Public Abstract

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Title:INDOOR SCENE 3D MODELING WITH SINGLE IMAGE

3D modeling is a fundamental and very important research area in computer vision and computer graphics. One specific category of this research field is indoor scene 3D modeling. Many efforts have been devoted to its development, but this particular type of modeling is far from mature. Some researchers have focused on single-view reconstruction which reconstructs a 3D model from a single-view 2D indoor image. This is based on the Manhattan world assumption, which states that structure edges are usually parallel with the X, Y, Z axis of the Cartesian coordinate system defined in a scene. Parallel lines, when projected to a 2D image, are straight lines that converge to a vanishing point. Single-view reconstruction uses these constraints to do 3D modeling from a 2D image only. However, this is not an easy task due to the lack of depth information in the 2D image. With the development and maturity of 3D imaging methods such as stereo vision, structured light triangulation, laser strip triangulation, etc., devices that gives 2D images associated with depth information, which form the so called RGBD image, are becoming more popular. Processing of RGB color images and depth images can be combined to ease the 3D modeling of indoor scenes. Two methods combining 2D and 3D modeling are developed in this thesis for comparison. One is region growing segmentation, and second is RANSAC planar segmentation in 3D directly. Results are compared, and 3D modeling is illustrated. 3D modeling is composed of plane labeling, automatic floor, wall, and boundary point detection, wall domain partitions using automatically detected wall, and wall boundary points in 2D image, 3D modeling by extruding from obtained boundary points from floor plane etc. Tests were conducted to verify the method.