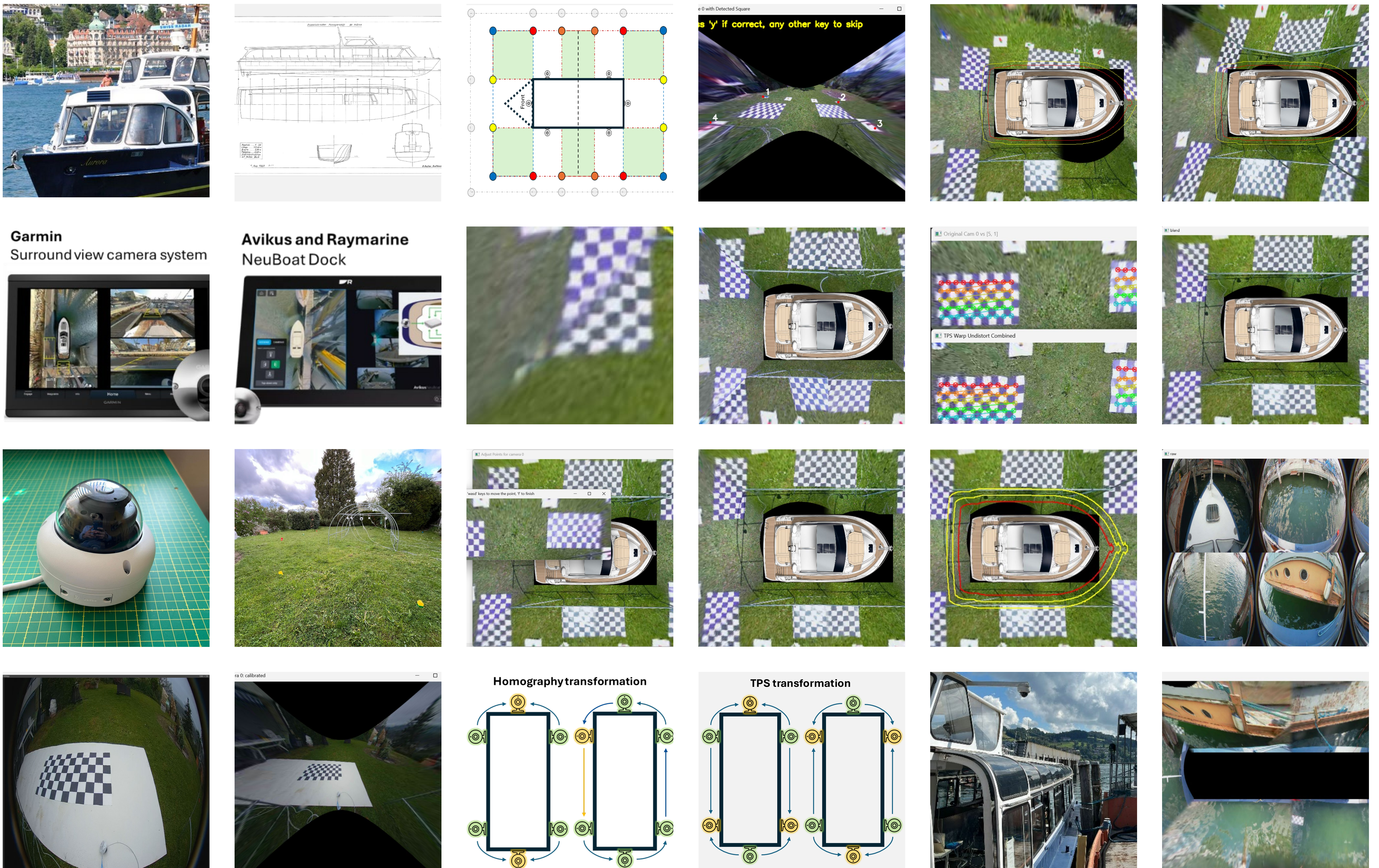


Master of Science in Engineering with Specialization in Business Engineering
Surround view camera system for Shiptec AG



This project covers the development of a surround view camera system for Shiptec, Switzerland's leading company in ship engineering and maintenance. The primary objective was to improve ship operational safety by developing a system that combines six cameras to provide a 360° view, providing a timely and precise visualization that is critical for navigation and docking. The project required selecting suitable hardware and creating the necessary software architecture to process and combine the images in real time.

The software was developed using Python and OpenCV. It manages real-time 360° visualization by synchronizing six cameras, correcting distortions, creating a top-down view, blending images, and improving registration with perspective transformations.

Testing was conducted both on land and on the R&D vessel MS Aurora. The tests focused on validating the hardware's field of view and latency, calibrating the cameras to correct distortions, and aligning the images to create a 360° view. The land-based tests demonstrated the system's capability to achieve precise calibration and image alignment, with an alignment error of 1.27 pixels. The system's real-time processing proved effective, with a total latency of less than 160ms mostly influenced by the employed cameras. However, the water-based setup on MS Aurora revealed challenges due to the labor-intensive and imprecise method used for the first calibration procedures and still requires further testing.

One of the software's key features was the combination of manual adjustment with the use of homography matrices or Thin Plate Spline (TPS) transformations to align and blend images from various cameras. The TPS approach produced great alignment results, but it requires an accurate initial match to prevent excessive curvatures.

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