Software practical / Bachelor Thesis
Implementation of Fourier Tags and Comparison to other Coded Targets

Background
Project ArchEye is working on new drone based approaches to document objects and landscapes, with a focus on other interdisciplinary questions, especially emerging from the fields of building research and archeology. For this purpose, a set of photographs is produced, which is used for offline 3D reconstruction utilizing a structure from motion software afterwards. In order to do this, we need large sets of well positioned and well distributed images all over the object to get the desired quality and completeness. Accordingly, one main focus is on computation of optimal routes for the drone, either for mapping landscapes having a 2D flight plan or for buildings using 3D flight planning.

Project description
3D models created with SfM methods are usually unscaled and without any global reference point (e.g. orientation and position in the real world). Using (coded) markers solves this problem. Each markers’ position is surveyed, and therefore known in the global reference system. The markers are detected in each image and tracked in the resulting 3D reconstructions. By fitting the set of markers of the reconstructed model into the previously measured global geo-positions, the model gets oriented and scaled. There are several bar-code-like types of coded marker-patterns, such as augmented reality tags, MaxiCode, circular binary coded markers and many more. A different approach is the Fourier-Tag^1, which provides efficient and robust detection using a fourier pattern. In this project, the following tasks have to be completed:

- Literature review
- Implementing encoder/decoder for Fourier-Tags
- Comparison to other coded markers (e.g. detection robustness/accuracy)
- Writing a documentation
- Presentation

Required prerequisites
Programming skills (preferably C++, or similar) are necessary. Knowledge in image-processing is helpful.

Contact
Christian Seitz – christian.seitz@ziti.uni-heidelberg.de
Silvan Lindner – silvan.lindner@ziti.uni-heidelberg.de
Prof. Dr. Katja Mombaur – katja.mombaur@ziti.uni-heidelberg.de
https://orb.iwr.uni-heidelberg.de/