Biomedical Imaging FS 2019

Ultrasound 3

Please prepare solutions in pdf format and upload them on the Moodle platform (https://moodle-app2.let.ethz.ch/).

Exercise

1. Consider pulsed Doppler velocity measurement with the following specifications:

   ultrasound frequency: $f = 3.2\ MHz$

   density of the medium: $\rho = 1.0\ \frac{g}{cm^3}$

   impedance of the medium: $Z = 1.6 \cdot 10^6\ \frac{kg}{m^2 s}$

   a. What is the range of Doppler shifts that can be resolved unambiguously at a pulse repetition frequency of 1 kHz?

   b. What is the corresponding range of velocities for motion along the direction of the ultrasound beam?

   c. How is spatial selectivity achieved in Doppler velocity measurements?

2. Speckle noise

   a. What is the cause of speckle noise in ultrasound imaging?

   b. What is the characteristic length of speckle noise?

   c. How can speckle noise be mitigated?

Questions?

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