

PV160

HCI Lab + Visit Lab

List of topics, autumn 2020

Visualization of Honey Bee Colony Activities with a Temperature Sensor Grid

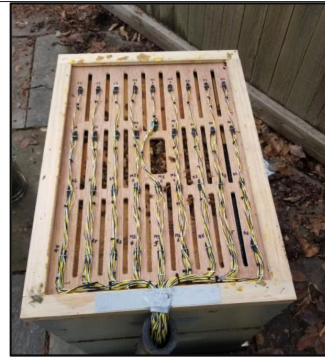
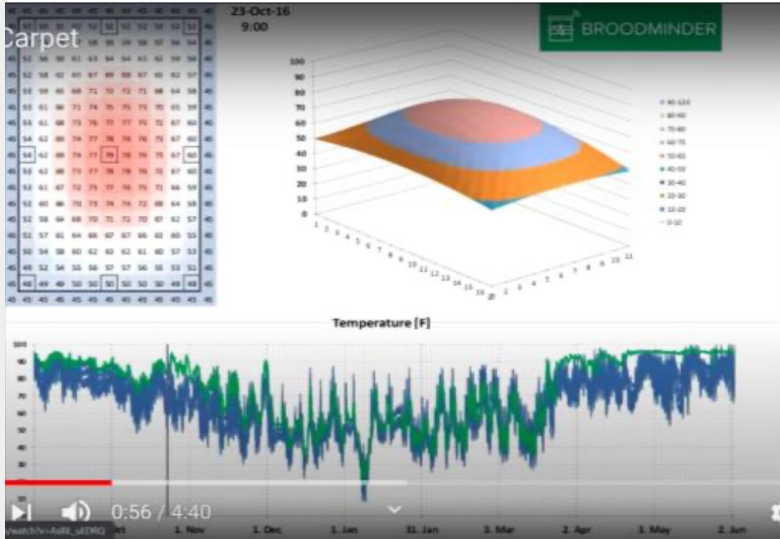


Fig. 1 Sensor Board made by modifying an inner cover. Slots allow bees to pass freely from box to

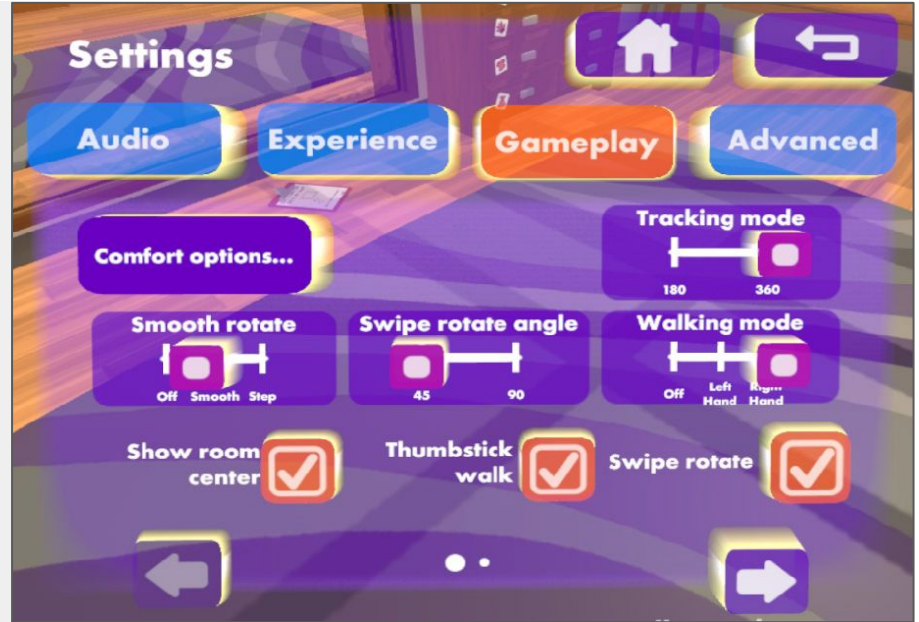
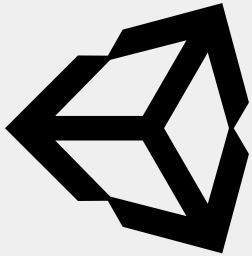


Fig. 2 Winter cluster, November 9, 2020 when placing the sensor board

Contact - Palko

User Interface for Virtual Reality

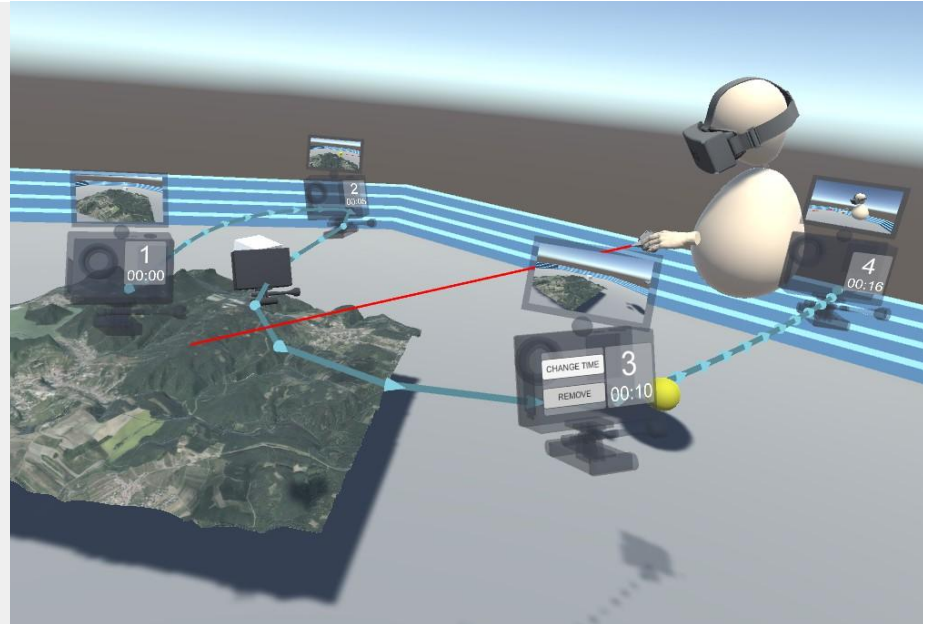
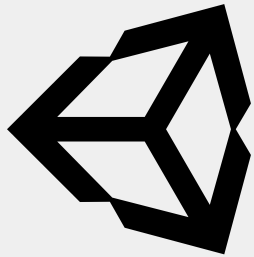
- Universal UI for VR Apps
- Interactive:
 - “Physically” & via pointer
- **Unity**



Contact: Vojta

Interactable Trajectory Visualization in Virtual Reality

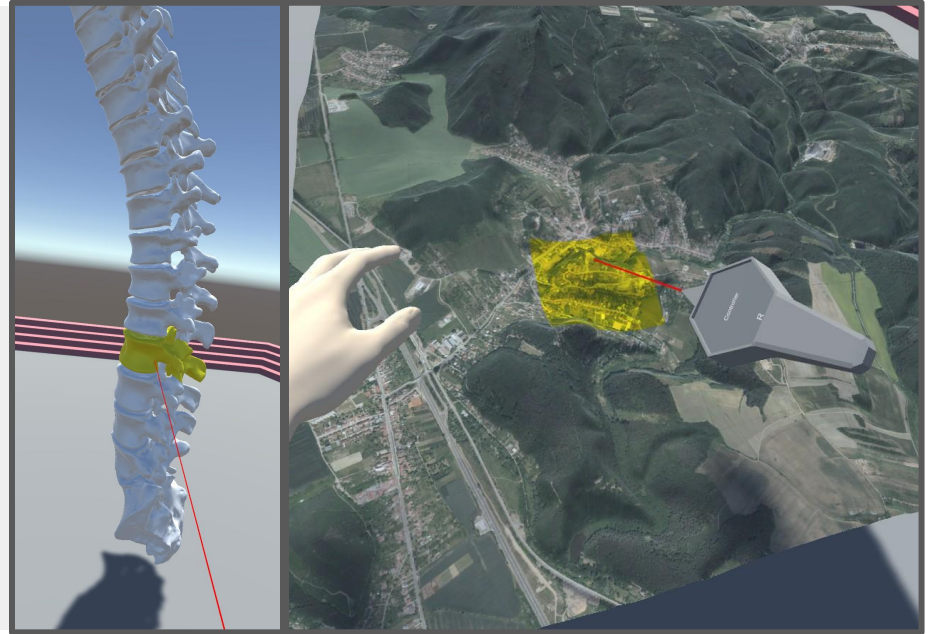
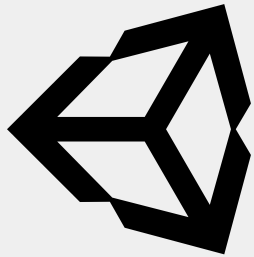
- Be able to **create** and **edit** at runtime
- **Unity**



Contact: Vojta

Objects Grouping and Highlighting in VRdeo

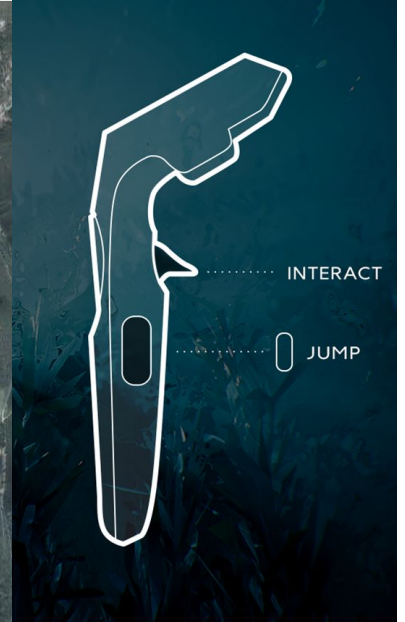
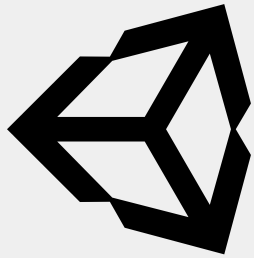
- Group and ungroup objects
- Highlight in 3D
- Unity



Contact: Vojta

Custom Interactive Models of Virtual Reality Controllers

- Highlight individual buttons
- Labels (“Tutorial”)
- Unity



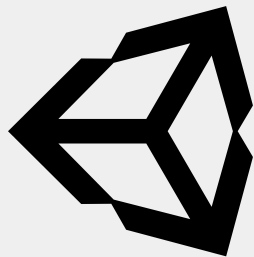
Contact: Vojta

VR Paraglide

- a) simple “physics” of paraglide
- b) “flythrough” - log, analysis, ...

+ Basic controls in VR

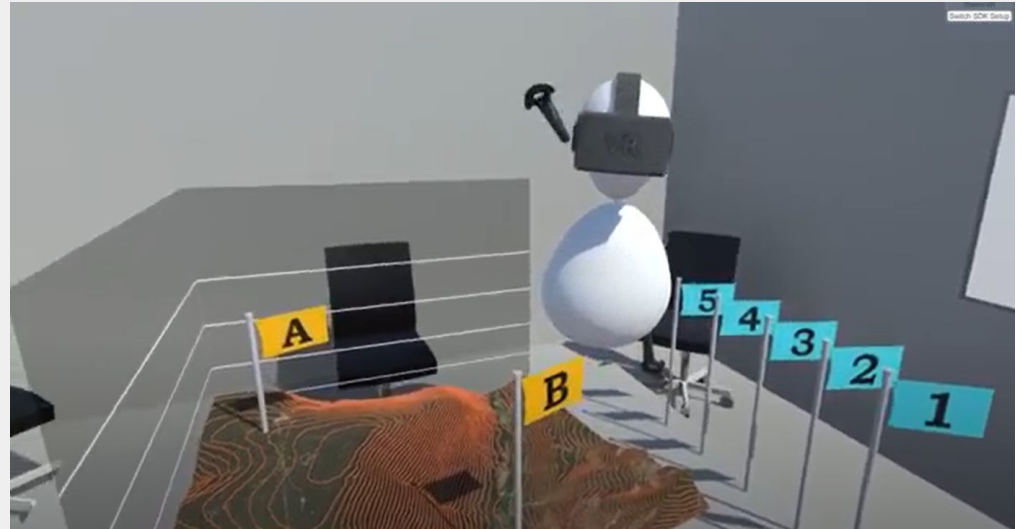
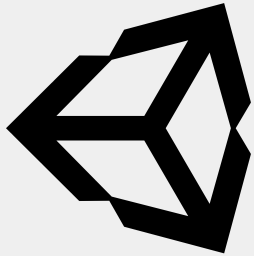
Suitable for bachelor thesis



Contact: Jirka, Vojta

Collaborative VR

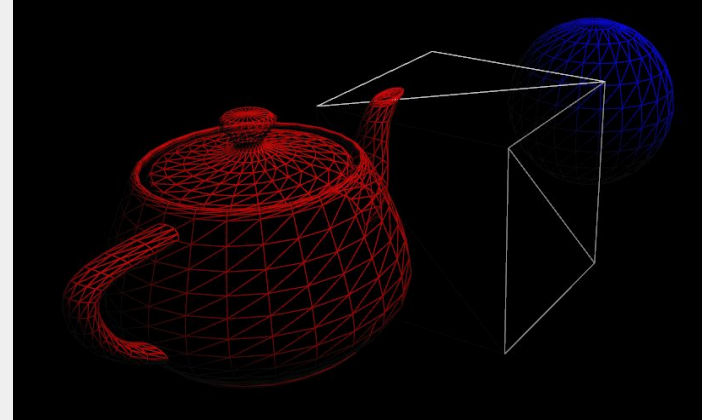
- Various topics related to **networking** and VR
 - Related to voice chat, e.g. speaker highlighting
 - ...



Contact: Jirka, Vojta

E-Learning

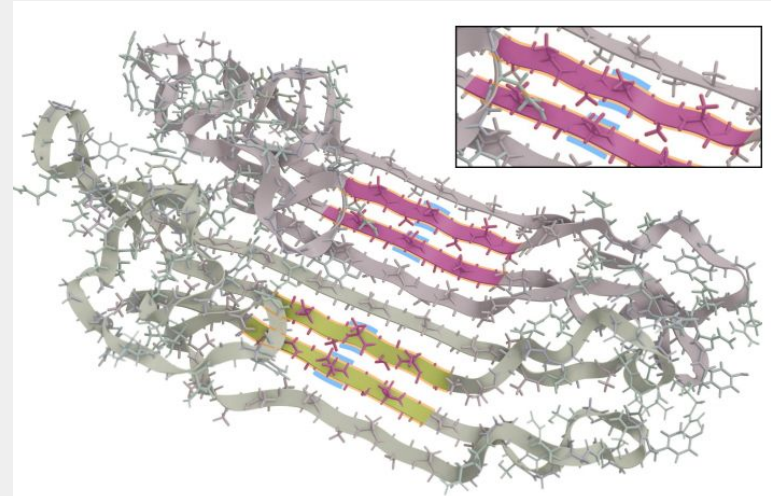
- System for automatic correction of short PB009 programming assignments
- Suitable for bachelor/master thesis



Contact: Jan

Selection Schemes for CAVER Analyst

- Reimplementation of techniques presented in
 - MolFind – Integrated Multi-Selection Schemes for Complex Molecular Structures



Contact: Jan

Filtering UI

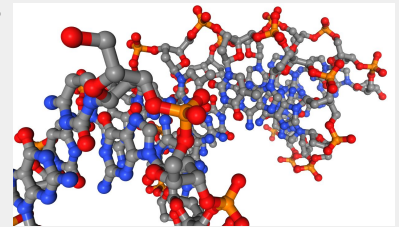
- Implementation of UI for filtering panels in CAVER Analyst



Contact: Jan

Ball-and-stick billboarding in Unity URP

- **Task:** Implement billboarded ball-and-stick model for real-time rendering of large molecules
- **Technology:** Unity, Universal Render Pipeline
- **Deliverables:**
 - Unity project presenting an extensible & well-documented algorithm(s) able to render a large molecule with a ball-and-stick model:
 - using a 3D geometry,
 - Can be unoptimized, primarily for reference.
 - using billboards / imposter rendering.
 - Should have a good performance.



Contact: David

Exploring VR on the web

- **Task:** Examine WebXR standard and relevant frameworks for development of web-based VR apps
- **Technology:** JavaScript
- **Deliverables:**
 - Document / mind map summarizing existing frameworks, which can provide some kind of VR experience via a web browser
 - Each framework above will be accompanied by a description of its capabilities, links to useful tutorials or documentation
 - A working example of a web-based VR scene allowing the user to move around and interact with some of the things in the scene



(Alpha)numeric input in VR

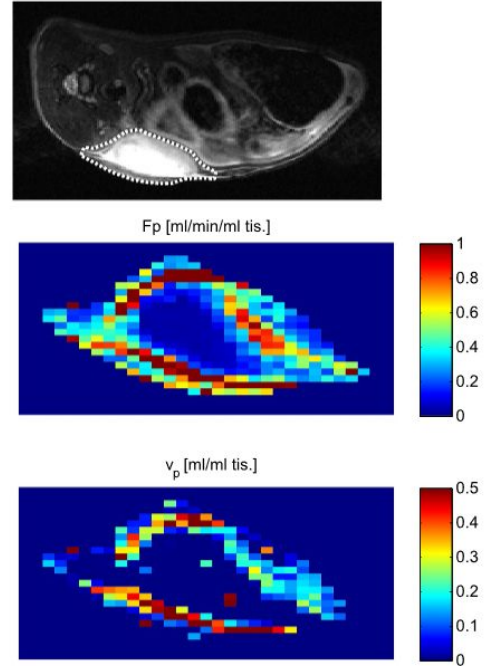
- **Task:** Design and implement several approaches for (alpha)numeric input in VR
- **Technology:** Unity
- **Deliverables:**
 - Results of research of existing approaches
 - Unity VR project with a simple scene containing a text field for the user input
 - At least 5 different ways how to input purely numeric values
 - Numeric VR keyboard, touchpad-controlled “menu”, ???
 - At least 5 different ways how to input alphanumeric values
 - VR keyboard, speech-to-text, ???
 - Physical keyboard of the computer does not count :-)



Contact: David

Framework for perfusion MRI modeling

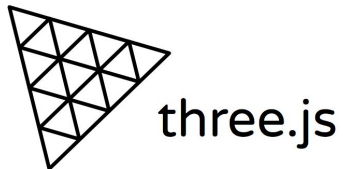
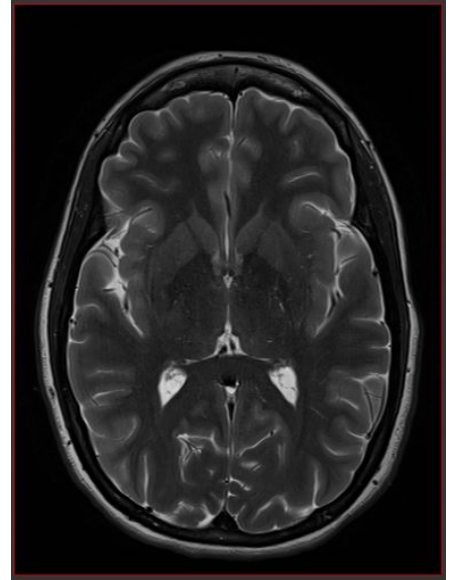
- **Task:** Create a data model for MRI perfusion simulations
- **Technology:** Python
- **Deliverables:**
 - Implementation of framework generating perfusion scenes with the possibility to alter tissue model, phantom image,...



Contact: Tomáš

Components for the ami library

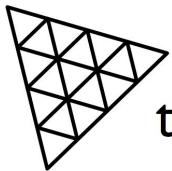
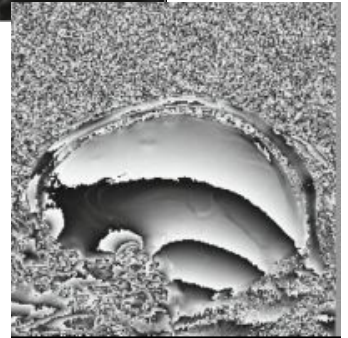
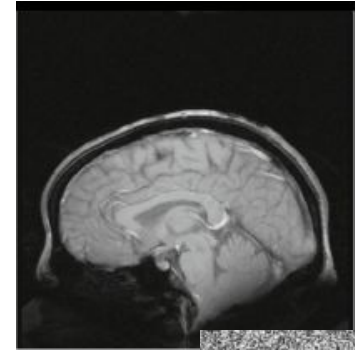
- Implement one of the following:
 - Ruler
 - Segmentation interface
 - Image enhancement interface
- **Technology:** AMI, Three.js



Contact: Tomáš

Visualization of complex-valued images

- **Task:**
 - Explore possibilities of visualization of complex-valued images in AMI
- **Technology:** AMI, Three.js
- **Deliverables:**
 - Visualization of complex-valued MRI data in AMI



three.js



ami

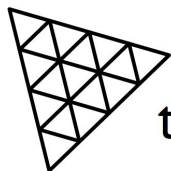
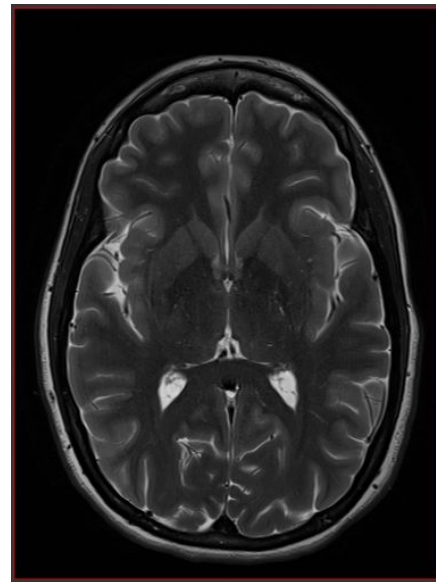
Medical Imaging

Javascript Toolkit

Contact: Tomáš

Medical data visualization using Electron

- **Task:** Create desktop apps out of example visualizations from AMI library and evaluate performance
- **Technology:** Electron, AMI, Three.js
- **Deliverables:**
 - Compiled applications
 - Performance report



three.js



ami

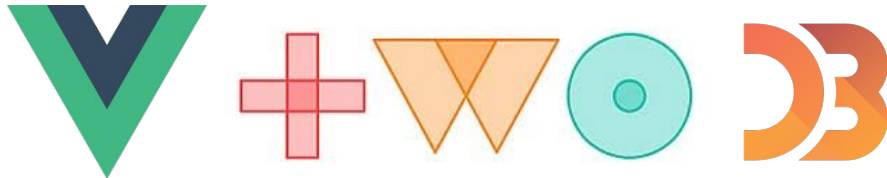
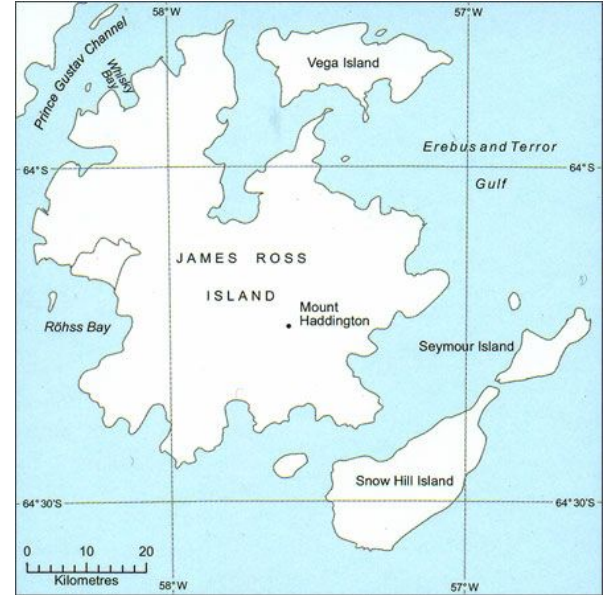
Medical Imaging

Javascript Toolkit

Contact: Tomáš

Map visualization of measurement sites in Antarctica

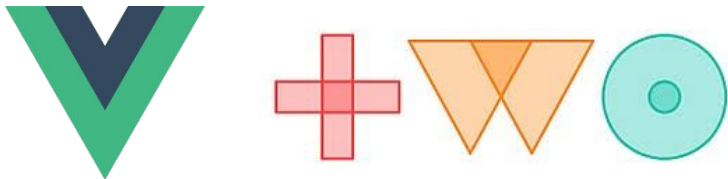
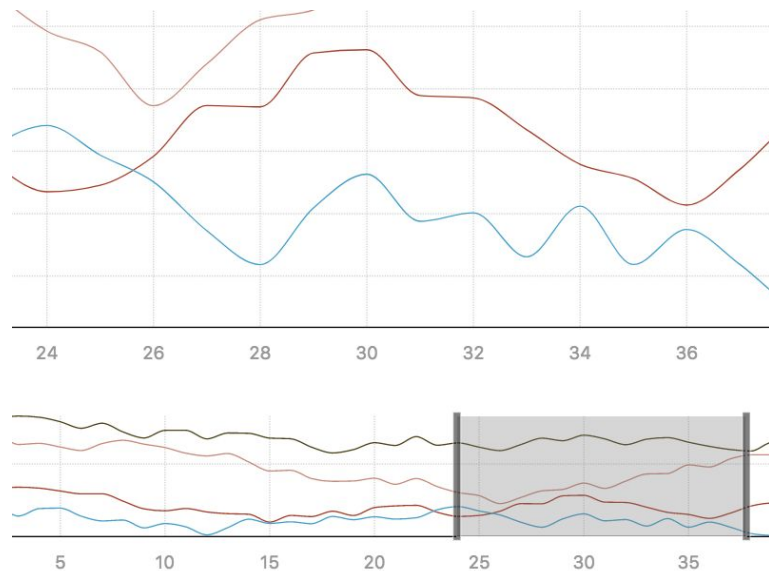
- **Task:** Create map visualization of snow height measurement sites at Mendel Polar Station in Antarctica
- **Technology:** Vue.js, Two.js, D3.js
- **Deliverables:**
 - Vue.js component



Contact: Matěj

Minimap for long charts

- **Task:** Create minimap for time series charts, showing current view
- **Technology:** Vue.js, Two.js
- **Deliverables:**
 - Vue.js component



Contact: Matěj

Contacts:

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