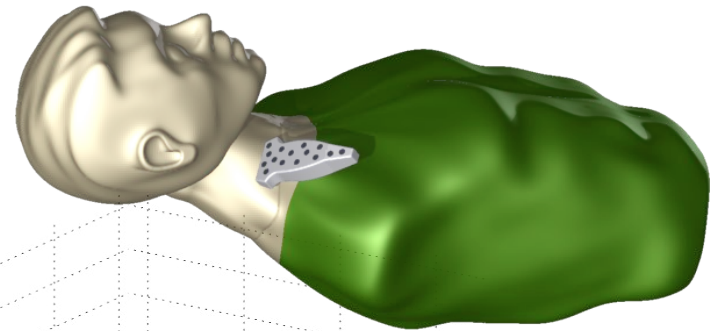
Outline

- Project Outline
 - Motivation & Problem Statement
 - Requirements & Specifications
 - Scoping & Planning
- Software Design
 - Software Architecture & Design Patterns
- Progress
- Project Outlook
 - Tasks and Subtasks & Challenges



Project Outline

- Motivation
 - Position and orientation information in real-time
 - Different systems
 - Spatial accuracy often unknown
- Problem Statement
 - Visualizing the volumetric accuracy
 - Interactive GUI



* Figures of US probe and tracking setup kindly provided by FRAMOS GmbH



Project Outline

- Requirements & Specifications
 - Visualization
 - Differentiate tracking error and system accuracy
 - Additional reference points or medical devices
 - Different visualizations
 - GUI
 - Interactive
 - Real-time
 - Input
 - Pose & accuracy via TCP / IP
 - Output
 - Rendering
 - Environment
 - Windows, Visual Studio, C++, OpenGL, OpenIGTLink, GitLab



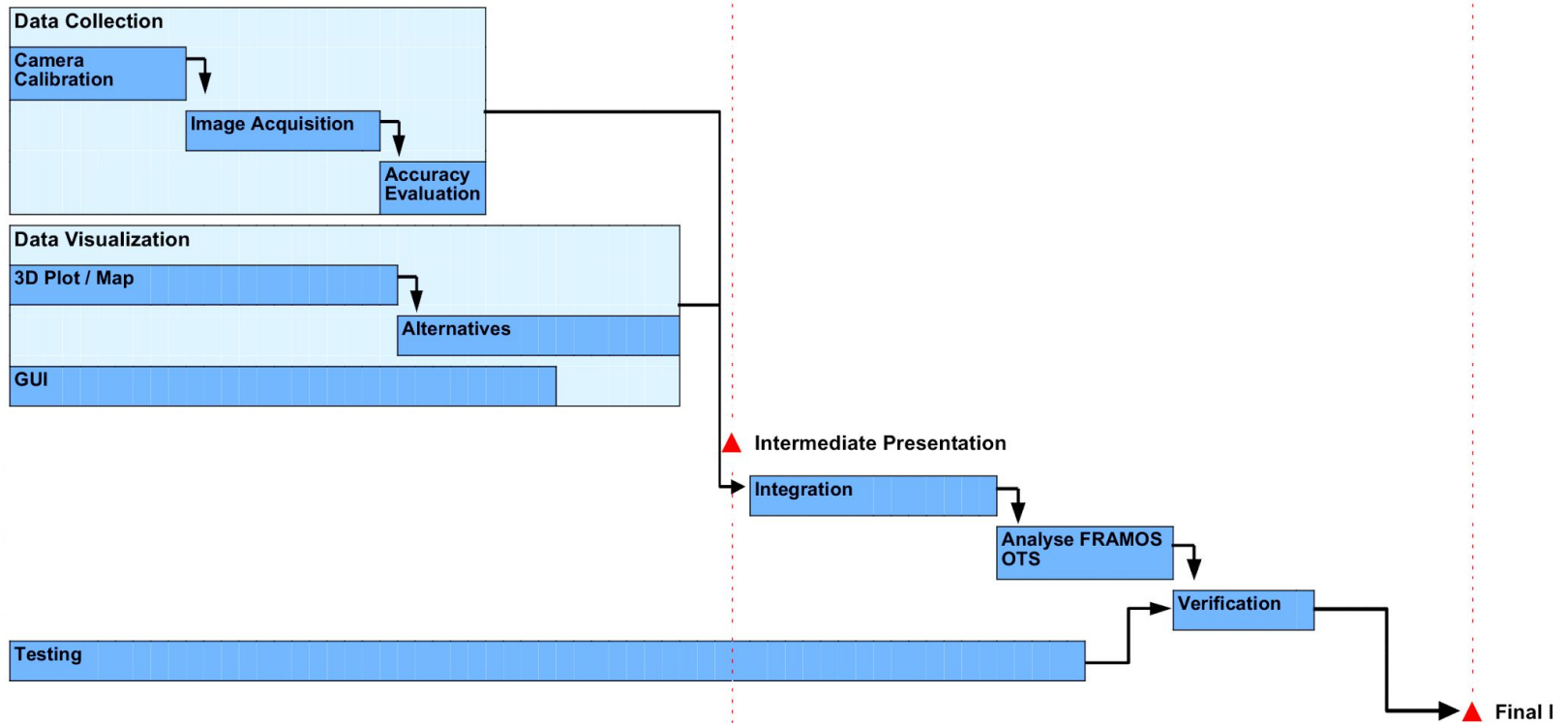
Project Outline

- Scoping and Planning - Original Project Plan

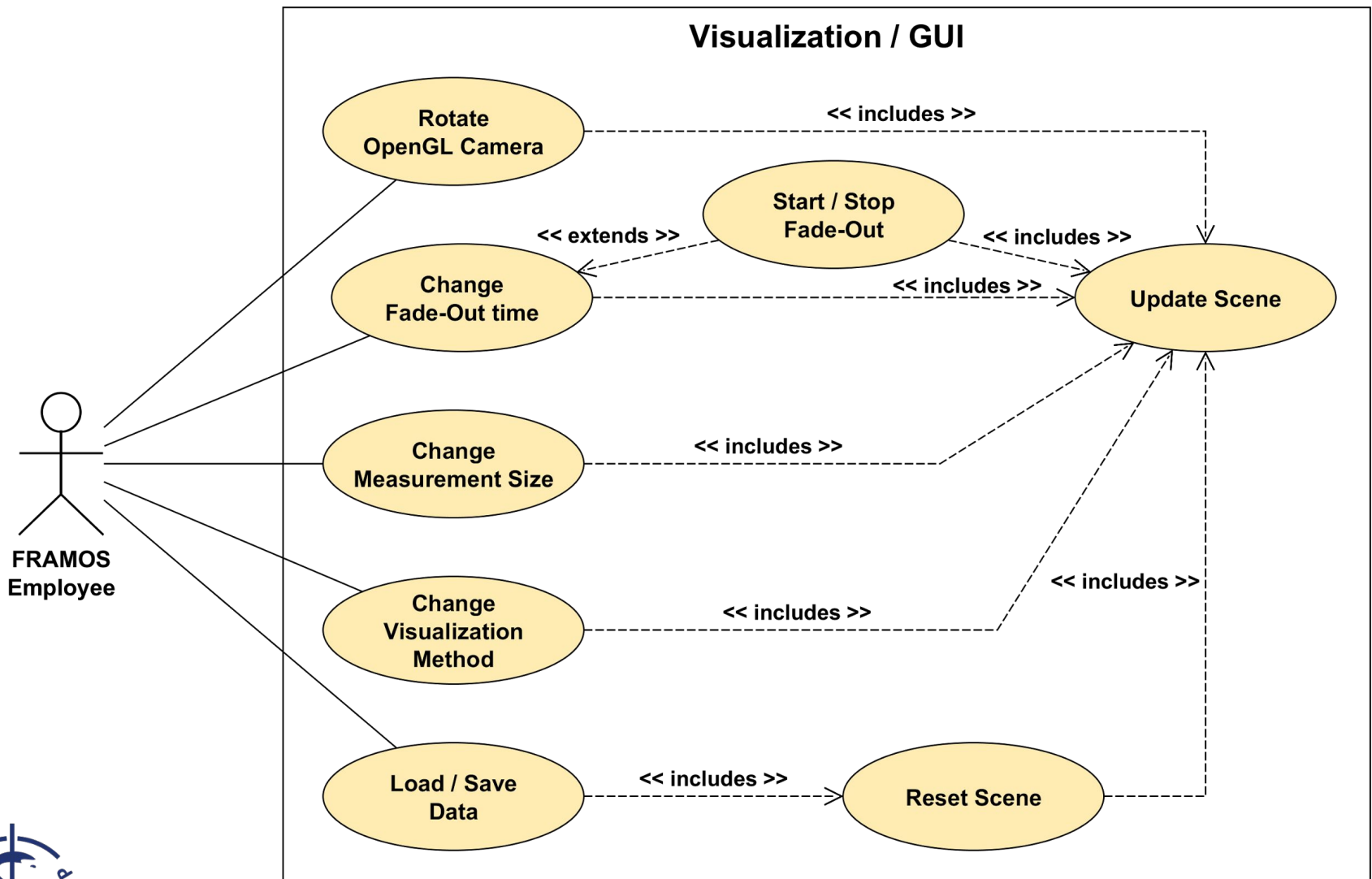
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▲ Initial Meeting

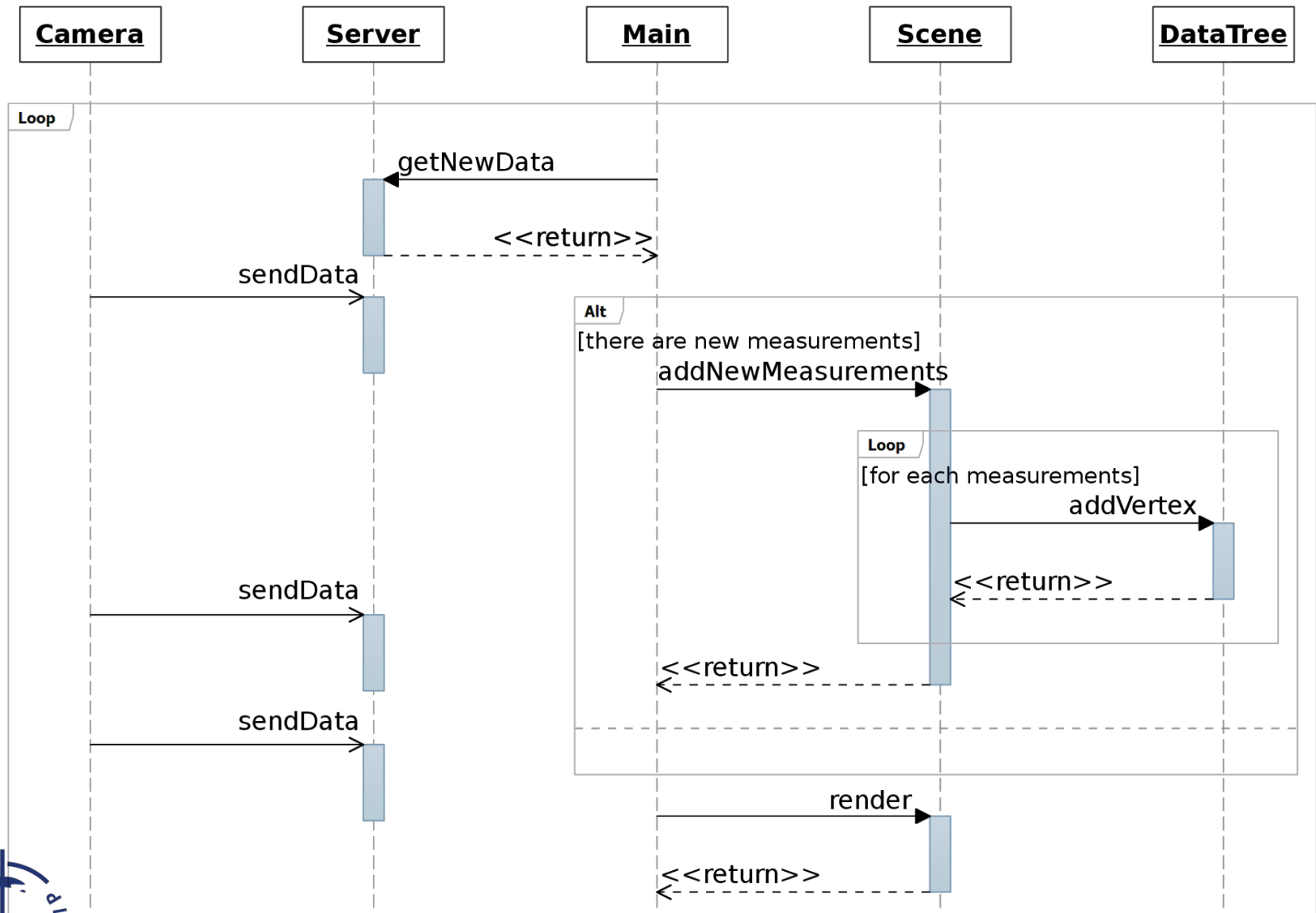
▲ Project Requirements Presentation



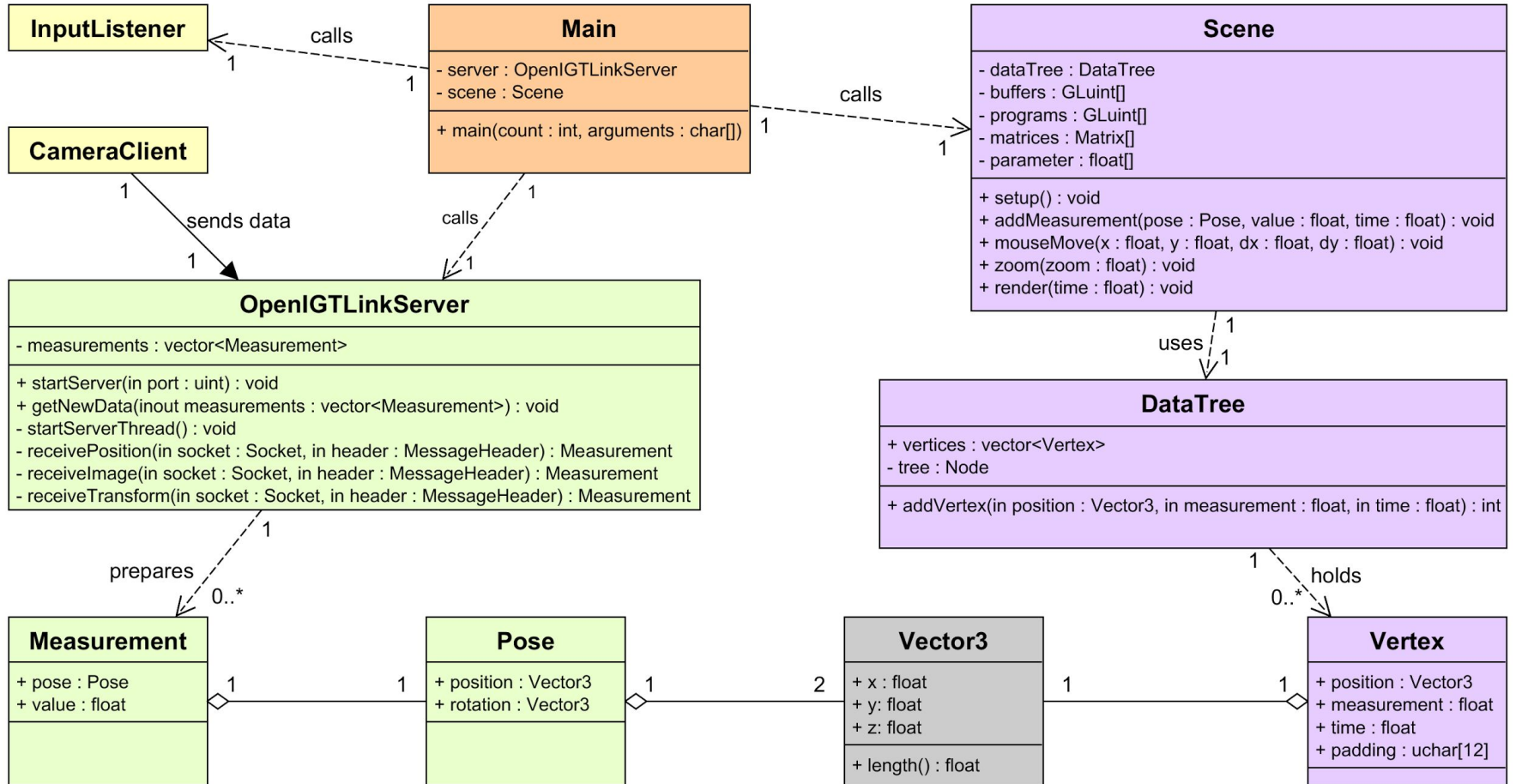
Software Design UML Use Case Diagram



Software Design UML Sequence Diagram



Software Design UML Class Diagram



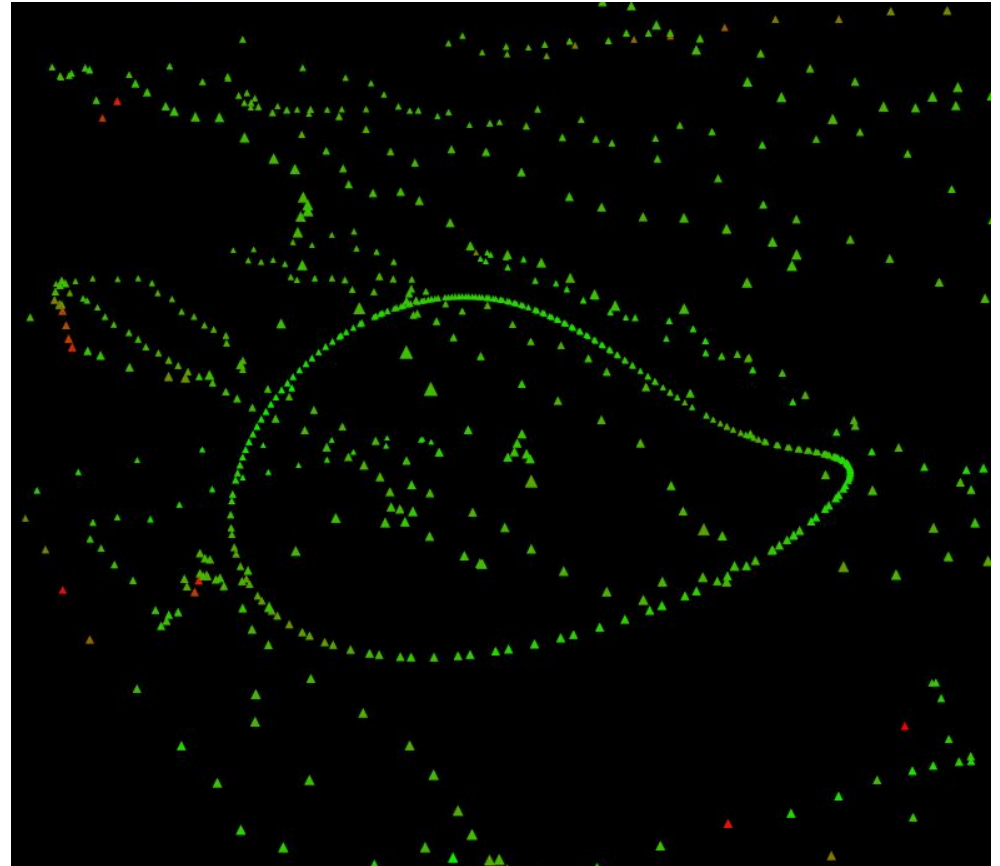
Software Design

- Strategies
 - GUI / rendering: bottom-up implementation
 - Server-Client: top-down
- Server-Client Communication
 - OpenIGTLink protocol, using specification for Position Message
 - Separate thread
- Design Patterns
 - Creational Patterns: RAII
 - Concurrency Patterns: Monitor Object (for server)



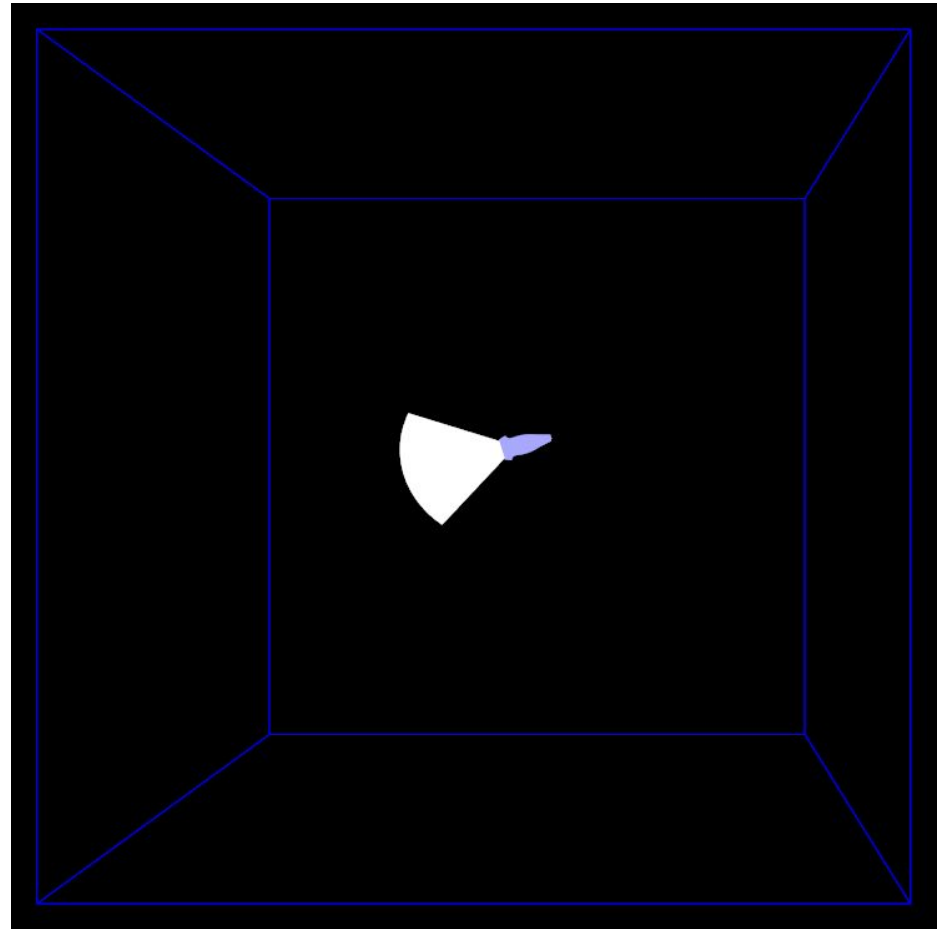
Progress

- Initial Approach
 - Show all positions
 - Use color for accuracy
- Drawback
 - Cluttered
 - Overloaded
 - Some structure
- Questions
 - How useful is old data ?
 - What if paths cross ?

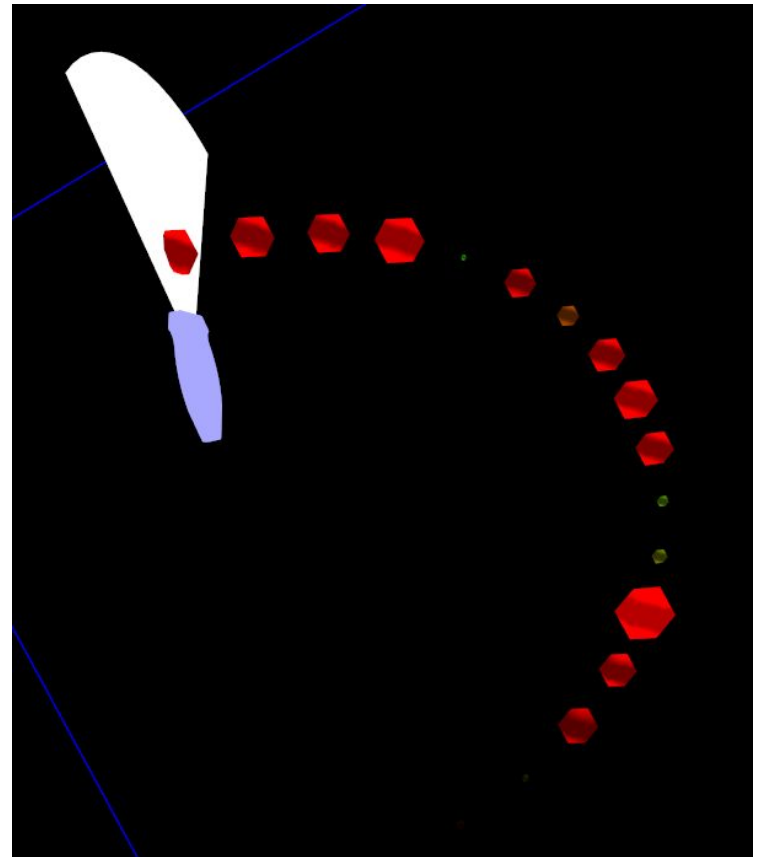
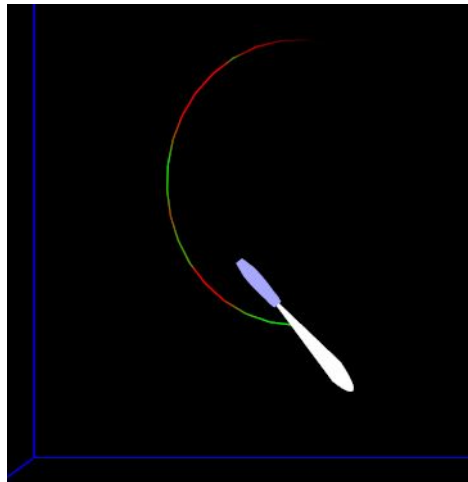
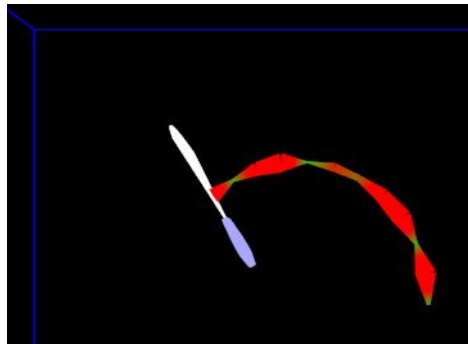
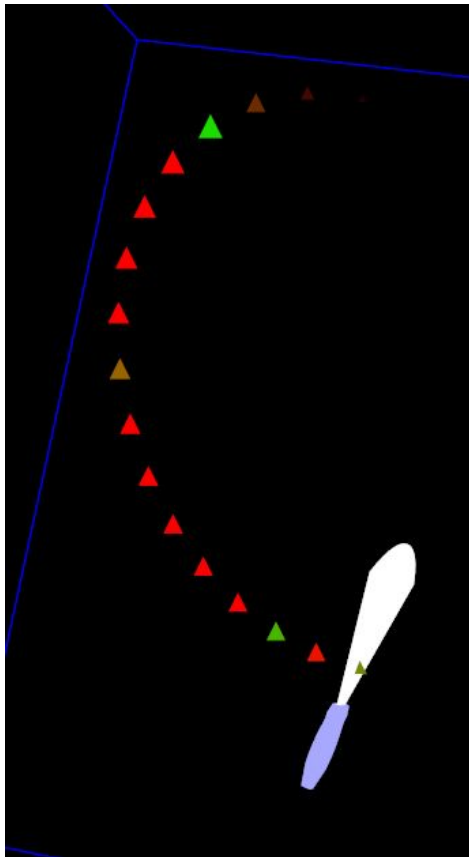


Progress

- Questions
 - How useful is old data ?
 - Postprocessing
 - What if paths cross ?
 - Show latest data
- Current Approach
 - Show **recent** positions
 - Use **color** for accuracy
 - Use **size** for accuracy
 - Show **reference frame**
 - Show additional **devices**
 - Let measurements **fade out**

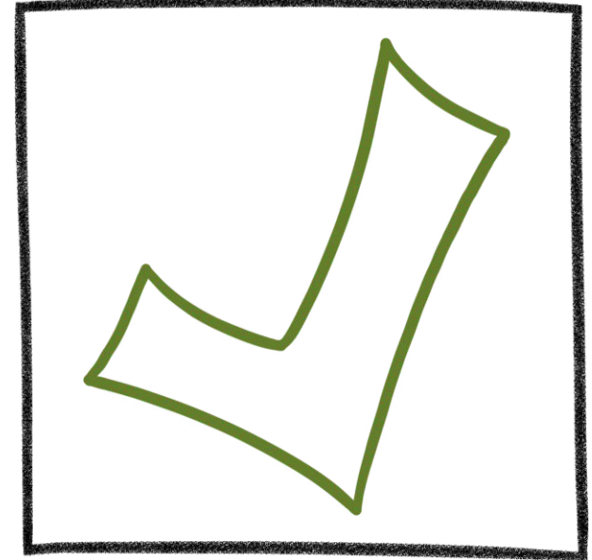


Progress



Project Outlook

- Completed Tasks and Subtasks
 - 5 different visualizations
 - Showing reference frame
 - Showing US probe mesh
 - Server implementation
 - OpenIGTLink integration
 - Customization of visualization
 - Connection with FRAMOS framework
(directional communication via OpenIGTLink packages)
- Challenges so far
 - Integration of OpenIGTLink took > 7 h



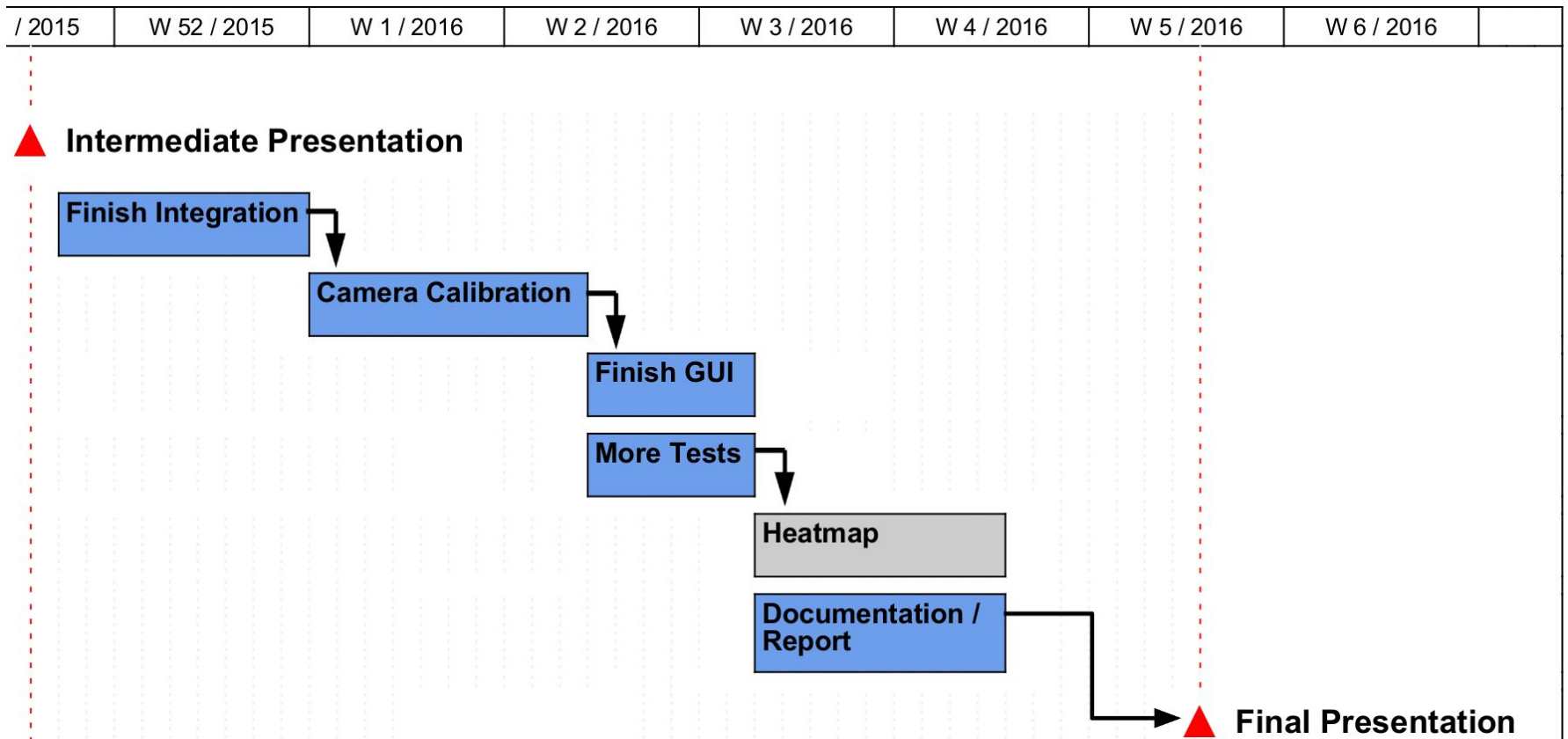
Project Outlook

- Upcoming Tasks
 - Finish integration on client side (framework @ FRAMOS)
 - Camera calibration
 - risk: might be challenging**
 - Finish GUI
 - More tests / evaluation
 - Heatmap for postprocessing (optional)
 - Documentation / report



Project Outlook

- Updated Project Plan



- Questions

- Comments

- Ideas

