

Fig. 6. First three of 125 images.

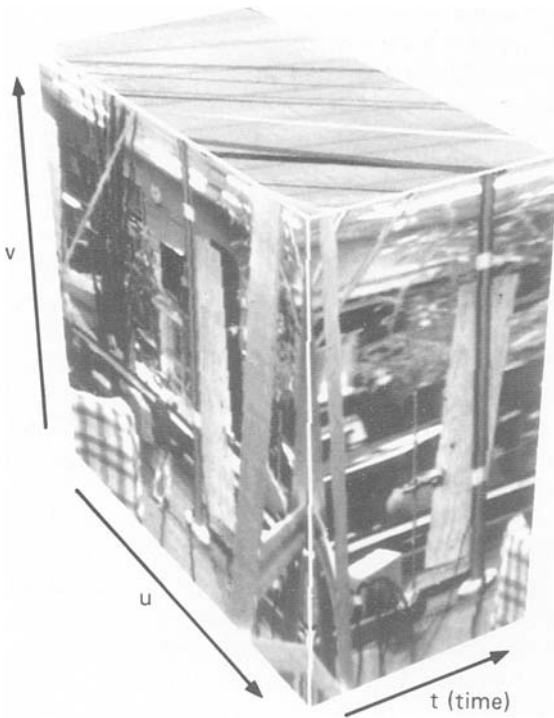


Fig. 7. Spatiotemporal solid of data.

such knowledge, our application of this idea has undergone some revision. Rather than monitor the motion of the sensor, we now restrict the motion to straight lines. This allows us to partition the three-dimensional problem into a set of two-dimensional analyses, one for each epipolar plane.

Our second initial idea was to take long sequences of closely spaced images to obtain a long baseline by tracking features through many simi-

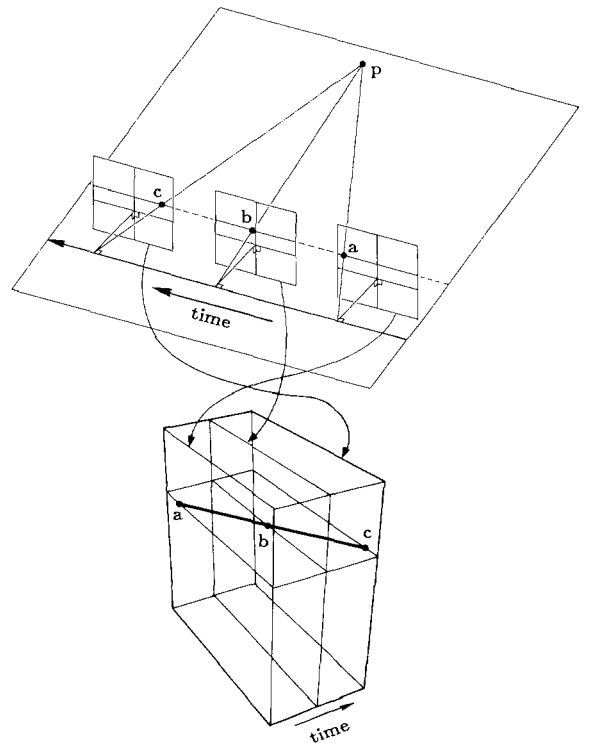


Fig. 8. Lateral motion with solid.

lar images. To pursue this idea further than was possible with the few image sequences described in the introduction, we took some longer sequences in which the images were so close together that no single image feature moved by more than a few pixels from image to image. (Figure 6 shows the first three images from one of our sequences of 125.) This sampling frequency guaranteed a continuity in the temporal domain similar to that of the spatial domain. Thus, an edge of an object

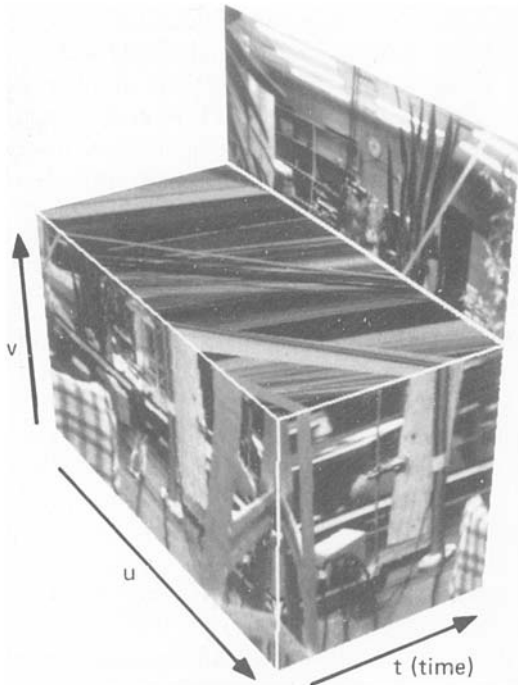


Fig. 9. Sliced solid of data.

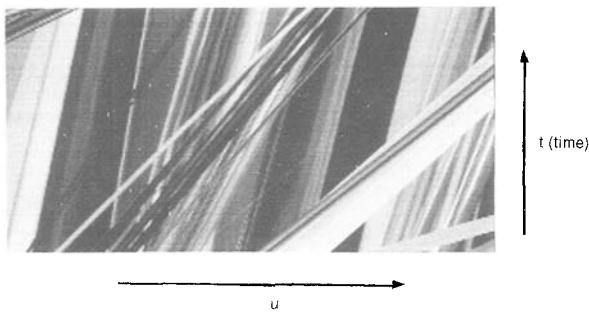


Fig. 10. Frontal view of the EPI.

in one image appeared temporally adjacent to (within a pixel of) its occurrence in both the preceding and following images. This temporal continuity made it possible to construct a solid block of data in which time is the third dimension and continuity is maintained over all three dimensions (see figure 7). This solid of data is referred to as *spatiotemporal data*.

An EPI is a slice of this solid of data. The position and shape of the slice depend on the type of motion. An EPI for a *lateral motion*, whereby the camera is aimed perpendicularly to its path, is a horizontal slice of the spatiotemporal data. This is

because the epipolar lines are horizontal scanlines that occur at the same vertical position in all images (see figure 8). Figure 9 shows one of these slices through the solid of data in figure 7. Figure 10 is a frontal view of that slice. In this image, time progresses from bottom to top and, as the camera moves from right to left, the features shift toward the right.

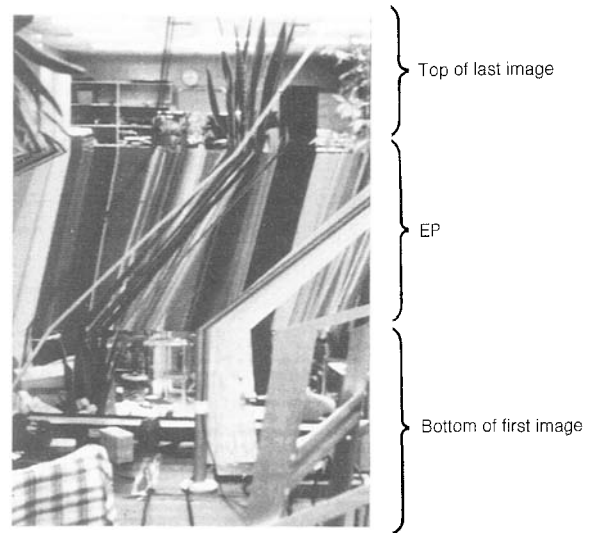


Fig. 11. EPI with portions of the spatial images.

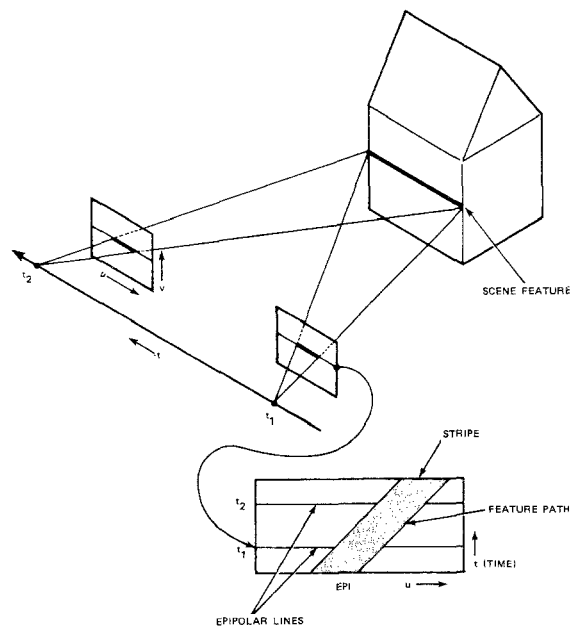


Fig. 12. Relationship of scene features to feature paths.