

## Sensor-Vision Fusion using Kalman filter

The cultural heritage of European nations is spread all across the continent. While things on land are easily accessible, maritime heritage, such as shipwrecks or ancient underwater cities, is often unreachable for tourists. Project i-MareCulture aims at bringing the underwater cultural heritage within digital reach of the wide public by implementing virtual visits, serious games with immersive technologies and underwater augmented reality. The thesis focuses on augmented reality within this project. It is dealing with various problems, such as bad visibility, lack of flat surfaces, and various forces interacting with the device. Therefore, the device cannot rely only on the camera itself, but it has to combine the image with sensors, mainly accelerometer and gyroscope. The goal of the thesis is to add the data from the sensors together using Kalman filter. This algorithm produces good estimates and also deals with noise very well. Different variations of the algorithm are tested (e.g., Extended Kalman filter) in order to achieve the most accurate results. The accuracy is tested with motion-tracking system in the laboratory. Finally, the optimized model is implemented as a mobile application and subsequently evaluated underwater.