Aalto University

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Neural network based methods for visual localization and image matching

Title of the dissertation	Deep Learning Methods for Image Matching and Camera Relocalization
Contents of the dissertation	Camera relocalization is a fundamental problem in robotics and computer vision. It aims at estimating the camera orientation and position in a known scene and it is essential for many applications such as navigation of autonomous vehicles, structure from motion, augmented reality and simultaneous localization and mapping (SLAM). Due to its practical importance, plenty of research effort has been devoted to the task over the years. Traditionally, the localization problem has been tackled using 3D geometry by establishing correspondences between pixels in an image (2D) and 3D points in the scene. While the traditional methods demonstrate good localization performance, they require accurate 3D scene model which might be difficult to obtain especially for large scenes.
	In this thesis, we present methods which directly predict absolute and relative camera poses from images by using Convolutional Neural Networks (CNNs) and provide a thorough comparison with the approaches based on traditional image descriptors. In addition, we introduce a coarse-to-fine CNN-based architecture for dense pixel correspondence estimation that can leverage the advantages of optical flow methods and extend them to the case of wide baseline between two views. The obtained list of correspondences is used for the problem of image matching and image alignment.
Field of the dissertation	Computer Science
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