

Exercise: Image and Video Processing

Sheet 5 – Background Image / Object Segmentation

Exercise 1 – Class BackgroundImage

Design a class *BackgroundImage* to calculate a background image based on several input images. Assume that all input images have already been transformed with the correct camera model parameters.

- `void calculateAverage (Image img[], int cnt_images, Image &dest);`

The array `img[]` contains `cnt_images` transformed input images. These images should be used to calculate the background image. Use the average value (medium value) of all pixels at one pixel position. Undefined image regions are white (`color==255`) and should not be considered for the calculation of the average value.

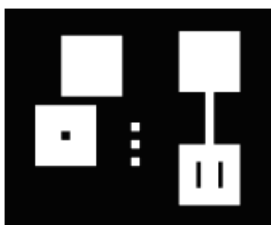
- `void calculateMedian (Image img[], int cnt_images, Image &dest);`

Use the median of all pixels at one position to calculate the background image. Do not consider undefined image regions.

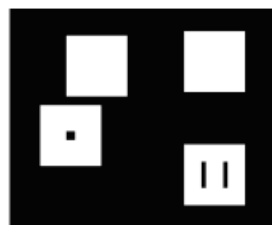
- Open the images *test7_01* to *test7_15* and calculate the background by using both functions. What are the differences? Which types of errors do occur?

Exercise 2 – Object Segmentation in Videos

1. Name assumptions to segment objects in videos (based on motion)?
2. Describe the segmentation steps.
3. Assume that the parameters of the camera model between adjacent frames are given. How do we derive the parameters between arbitrary frames?
4. A grayscale image should be transformed by a given camera model transformation. A new pixel position is not necessarily located at a integer pixel position. Name possible solutions.
5. The computational effort to calculate the median is very high. How can we calculate it more efficiently?
6. Describe how the center of gravity of a segmented object can be estimated?
7. Which morphological operator is depicted in the following figure?



original image



modified image