論 文 の 内 容 の 要 旨

論文題目　Learning 3D mesh reconstruction from 2D images
（2D画像からのからの3Dメッシュの再構成の学習）

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Understanding the 3D structure of an object at a glance, called single-view 3D object reconstruction in computer vision, is a useful ability for machines. Because this is an ill-posed problem, it is solved by learning 3D reconstruction from the data, in contrast to traditional 3D reconstruction methods that employ geometric estimation. The question to consider is what kind of data to learn from. Because of the large number of object categories in the world, 3D object reconstruction has to be learned at a low cost. This thesis explores methods for learning 3D object reconstruction using 2D images instead of costly 3D shapes. First, we develop a novel rasterization method to incorporate mesh rendering into neural networks. We also present a detailed comparison of differentiable rasterization methods. Second, to learn single-view 3D object reconstruction from multi-view images with camera parameter and foreground mask annotations, we develop a mesh reconstruction method using the renderer. Third, to use single-view images rather than multi-view images, we propose to address the shape ambiguity inherent in single-view images. Fourth, to use images without annotations, we propose learning reconstruction while separating the foreground and background. By developing these techniques, we significantly reduce the cost of training data required for 3D object reconstruction. We are the first to realize learning 3D mesh reconstruction from images while existing works use voxels, improve the accuracy of reconstruction learned from single-view images by learning priors of views, and achieve learning 3D object reconstruction from only images without additional supervision.