

Research Project, Master Thesis

Optical Flow Ground Truth

Description

While real-world Optical Flow Ground Truth is sparsely available, the professorship of digital- and circuit design (DST) is working in the field of data acquisition of movement determination. To evaluate the accuracy of neuronal networks based optical flow determination [1], [2] a comparison to highly accurate dataset is necessary. Ground Truth means a high accurate dataset of movement vectors. The basic idea of approaches to optical flow can be found in [3]–[5]. The idea behind this project is to capture highly accurate data in image sequences using an OptiTrack System¹.



Figure 1: Suit with markers from OptiTrack™

The student's work isn't limited to this work but should at least do the following steps to capture ground truth:

- Getting to know and calibration of the OptiTrack System, which is available at the professorship DST
- Capture a trajectory with a suit for body motion and image sequences, as shown in Figure 1
- Save the markers and images to common file format (e.g. *.bvh, *.png)
- The result of the work is the position of markers in image sequences
- The corresponding Velocity Vector

¹<https://optitrack.com/motion-capture-movement-sciences/>

Recommended experience

- basic understanding in computer vision
- knowledge in at least one programming language (preferably Python or C++)
- basic knowledge in Blender

Literature

- [1] A. Dosovitskiy *et al.*, “FlowNet: Learning optical flow with convolutional networks,” in *Proceedings of the IEEE international conference on computer vision*, 2015, pp. 2758–2766.
- [2] E. Ilg, N. Mayer, T. Saikia, M. Keuper, A. Dosovitskiy, and T. Brox, “FlowNet 2.0: Evolution of optical flow estimation with deep networks,” in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2017, pp. 2462–2470.
- [3] A. Bruhn, J. Weickert, and C. Schnörr, “Lucas/Kanade meets Horn/Schunck: Combining local and global optic flow methods,” *International journal of computer vision*, vol. 61, no. 3, pp. 211–231, 2005.
- [4] B. K. Horn and B. G. Schunck, “Determining optical flow,” *Artificial intelligence*, vol. 17, no. 1–3, pp. 185–203, 1981.
- [5] B. D. Lucas, T. Kanade, *et al.*, “An iterative image registration technique with an application to stereo vision,” 1981.