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Image Resolution using Delaunay Triangulation

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Introduction

High resolution image from multi-frames refers to the particular case where multiple images of the same scene are available. In general, changes in these low-resolution images caused by camera or scene motion, camera zoom, focus and blur mean extra data is recovered so as to allow reconstruct an output image at a resolution above the limits of the original camera or other imaging device. High resolution images are crucial in several applications including medical imaging and diagnosis, military surveillance, satellite and astronomical imaging, and remote sensing. A clear, high-quality image of a region of interest in a video sequence may be useful for facial recognition algorithms, car number plate identification, or for producing a quality picture for the press.

In this paper a set of low-resolution images are combined together and processed so as to reconstruct a high-resolution image. Many problems require finding the coordinate transformation between two images of the same scene or object. Whether to recover camera motion between video frames, to stabilize video images, to relate or recognize photographs taken from two different cameras, to compute depth within a three-dimensional (3-D) scene, or for image registration and resolution enhancement, it is important to have both a precise description of the coordinate transformation between a pair of images or video frames, and some indication as to its accuracy. A new solution to the motion estimation problem using a more general estimation of a coordinate transformation, and propose techniques for automatically finding the eight-parameter projective coordinate transformation that relates two frames taken of the same static scene A high resolution algorithm along with Delaunay triangulation approach is used so as to enhance the image resolution. Delaunay Triangulation and Voronoi Diagram are important data structures in computational geometry.

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Delaunay Triangulation is the dual structure of the Voronoi diagram in 2-D plane. It satisfies the empty circle property, that is, for each edge in Delaunay Triangulation, we can find a circle passes through the edge's endpoints without enclosing other points. The aim of this project is to design an algorithm for constructing an initial HR image with the capability of improving, subsequently, its quality by local updates with the availability of a larger number of input frames than initially used.

Literature Survey

Recursive reconstruction of high-resolution image from noisy under sampled multiframes by S. P. Kim, N. K. Bose, and H. M. Valenzuela proposes an efficient algorithm for the interpolation and removal of noisy images. In case of satellite images pictures taken usually do not coincide. So, the displacement of each frame relative to an arbitrarily chosen reference frame has to be measured. This is the problem of image registration. Recursive high-resolution reconstruction of blurred multiframe images by S. P. Kim and W. Y. Su presents an approach to obtain high-resolution image reconstruction from low-resolution, blurred, and noisy multiple-input frames.

Proposed Method

In this paper successive images of the same scene are combined together so as to enhance the image resolution. From a set of low-resolution images some additional information are extracted so as to reconstruct the high-resolution image. High-resolution algorithms, which increase the effective sampling rate and bandwidth of observed low resolution degraded images, usually accompany a series of processing tasks such as sub-pixel motion estimation, filtering, and interpolated image restoration for tasks in surveillance, medical and commercial applications. Here a high-resolution algorithm along with a triangulation method called Delaunay triangulation is adopted for resolution. Fig.1 shows the various stages between the data acquisition and high-resolution image reconstruction. Here by the controlled motion of camera a set of low resolution (LR) image frames are obtained. The most common assumption in motion estimation for coding is that the coordinate transformation between frames is translation. The image registration problem can be identified using a subset