



DEGREE PROJECTS

This list of degree projects shows a set of relevant project examples that could be ran in tight cooperation with Image Systems Motion Analysis, and would be suitable for degree projects. Other topics related to image analysis algorithms may also be interesting. Please feel free to contact us and to discuss your ideas!

MOTION BLUR COMPENSATION IN DYNAMIC CAMERAS

While recording images and videos, motion in the scene or of the camera might introduce blur. In a single frame, the light is integrated in the sensor during the exposure time, and if motion occurs during this time the moving image features will get blurred. For our measurements we sometimes have a-priori information about the camera movement, from the camera platform, which may make it possible to compensate for the motion blur effect. There are also other ways of detecting and decreasing the effect of motion in images, without a-priori knowledge, such as using a Wiener filter.

This goal of this master thesis is to study, implement and evaluate methods to compensate for the motion blur. A basic level would be to use Wiener deconvolution, but potential improvements could include using a-priori information to increase the performance.

INVESTIGATE AND OPTIMIZE A TRACKING ALGORITHM FOR FINDING SYMMETRIC FEATURES

Today we have a proprietary tracking algorithm that can find symmetric features in an image sequence using pattern recognition techniques. This algorithm performs well, but due to overall improvements in available software and hardware we expect that it could be improved.

The algorithm is based on a doctoral thesis from 1988 but is poorly documented and it is not obvious exactly how the C++ code is derived from the published theory.

This thesis project could be formulated in several ways depending on the interest and competence of the student. One approach would be the theoretical approach, which would focus on relating the theory from the original thesis to the C++ algorithm and would result in a theoretical description of how it works. It could also involve potential improvements or generalization of the algorithm, and to identify an accuracy measure. Another approach would focus on optimizing the implementation, possibly by using GPU programming (in OpenCL or CUDA).



TURBULENCE MITIGATION IN VIDEO SEQUENCES

When recording video sequences of images over long distances the images are often distorted and degraded in a number of aspects such as blur, tilt and scintillation. There are several approaches that might mitigate these artifacts for our applications, where some interesting options are covered by "Turbulence Mitigation Methods and their Evaluation" (Found in SPIE EO and IR Systems, Technology and Applications XI, 2014. Vol 9249). Since we normally have dynamic movements both of the camera and of the target, the complexity is increased for our use case.

The goal of this master thesis is to study, implement and evaluate some methods for turbulence mitigation for our scenarios.

OPERATOR PANEL CONTROL STATE DETECTOR USING MACHINE LEARNING METHODS

Machine learning contains strong methods to detect and recognize features in images. In this project, an operator panel with a set of controls, such as buttons, switches, and 7-segment displays, is recorded during operation. Every control has a number of known states, that should be logged. Disturbed by for instance lens distortions, vignetting, camera projection, varying lighting conditions and operator hands and shadows, this has shown to be a tough problem. By simulating the state changes in the operator panel, we should be able to create enough data to use machine learning methods for these detectors.

The goal of this master thesis is to study, implement and evaluate some machine learning methods to detect the state of certain controls in video sequences. It will include to generate simulated operator panel data.

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