Report Sheet 2, Advanced Part

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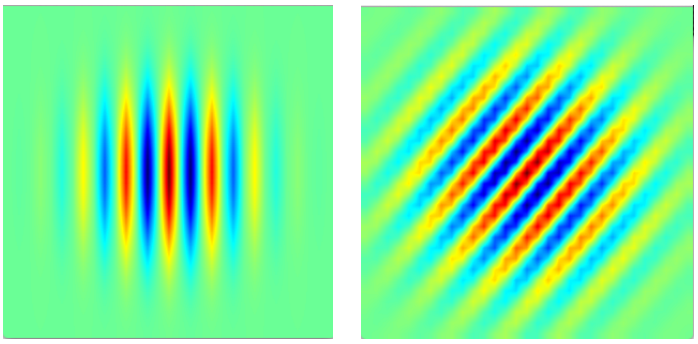
1 Gabor Features

Gabor Filters Gabor Features are based on Gabor Filters. Gabor Filters are a kind of spatial filters for edge detection. It is composed of a harmonic function multiplied by a gaussian function. They are thought to display similar features as edge detections in the human visual system. Figure 1 shows two of the filters we used. Whereas single gabor filters can be used to detect edges, a set of different gabor filters can be used to create gabor features.

We created a filter bank with a total of 27 different gabor filters (combining different parameters such as orientation, width of the gaussian etc). Each filter was then convolved with an image. In this way, we generated 27 different images.

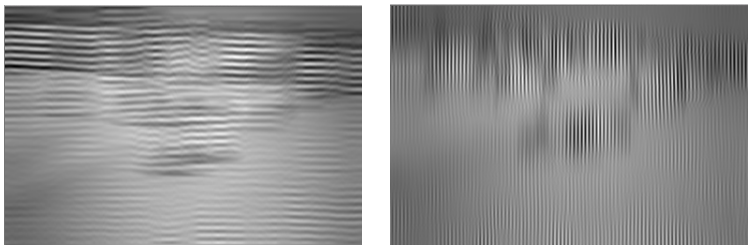
Each r*c feature vectors, each with 27 entries. We then generated distance maps displaying the euclidian distance of the feature vector of a reference pixel to all other feature vectors (see Figures 3-**??**).

Discussion Calculating the 3D coordinates of points with a disparity map is a different approach than what we discussed in the seminar, stratified



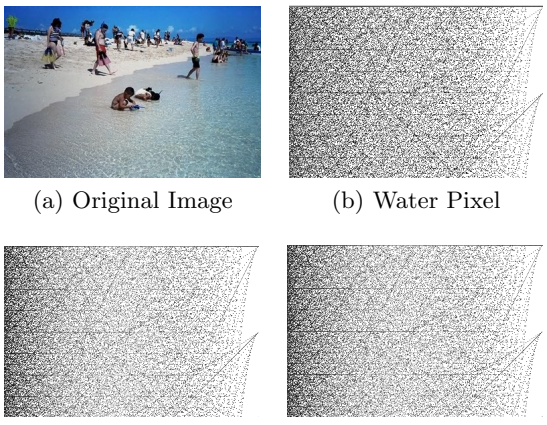
(a) Filter 1 (b) Filter 2

Figure 1: Two gabor filters.



(a) Filter 1 (b) Filter 2

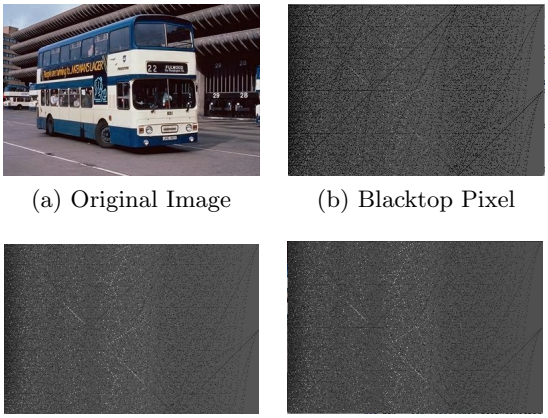
Figure 2: An image of a beach scene (see Fig. 2 filtered with two different gabor filters. One of the filters had a horizontal orientation, the other one a vertical orientation, resulting in the highlighting of horizontal and vertical edges respectively.



(a) Original Image (b) Water Pixel

(c) Person Pixel (d) Sand Pixel

Figure 3: Image of a beach scene and three different distance maps. The captions indicate the approximate location of the reference pixels.

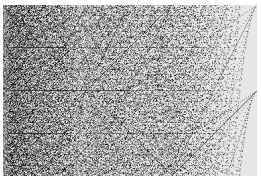


(a) Original Image (b) Blacktop Pixel

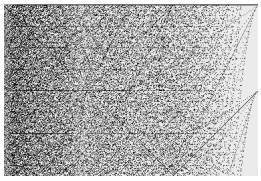
(c) White bus part pixel (d) blue bus part pixel

Figure 4: Image of a bus in a downtown area.

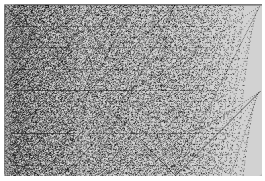
(a) Original Image



(b) Background pixel



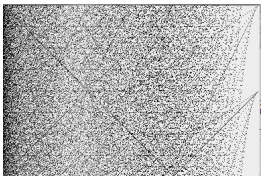
(c) Brown body pixel



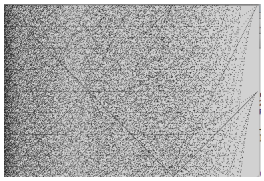
(d) White body pixel

Figure 5: Image of a dinosaur painting.

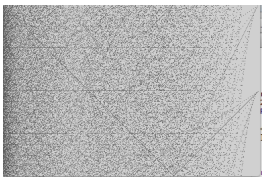
(a) Original Image



(b) Background pixel



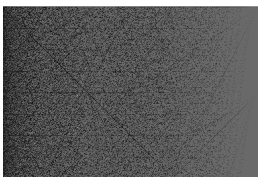
(c) Body pixel



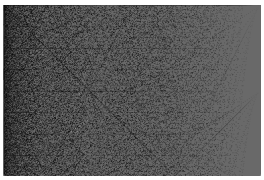
(d) Head pixel

Figure 6: Another dinosaur painting.

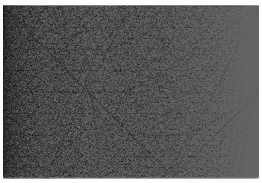
(a) Original Image



(b) Center flower pixel

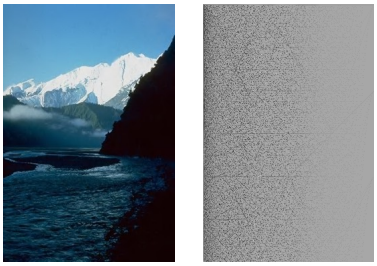


(c) Leaf pixel



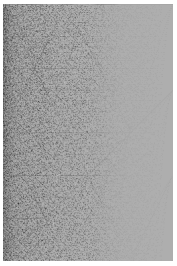
(d) Petal pixel

Figure 7: Image of a flower.

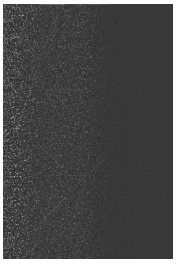


(a) Original Image

(b) Wood pixel



(c) Snow pixel



(d) Water pixel

Figure 8: Image of a mountain scene.

reconstruction (the approach discussed in the Zisserman book). One of the advantages is the fact that it is not requiered to calculate the plane at the infinity. A disadvantage is the requirement, that the disparity only occurs in the horizontal direction, this, of course can be obtained by careful placement of the cameras and image rectification, nevertheless, it is at least in theory less general than stratified reconstruction. Also, the results we obtained are not very promising.

When small block sizes are used and the smootheness is not enforced, the resulting maps are very speckled and probably useless for further usage without processing. Maybe a median filter of some sort could help here. The second set of disparity maps are smoother, however, a lot of detail, which is still visible to our eyes in the first set of maps, is lost and edges are not straight.Perhaps the results of this algorithm can be improved by preprocessing images. Histogram equalization could increase contrast and facilitate matching of points, possibly improving both the estimate of F and the disparity map. Foreground segmentation could be another useful trick. Usually, disparity vanishes when objects are distant enough from the cameras (exact value not known to us). So the resulting disparity seen for example in the upper regions of both the disparity map of the table scene and the street scene probably noise. Additionally, background objects are ususally out of focus (car scene) or homogenous (the back wall in the table scene), further reducing the quality of the matching and thus the resulting

disparity map.