

IMAGE PROCESSING (RRY025/ASM420)

One of the Exams in 2016/2017

1 Warming up: MISCELLANEA [12 points]

- (a) [2p] What are the strong and the weak points of the discrete Fourier transform?
- (b) [2p] And of the fast wavelet transform?
- (c) [2p] And of the block discrete cosine transform?
- (d) [2p] In which area(s) of image processing (enhancement, compression, restoration) can the discrete Fourier transform be successfully applied? And why?
- (e) [2p] Same questions for the fast wavelet transform.
- (f) [2p] Same questions for the block discrete cosine transform.

2 IMAGE ENHANCEMENT [15 points]

- (a) [3p] Consider a signal $s(t)$ that is almost perfectly regular: it is continuous together with its first seven derivatives, except at a certain point t_0 , where the 3rd derivative has a discontinuity. In spite of its regularity, s is not a simple function of t , either for $t < t_0$ or for $t > t_0$. Construct a filter for detecting the ‘breakdown’ point t_0 , and estimate the uncertainty δt of your detection.
- (b) [6p] Is there a smarter way to detect t_0 ? Explain in detail!
- (c) [2p] You have an image and want to *de*-emphasize its details without smoothing the image or modifying its flux. Construct a filter that can do this.
- (d) [4p] Is there a smarter way to do that? Explain in detail!

3 Cooling down: MISCELLANEA [3 points]

- (a) [3p] In your opinion, what is the most interesting topic of the course? Explain how important this topic is in the context of image processing, and how important it is for your studies/job.