



SAAB

3D-Imaging

Development and Possibilities

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Agenda

- Introduction
- Image Processing @ SAAB Dynamics
- Stereo Basics and Image Based Navigation
- Calibration
- SeaWasp Integration
- Applications
- Capabilities and Advantages
- Demo

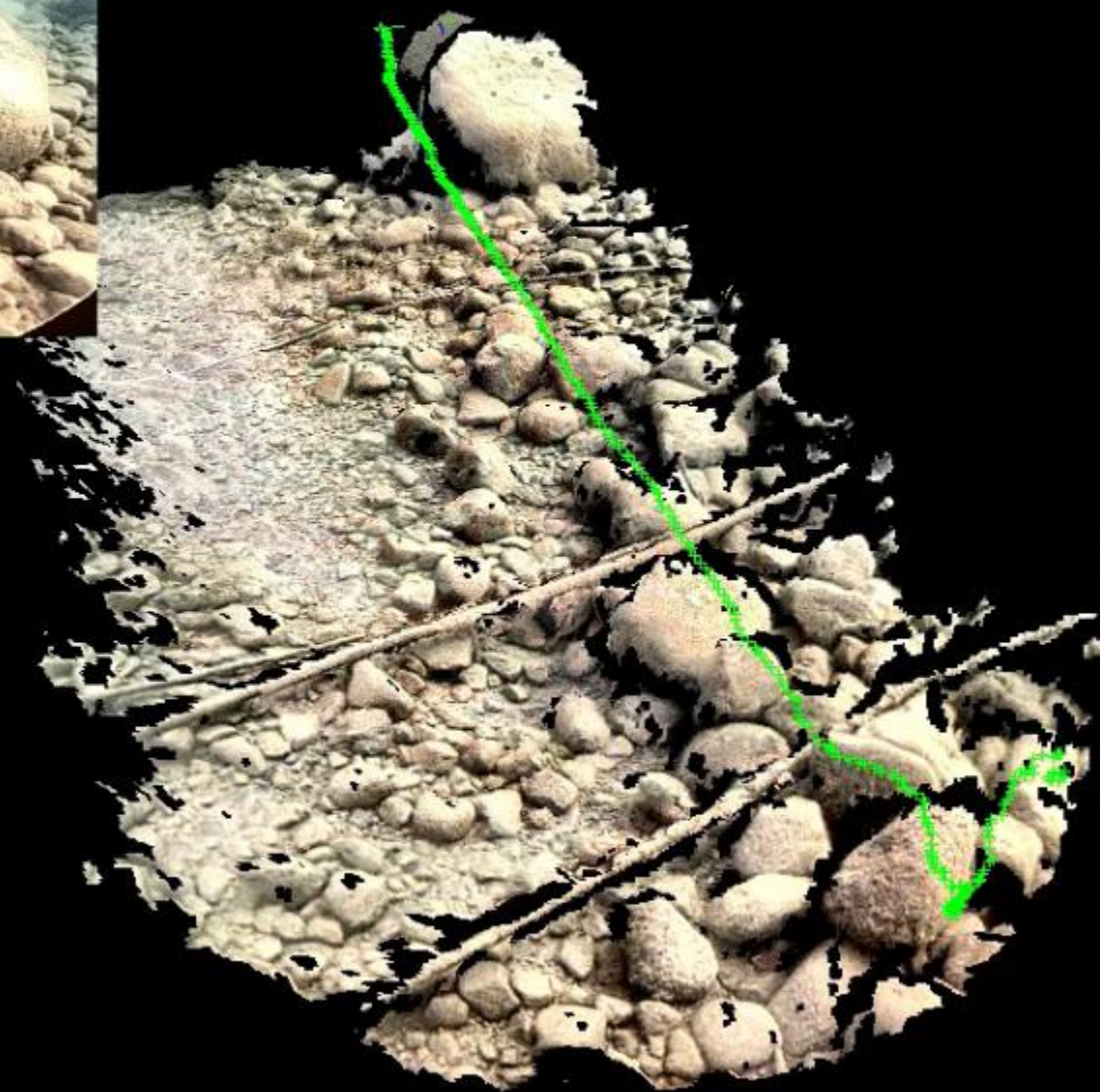
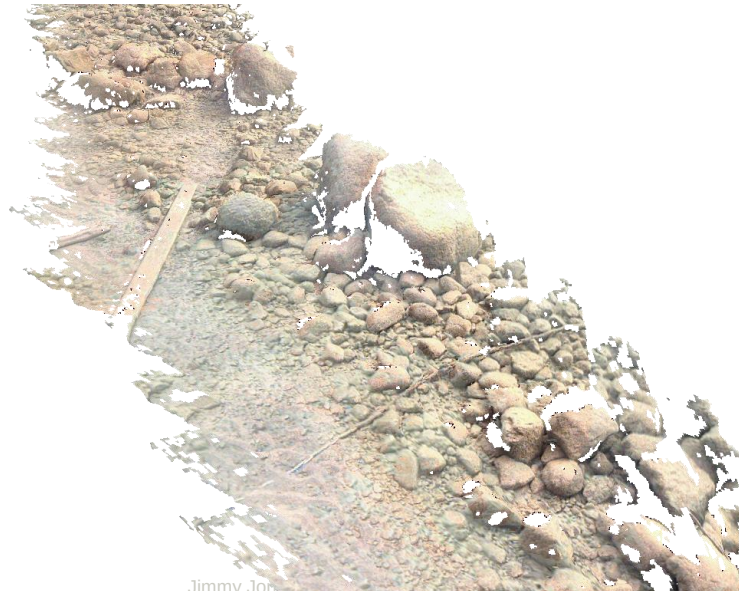
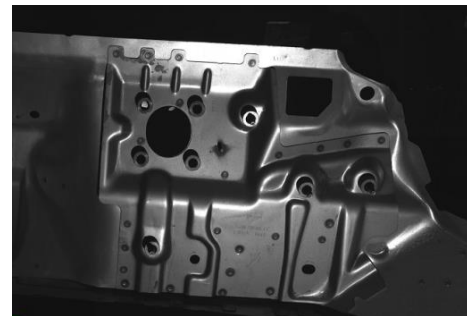
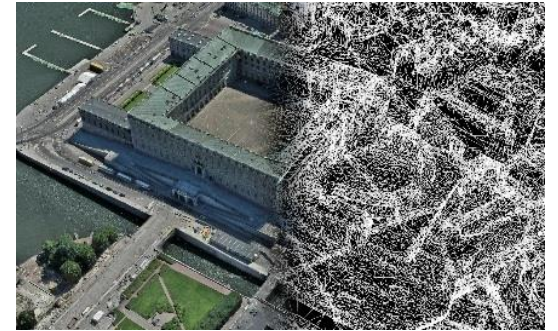
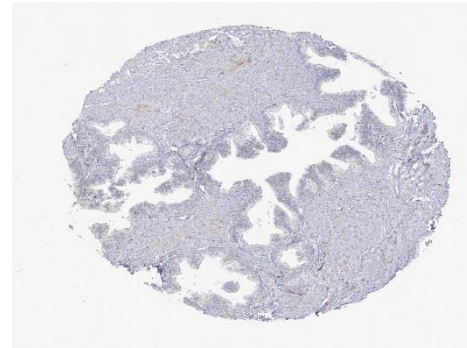


Image Processing at SAAB Dynamics

- Target Tracking
- Stereo
- Image Based Navigation - SLAM (stereo/mono)
- Recognition/Identification
- Camera Calibration

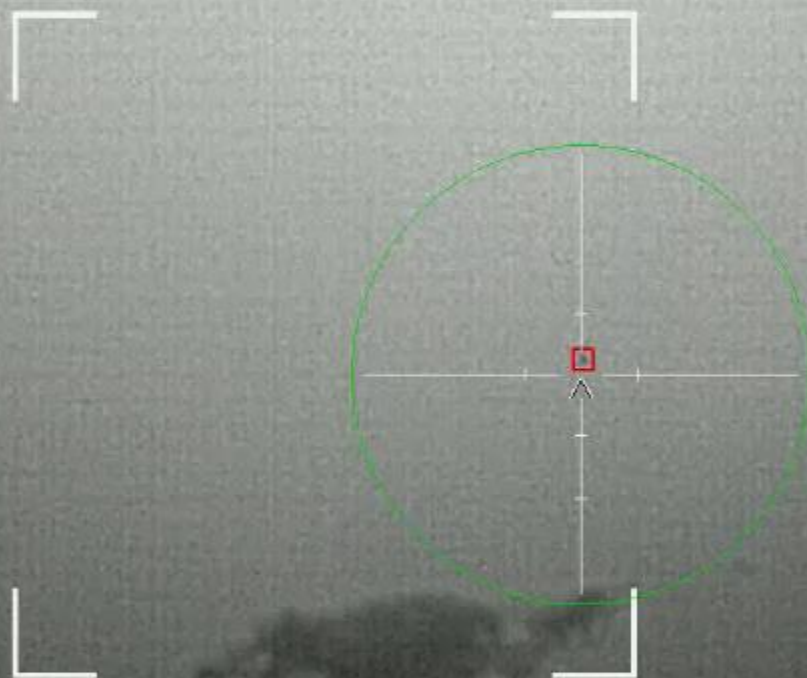


Jimmy Jon





△
216
▽





67

SPEED

5018

RANGE

1266

ALTITUDE



Stereo – Basics

- The scene is observed by two calibrated cameras
- The images are rectified in order to compensate for distortion and to make the epipolar line to become parallel with the x-axis in the images
- One dimensional matching between left and right image results in a disparity image
- Triangulation results in 3D-positions of points in the scene

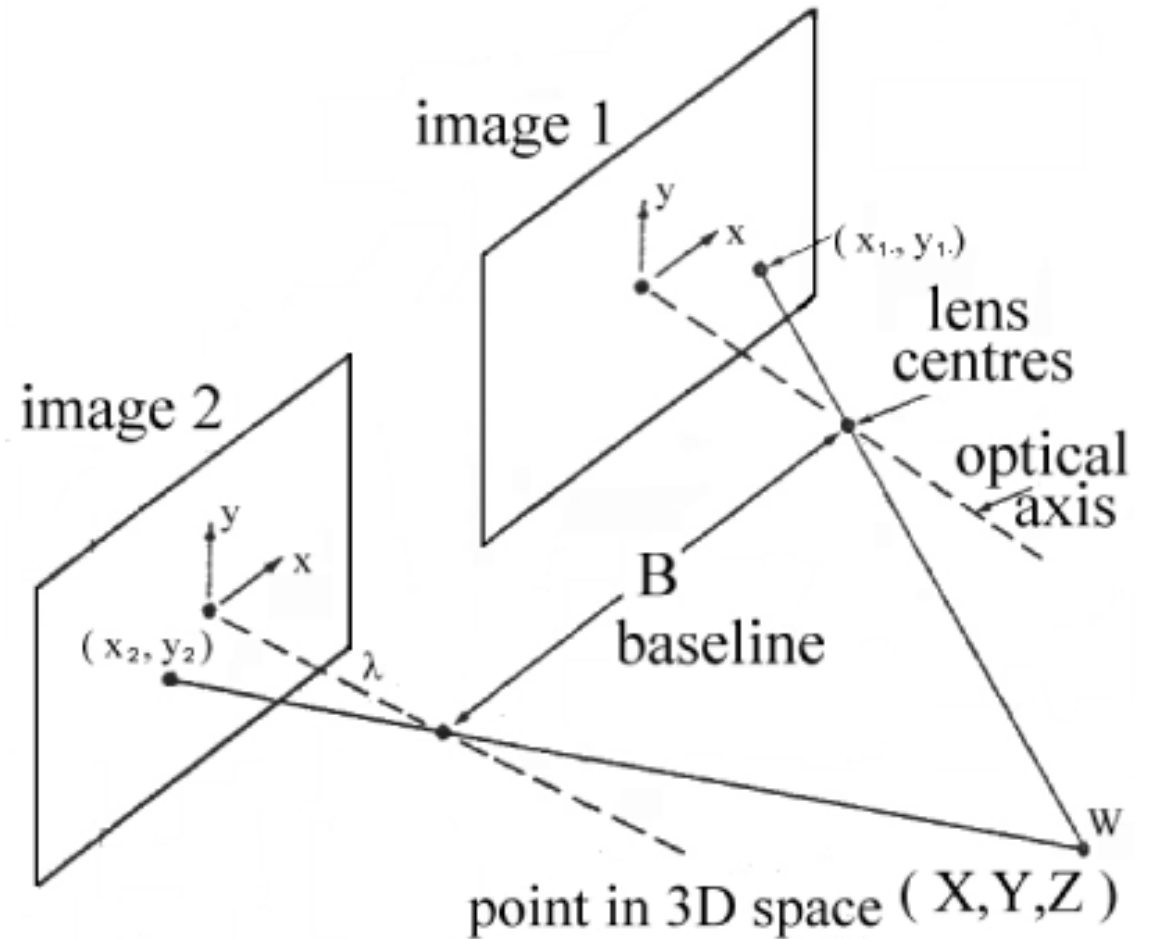
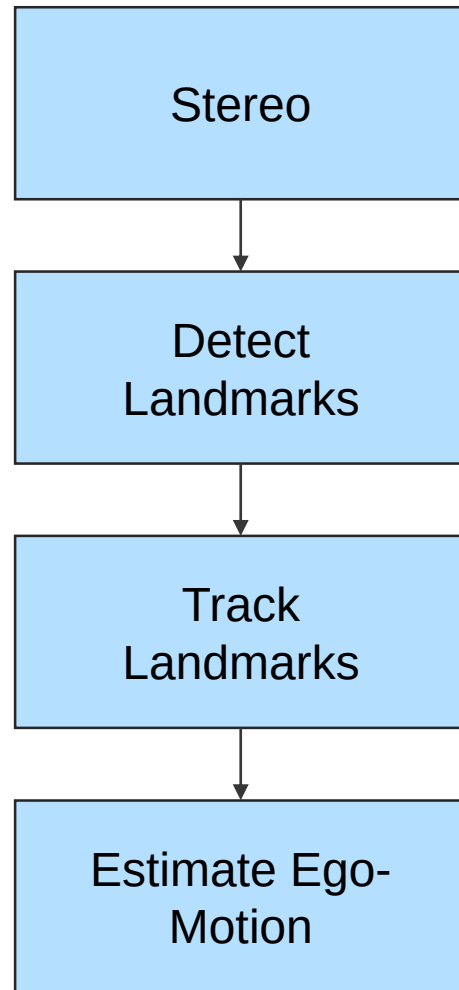
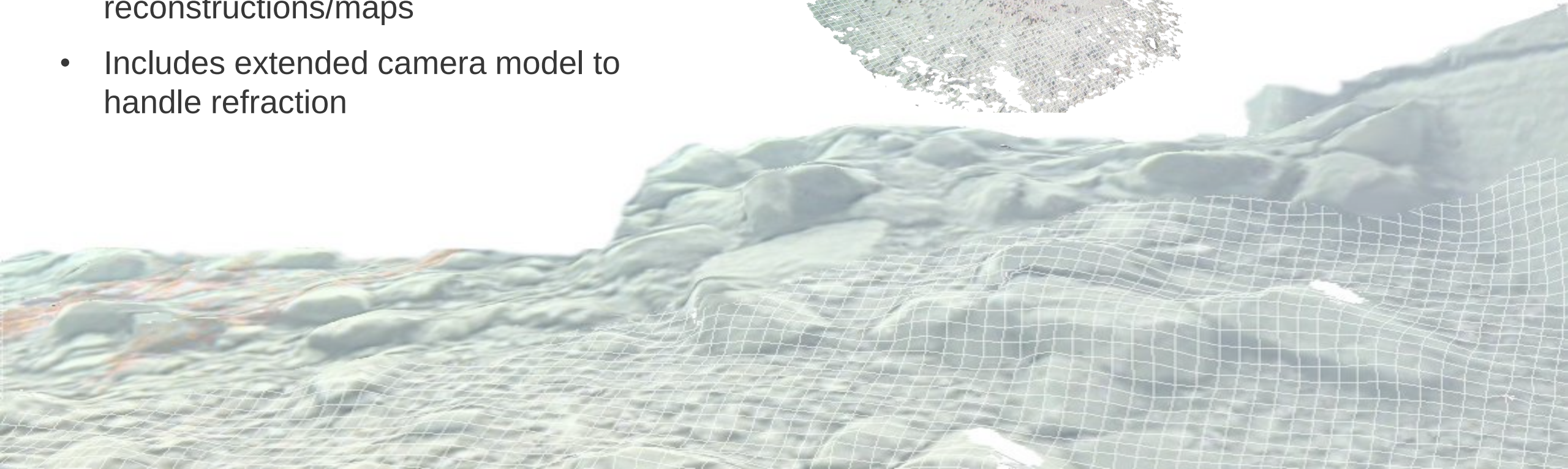
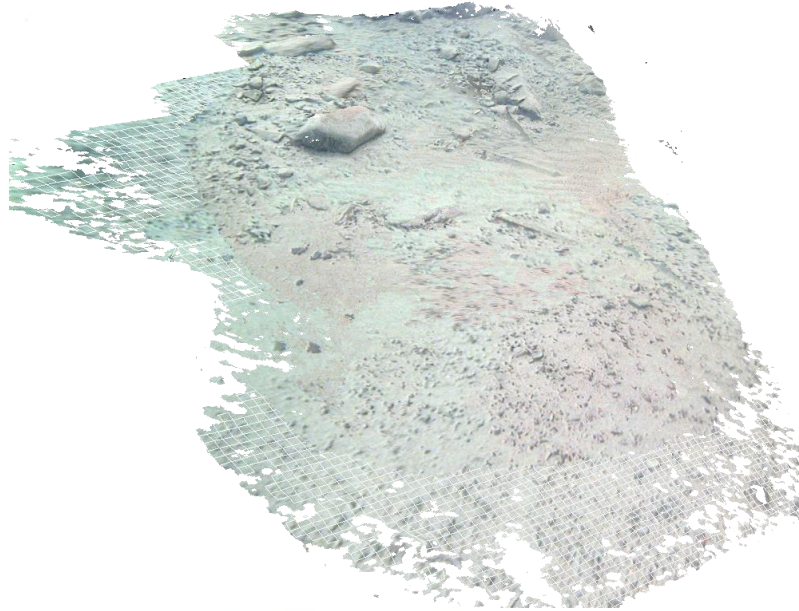


Image Based Navigation using Stereo



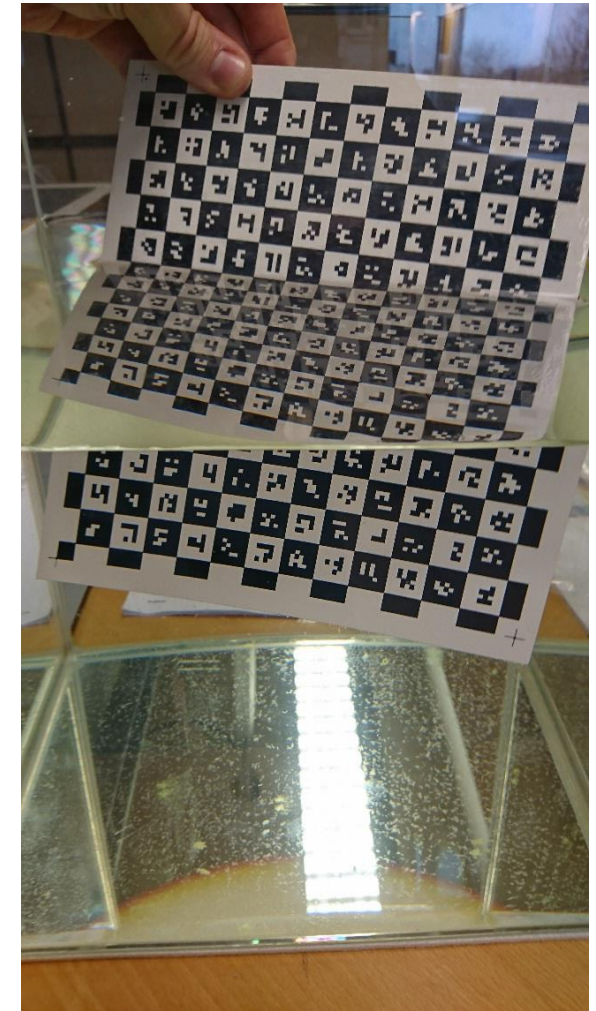
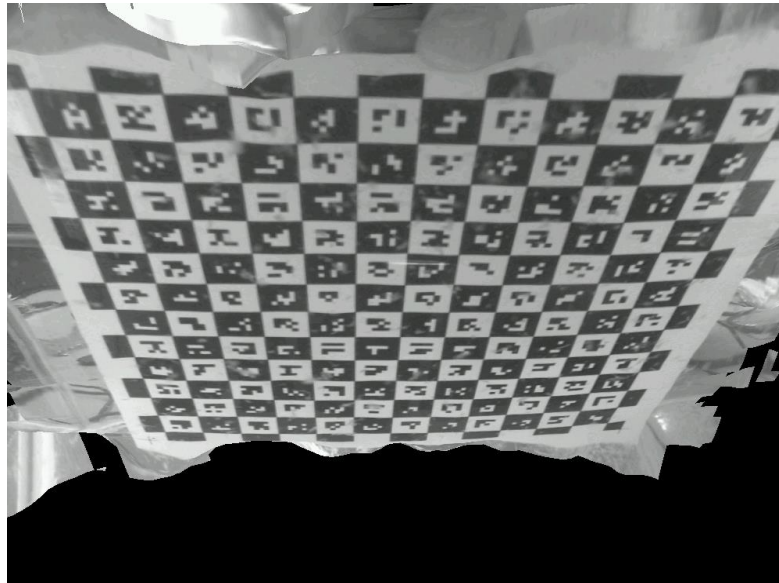
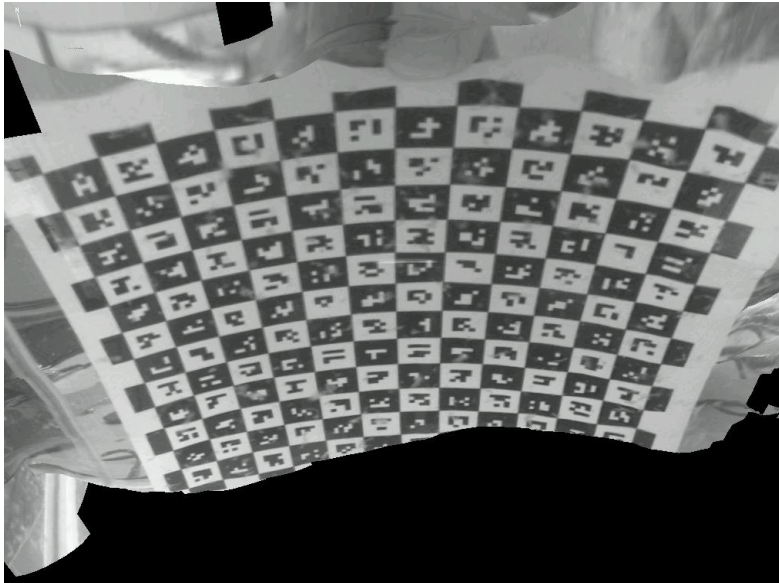
UWSLAM - UnderWater Simultaneous Localization And Mapping

- Built on SAAB's image based navigation system
- Uses stereo cameras to navigate and create sub sea 3D reconstructions/maps
- Includes extended camera model to handle refraction



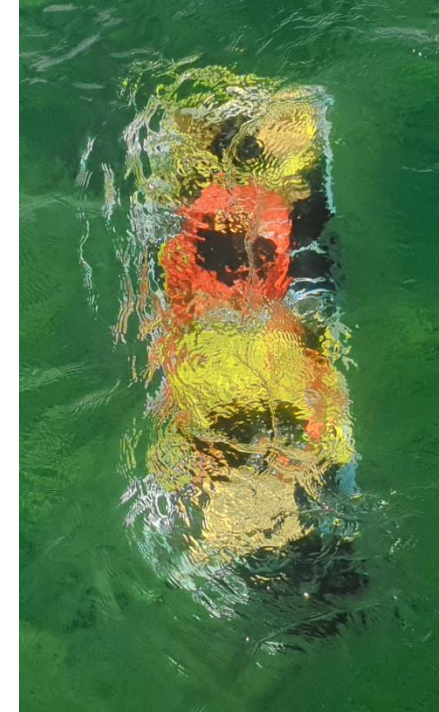
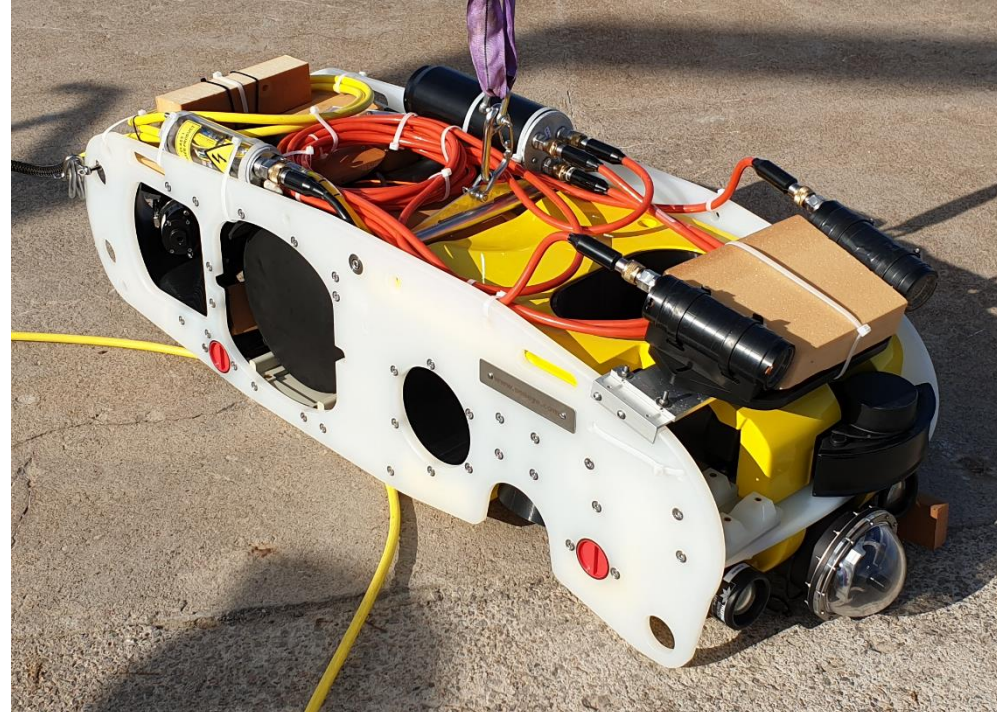
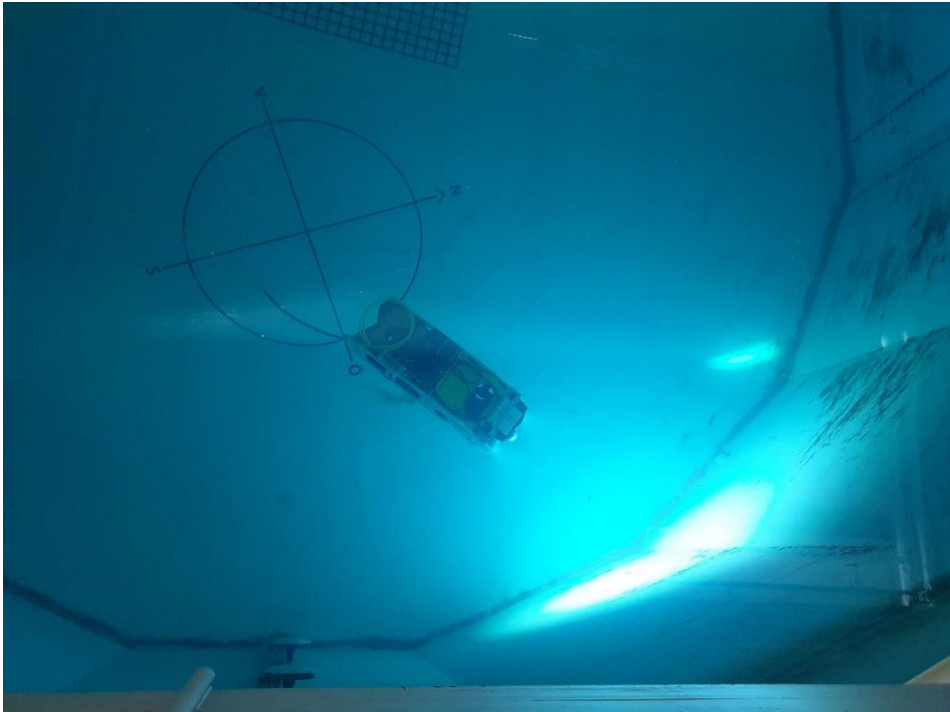
UWSLAM - Calibration

- Extended Calibration Model
 - Calibration of intrinsic and external parameters with standard camera model
 - New calibration parameters to handle refraction
- Refraction compensation by lens



SeaWasp Integration

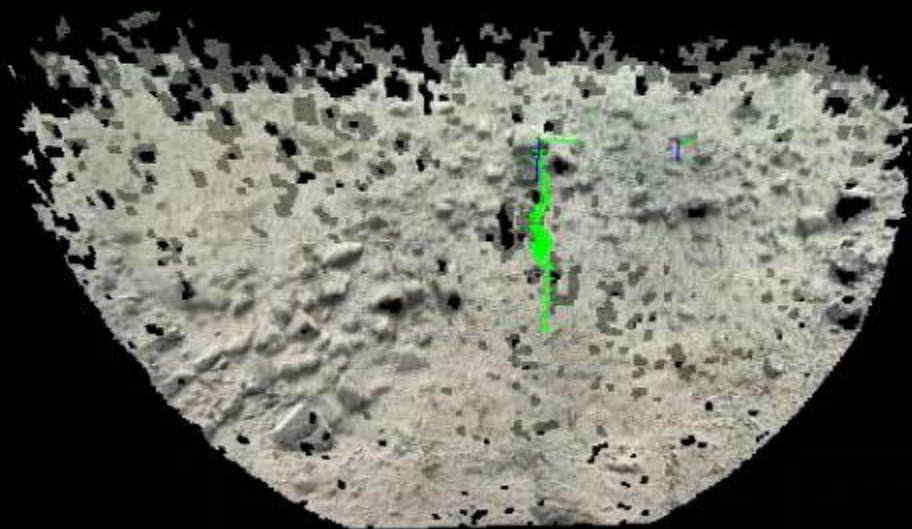
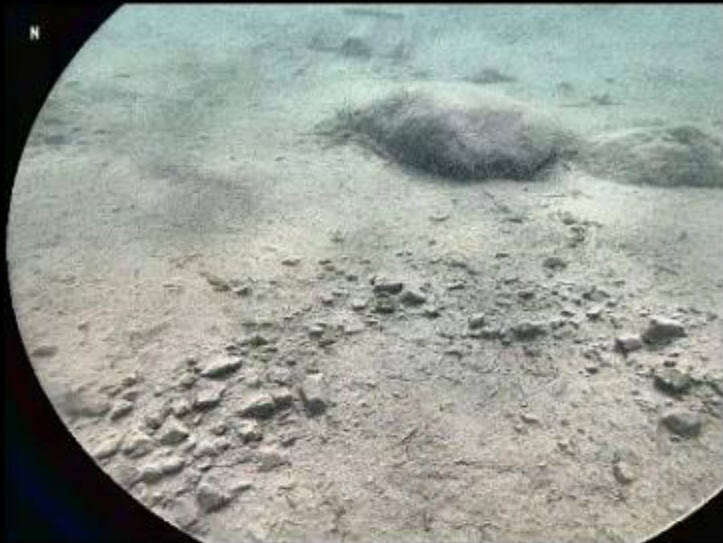
- Industrial GigE Vision Cameras mounted in underwater housings
- Processing (3D-reconstruction) on remote computer
- Tests performed in both test tank and Vättern/Motala





UWSLAM Applications

- 3D-mapping and Navigation
- Inspection/Measurements
- Station Keeping
- Object Detection and Recognition
 - Mine Detection
- Collision Avoidance
- Real-Time 3D situation awareness for e.g. ROV-pilot



Stereo Capabilities and Advantages

- Real-Time Stereo Reconstruction
- Real-Time 3D-Mapping
- Real-Time Measurements
- High Resolution and Full-Color Texture of 3D-Map
- Simple Calibration before mission start
- Auto-Calibration capability during mission
- Low-Cost Hardware compared to e.g. LIDAR