

Artificial Intelligence

Exercises week 7 - Computer vision -

Solutions

COMP9414

Question 1: Image processing – Averaging

Consider the binary image with dimension 7×16 shown in Figure 1. Use the averaging method with a threshold $\epsilon = 3$ and a 3×3 sliding windows. Show the resulting image.

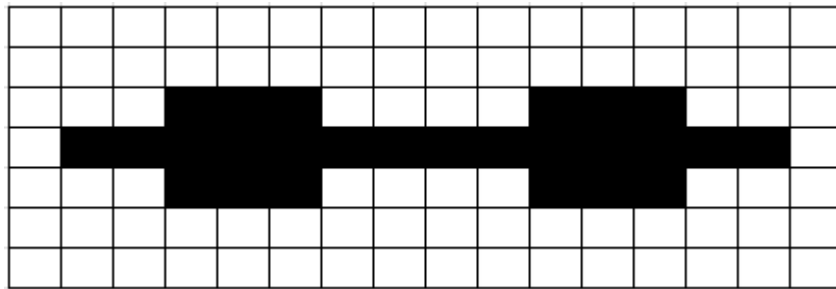


Figure 1: Original image.

Answer: White boxes represent a value 0, black boxes represent a value 1. We need to slide a window through the image and replace the middle pixel with a 0 or a 1 depending on if the number of pixels with value 1 are greater or not than the threshold $\epsilon = 3$ (if $\text{sum} > \epsilon \rightarrow 1$, otherwise 0). If we repeat the process, the result should look like the one shown in Figure 2.

threshold = 3. Therefore if sum 1, 2, or 3 then new pixel in the new image is 0.
 3x3 windows

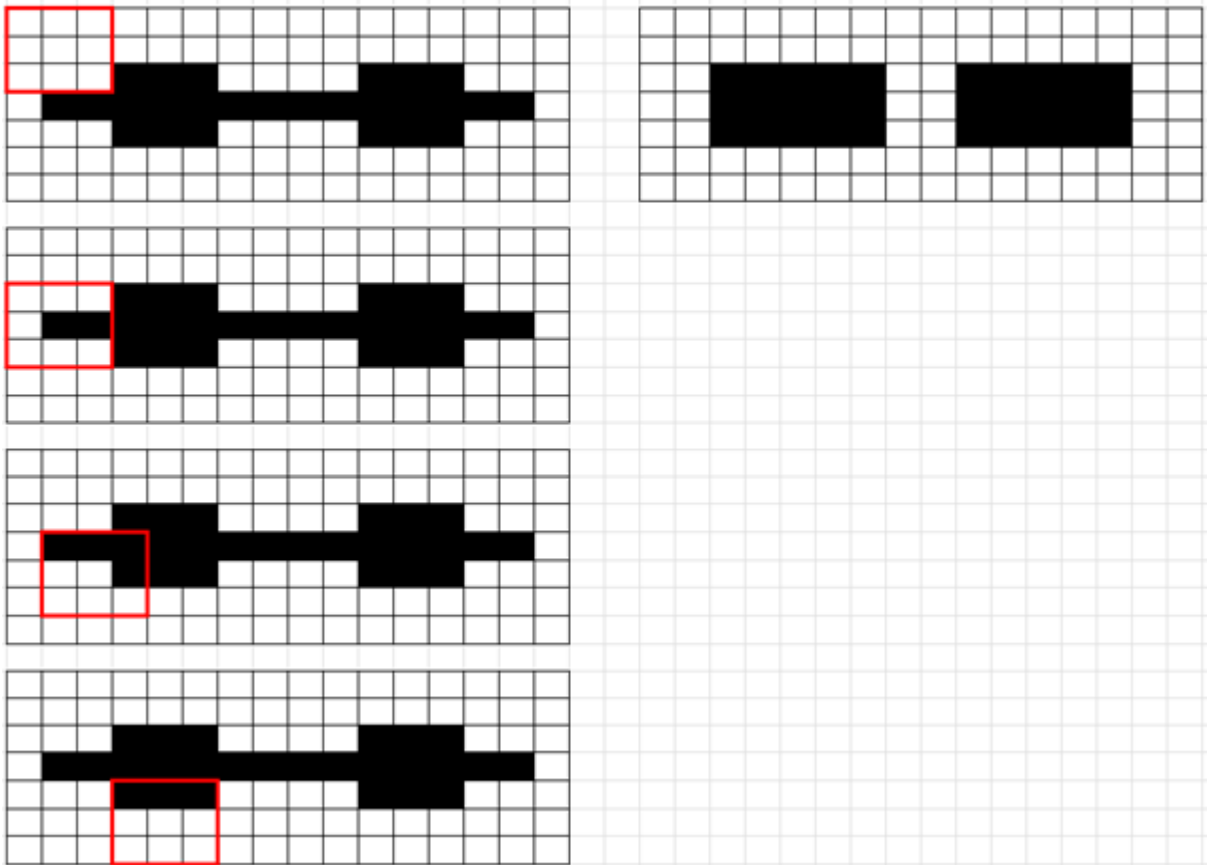


Figure 2: Resulting image.

Question 2: Scene analysis – Intersections

Consider the scene shown in Figure 3 in which points A, B, and C are intersections of planar surfaces creating occlude, blade, or fold edges.

What kind of intersection represents each point?

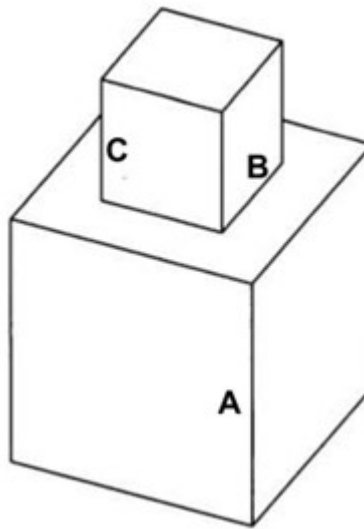


Figure 3: Scene with intersections.

Answer: Each of the intersections corresponds to the following:

A = blade, B = fold, C = occlude

Question 3: Stereo vision

Consider the scene shown in Figure 4 in which a known object is on the floor. The camera lens is at a height = 2 mts. and the object is perceived at an angle of 60 degrees.

What would be the computed distance d from the camera to the object?

Answer: As we know the object is on the floor and the camera height, we can use:

$$d = h / \tan \alpha \quad (1)$$

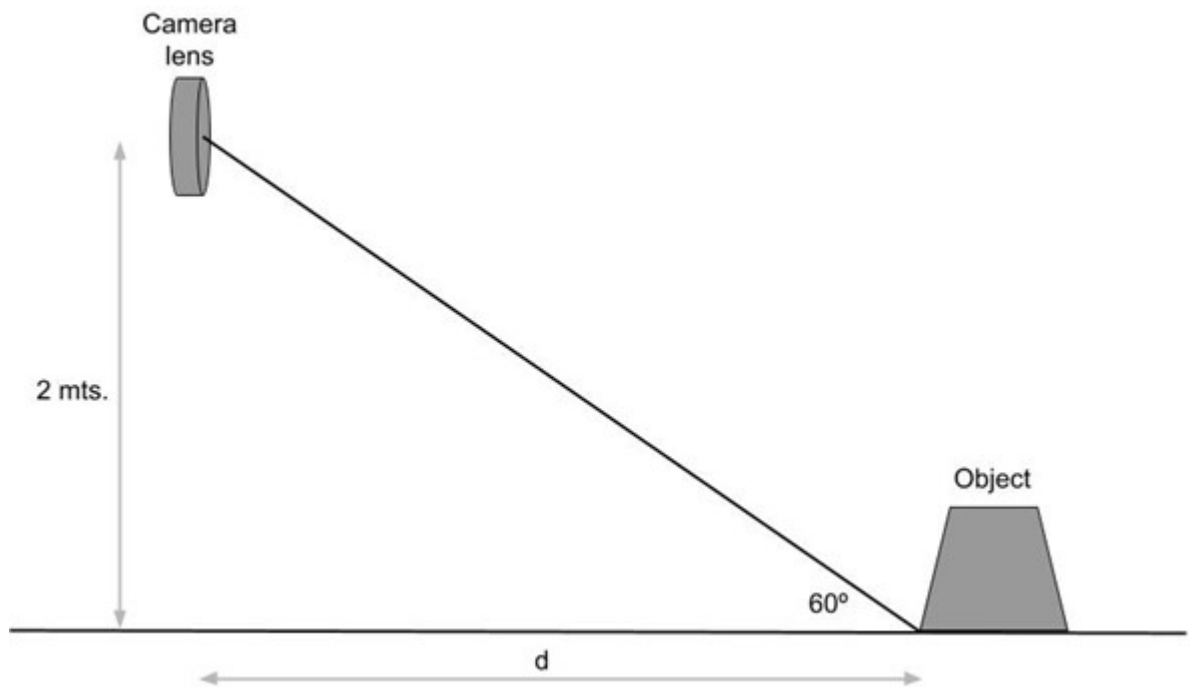


Figure 4: Stereo vision.

Therefore, as height $h = 2$ mts. and the angle $\alpha = 60$ degree, then $d = 1.1547$ mts.