

# EQ2330 – Image and Video Processing

## Assignment 12

The following preparation assignment is to be solved before the next exercise session indicated by the due date of the assignment. You bring your solution to the exercise session and one of your peers will correct it during that session. After that you will discuss the correction with your peers and resolve any open questions. If necessary, the teaching assistant can help you. It is required to solve all the assignments and correct at least one peer solution of each assignment in order to pass the course.

### Problem

You are designing a video conferencing software. After thorough analysis of a relevant database, you find that the probability functions in Figure 1 apply to the average background and foreground in video conferences. Further, the a priori probabilities for background and foreground pixels are given by  $P_{bg}$  and  $P_{fg}$ , respectively.

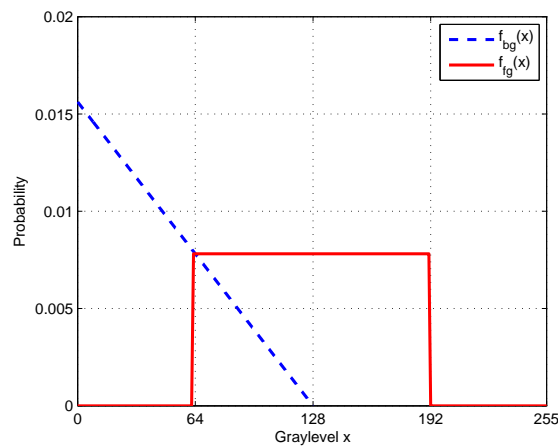


Figure 1: Probability density functions for video conference background and foreground.

1. Find the exact expressions for  $f_{bg}(x)$  and  $f_{fg}(x)$ !

2. To improve the efficiency of your video coder by, e.g., applying more bits to the foreground pixels, you design an image segmentation algorithm. You begin with global segmentation. Let  $x_T$  denote the optimal segmentation threshold. What is the optimal segmentation threshold in the two limiting cases  $P_{bg} = 0$  and  $P_{fg} = 0$ , respectively? That is, find

$$\lim_{P_{bg} \rightarrow 0} x_T \tag{1}$$

and

$$\lim_{P_{fg} \rightarrow 0} x_T. \tag{2}$$

3. Give an expression for the optimal *supervised* segmentation threshold  $x_T$  as a function of the a priori probability  $P_{fg}$ !
4. Although your image segmentation threshold is optimal, the performance is not satisfying. Propose further steps to improve your image segmentation algorithm!