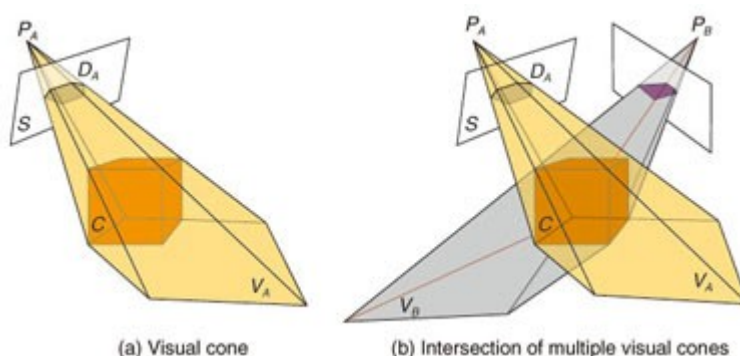


Object/shape reconstruction from silhouettes

Overview

The reconstruction of a 3D object model from a set of images taken from different viewpoints is an important problem in computer vision. One of the simplest ways to do this is to use the silhouettes of the object (the binary classification of images into object and background) to construct a bounding volume for the object. To efficiently represent this volume, Szeliski [1] uses an octree, which represents the object as a tree of recursively subdivided cubes.



The algorithm starts with a small number of black cubes. Black cubes are believed to lie completely within the object, white cubes are known to lie outside of the object, and gray cubes are ambiguous (e.g. along object's boundary). When a new image is acquired, all current cubes are projected in the image plane and tested whether they lie totally within or outside the silhouette. Then, the color of each cube is updated according to the outcome of the cube-silhouette intersection test.

Project

Implement the shape-from-silhouettes method above using images captured by a **single, hand-held camera** (webcam, mobile phone, etc.). Use a computer-vision library (e.g. OpenCV) to help you perform low-level computer vision tasks such as: feature detection, feature matching, segmentation, camera calibration, camera pose estimation, etc. If necessary, use a so-called camera calibration pattern (chessboard pattern).

References

[1] Rapid Octree Construction from Image Sequences. [Richard Szeliski](#), *Computer Vision, Graphics, and Image Processing. Image Understanding*, Vol. 58 (January 1993), pp. 23-32.