Title:	Visual Hull Reconstruction in Surveillance Videos
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Abstract:

The visual hull is a geometric entity created by shape-from-silhouette 3D reconstruction technique introduced by A. Laurentini. A lot of research is done in this shape-from-silhouette 3D reconstruction technique but majority of them are focused on 3D reconstruction in controlled environment with large number of views. In case of surveillance videos numbers of views are generally limited to around 3 to 4 views. Lighting changes results in erroneous foreground segmentation which results in artifacts in reconstructed visual hulls. We present a simple yet robust method to overcome this. We achieve this by modifying the silhouette by a relaxed carving framework instead of a deterministic carving. Real-time high-level vision systems require compact and explicit representations of 3D reconstruction that allows for efficient attention control, object detection, and reasoning. This raises a new question: How can one efficiently analyze half a million voxels and form a visual hull for this huge amount of data in real-time? We answer this by a coarse visual hull reconstruction method focused on speed. We achieve it using stixels as a discretization primitive. We analyze the results of our algorithm and compare it with standard voxel carving technique. Soft Voxel Carving reduces artifacts due to silhouette defects while Stixel Carving provides significant improvement in speed.

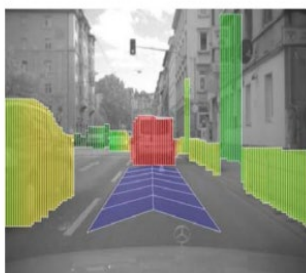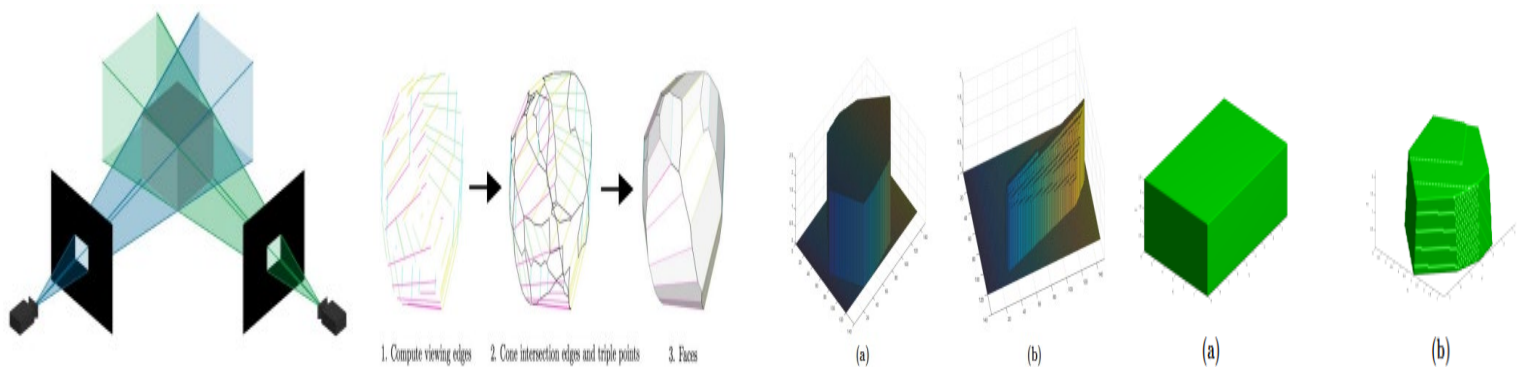1. Compute viewing edges   2. Cone intersection edges and triple points   3. Faces

(a)   (b)   (a)   (b)

Figure 2.4: Illustration of stixel world [14]

Invalid Stixel   Valid Stixel