Figure 6: Layer from the Animal Farm dataset. (a) The unoccluded layer $H_k$ can be defined using the contour $\gamma_k(s)$ on one viewpoint projected to the remaining frames. The 2D contour is denoted by the red curve on the first image. (b) Occluded layer $H^O_k$ can be inferred by removing the regions which intersect with other layers related to a smaller depth.

based on the sparse representation is to be implemented, where the segmentation of each layer must also be transmitted.

2.4 Sparse representation method high-level overview

We use the above analysis to develop a new method that provides sparse representations of multiview images. The method is outlined in Fig. 7. The first step of the method is to obtain a layer-based representation. As highlighted in Section 2.3 each layer is modeled by a constant depth plane and a contour on one of the image viewpoints. To extract these layers, we use a variational framework where the general segmentation results are modified to include the camera setup and the occlusion constraints.

In the following step we decompose the layers using a 4D DWT applied in a separable fashion across the viewpoint and the spatial dimensions. We modify the viewpoint transform to include disparity compensation and also efficiently deal with disoccluded regions. Additionally, the transform is implemented using the lifting scheme [20] to reduce the complexity and maintain invertibility.

In the following sections we describe the layer extraction and 4D DWT stages in more detail.

3 Layer-based segmentation

Data segmentation is the first stage of the proposed method. Here we introduce our segmentation algorithm which achieves accurate results by taking into account the structure of multiview data. We introduce the method by first describing a general segmentation problem and then showing how that solution can be adapted to extract layers from a light field dataset.