Editorial
RGB-D Sensors and 3D Reconstruction

I. Introduction

RGB-D sensors are a specific type of depth-sensing devices that work in association with RGB camera, that are able to augment the conventional image with depth information (related with the distance to the sensor) in a per-pixel basis. In recent years, depth sensors have encouraged the communities of computer vision and computer graphics to explore novel solutions based on RGB-D images. The depth information may provide a significant contribution to solve or simplify many challenging tasks, such as object detection, scene parsing, pose estimation, visual tracking, semantic segmentation, shape analysis, image-based rendering, and 3D reconstruction. For example, once the depth formation of the scene is obtained, the corresponding 3D model can be directly constructed by the mapping approach. In other words, depth-based 3D reconstruction does not need to run the routines of structure from motion (SFM) which is too complex, and produce a high-quality geometric model. Thus, RGB-D sensors provide a chance for the 3D reconstruction communities.

Although several RGB-D sensors, such as Microsoft Kinect, Structure IO, ASUS Xtion Pro, and Intel RealSense, have appeared on the market and have been studied by the communities of computer vision and graphics, from a user perspective, the quality of depth images from existing RGB-D sensors still needs to be improved. At the same time, the computer vision and machine learning communities have proposed many novel approaches to handle depth images, individually or fused with other information such as normal and RGB images. Those novel methods have also brought new opportunity for researchers of 3D reconstruction.

II. Accepted Papers

We accepted 38 high-quality papers in this successful Special Issue. Due to the limitation of editorial space, only 13 of the most representative papers will be introduced here.

In "High-Resolution Anisotropic Prestack Kirchhoff Dynamic Focused Beam Migration," anisotropic ray tracing will be applied to extend it to an anisotropic seismic imaging method.

"3D Block Matching Algorithm in Concealed Image Recognition and E-Commerce Customer Segmentation" identified and analyzed the internationalized commodity images of e-commerce networks.

"Edge Detection Algorithm Optimization and Simulation Based on Machine Learning Method and Image Depth Information" applies the idea of machine learning classification algorithm to depth image edge detection.

In "Human Motion Capture System Based 3D Reconstruction on Rehabilitation Assistance Stability of Lower Limb Exoskeleton Robot Climbing Upstairs Posture," a complete diagram of the stair-climbing posture can be set up.

"Feature Extraction of Brain–Computer Interface Electroencephalogram Based on Motor Imagery" proposes a new EEG feature extraction algorithm based on common spatial pattern (CSP) and adaptive auto-regressive (AAR).

In "The Research About Adaptive Active Recognition and Tracking Technology of Fast Target Image Strength," an adaptive laser divergence angle control method is proposed to match the distance between the target point and the passive imaging system.

In "Dynamic Monitoring of Haze Pollution Using Satellite Remote Sensing," the current study analyzed and explored the spatial distribution, aerosol vertical structure, source, and migration path of haze pollution.

In "Realtime RGB-Based 3D Object Pose Detection Using Convolutional Neural Networks," the authors present a new approach to efficiently detect the 3D pose of objects in images.

The image fusion method in SPCNN of adaptive parameters based on inherent characteristics of the image is proposed in "Multi-Modality Image Fusion in Adaptive-Parameters SPCNN Based on Inherent Characteristics of Image."

"Research on 3D Reconstruction Algorithm of Medical CT Image Based on Parallel Contour" studies the 3D reconstruction algorithm of medical CT image and realizes the 3D reconstruction of the aortic dissection by surface drawing and volume rendering.

In "Research on Partition Segment Grinding Path Method of Aero-Engine Blade Based on Robot Group," the contour of the aero-engine blade is fitted with spline curve, and the surface of the blade is segmented according to the fitted curve curvature.

In "Research on Binocular Visual System of Robotic Arm Based on Improved SURF Algorithm," SURF algorithm is improved and reverse feature vectors matching strategy is used to initialize the matching points set.

A novel technique on camera's intrinsic parameters calibration is proposed in "Calibration on Camera's Intrinsic Parameters Based on Orthogonal Learning Neural Network and Vanishing Points."

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