

REMOTE INTERACTION IN WEB-BASED MEDICAL VISUALIZATION APPLICATION

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PROBLEM

- Development of a framework for 3D medical data visualization
- Existing solutions:
 - Exposure Renderer, SimVascular in ParaView
- Drawbacks of mentioned solutions:
 - Dependency on a specific platform
 - Remote collaboration is not supported
 - Usually require powerful hardware

- Web-based visualization framework Med3D (based on NeckVeins)
- Rendering:
 - Rendering 3D polygon models (WebGL)
 - Indirect rendering of volumetric data (Marching cubes)
- Remote collaboration:
 - Sharing view of the data with other users
 - Annotations
 - Chat

FRAMEWORK MED3D



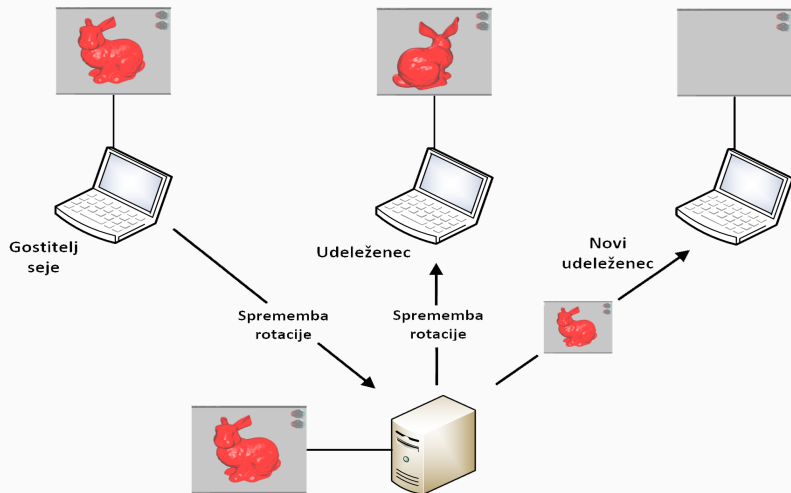
Framework consists of two parts

- Front-end:
 - Interaction between the user and the framework (Web browser)
 - Implemented using frameworks AngularJS and Bootstrap
- Back-end
 - Enables remote collaboration via dedicated server
 - Allows remote storage of volumetric and polygon data
 - Implemented using framework NodeJS in MongoDB database

CAMERA, VIEW SHARING

- Faster interpretation of data during collaboration
- Scene and camera parameters are shared via dedicated server
 - Websockets (TCP protocol)
 - Low latency even with many users
 - Camera parameters refresh (4 ms), ping packet (1 ms)
- Minimal strain of the session host

CAMERA, VIEW SHARING



Annotations:

- Allow user to mark points of interest
- Pinning text description to polygon model
- Implemented as a combination of Bootstrap modals and WebGL
- Annotations can be shared among other users

Chat:

- Allows users in same session to exchange text messages
- Improves the quality of remote collaboration

TEXT ANNOTATIONS AND CHAT

The screenshot displays a web browser window titled "Med3D - Medical Web V...". The address bar shows the URL "212.235.189.233:8080/web/#". The browser interface includes a menu with "File", "Options", "Help", and "Share", and a "Login" button in the top right corner.

The main content area features a 3D anatomical model of a red, branching blood vessel structure. Three text annotations are overlaid on the model:

- Področje interesa**: Zastirna struktura.
- ZAPISEK**: Lorem ipsum dolor sit amet, consectetur adipiscing elit. Fusce etloftend erat et molestie mollis. Donec aliquam ligula ipsum, nec cursus tellus velutpat eget. Donec eu dolor accumsan, elementum nulla ut, mollis mauris. In nulla leo et eros imperdiet bibendum. Quisque et accumsan neque, non pharetra est. Duis et condimentum augue.
- ŽILA**: Zelo pomembna anastomoz!

On the left side, there is a sidebar with the following sections:

- Annotations**: A search bar containing "Področje interesa" and a "New" button.
- Shared**: A list of users: "User: Miha" (with a search bar containing "Žila") and "User: Primož" (with a search bar containing "ZAPISEK").

On the right side, there are two circular navigation controls:

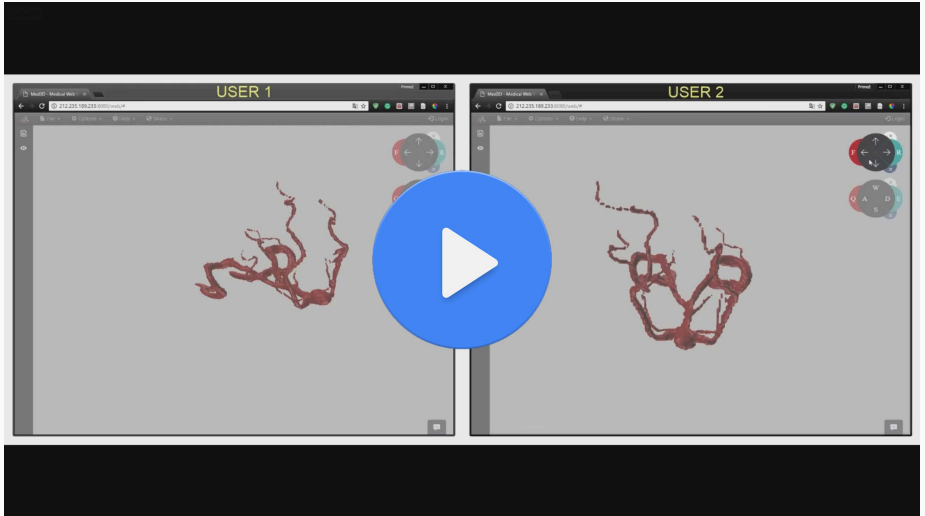
- A top control with arrows and letters F, R, W, X.
- A bottom control with letters W, A, S, D, E and an X.

In the bottom right corner, there is a "Session Chat" window with a message history:

- Primož: Pozdravljeni!
- Očakujemo nadaljevanje pa res super stvari.
- Miha: Se strinjam s tabo. Glej, omogoča tudi določanje anotacij!
- You: Tole ogrožje pa res ni kar tako.

At the bottom of the chat window, there is a text input field with the placeholder text "Prejeto, anotacije si med webjo tudi delimo!"

VIDEO



FUTURE WORK

- Implementing an option of hand drawn annotations on current screen
- Combining direct and indirect rendering approaches
- Remote rendering and processing
- User interface adaptation for mobile devices

THANKS.