Joint View Triangulation for Two Views

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Abstract

We propose the *Joint View Triangulation*, which coherently models all visible and partially occluded patches within n views of a scene (rigid or not). It is built from an underlying dense matching and can be used for any application requiring discrete and efficient representation of deformation and displacement between views.

First robustness has to deal the unavoidable matching errors. Secondly matched and half occluded areas should be separated in each view to allow different processes on them. Finally, the elements of the structure which represent the matched area of each view pair should be in correspondence. This ensures a global *coherence* of the data and avoid redundant processes. In fact, we merely expect to an approximate but coherent structure, because of the finite precision of the images and bad matches.

This paper deals only with the two view case but also applies the joint view triangulation to morphing between real image pairs with large camera displacement.

Keywords: Constrained Delaunay Triangulation, Visibility, Morphing, Region Growing Matching.

1 Introduction

Motivations Many applications (e.g. image compression, image based rendering, layers, surface reconstructions, help for telemanipulation) need efficient rendering-oriented representations of a set of images. This paper introduces the joint view triangulation (JVT), a triangulation whose patches are shared between multiples views. It is an effective tool for modeling visibility information and improves existing solutions. It provides:

1. An image based representation with a reduced set of primitives, which approximates displacement maps.
2. For each view, a separation of matched and half occluded areas to allow different processes on them.
3. For each pair of views, a correspondence between primitives which represents the common (i.e. matched) areas of the pair. This ensures the global *coherence* of the data and avoids redundant processing during use.

Figure 1 shows an example of a JVT. A precise definition is given in the next section. Section 3 presents a robust algorithm for its construction in the two view case. Sections 4 and 5 apply it to the morphing of real image pairs, which are matched with a region-growing method. A report [13] describe the complete process (matching, JVT and warping).

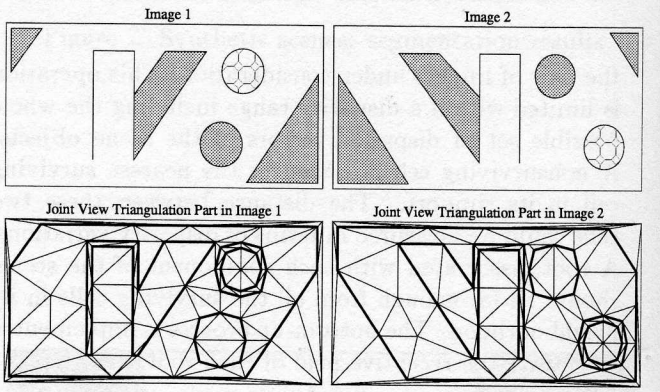

Figure 1: The first row represents two views of a non rigid scene, composed of a small vertical rectangle on an infinite horizontal plane and a falling ball. Half occluded areas (visible in only one image) are shaded gray. The second row shows a joint view triangulation for these two views. *Matched* (resp. *Unmatched*) *triangles* fill the matched (resp. unmatched) areas. The black edges represent the boundaries of matched areas and are forced to be edges of their respective triangulations.

Related Work Other structures have been proposed to model visibility information in computer vision and computer graphics (e.g. aspect graphs [6] and visibility skeleton [2]), but they need a rigid 3D model as input and are not optimized for the same uses. In contrast to these, our struc-