

Lab 3. Task 1- preparation task

Template for answers

Save this document as a .pdf document before submitting.

Student names and LiU-IDs: (Max 2 students per group):

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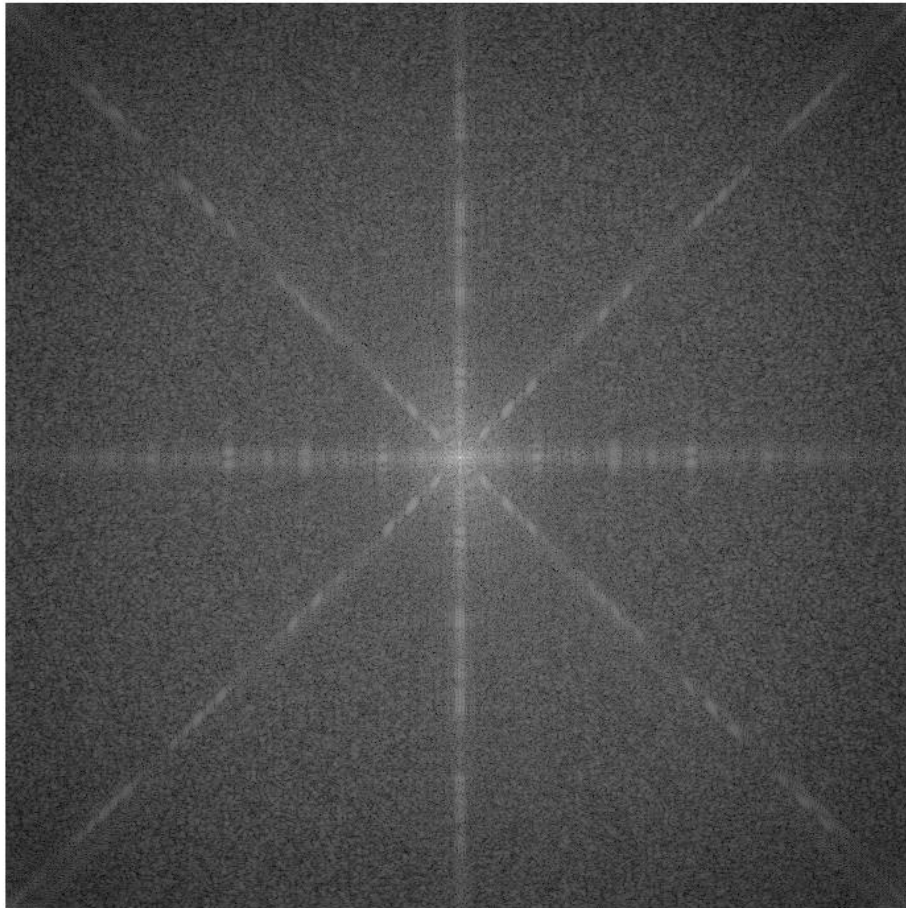
2. Cindy Khuong cinkh090

Submission date: 2021-12-06

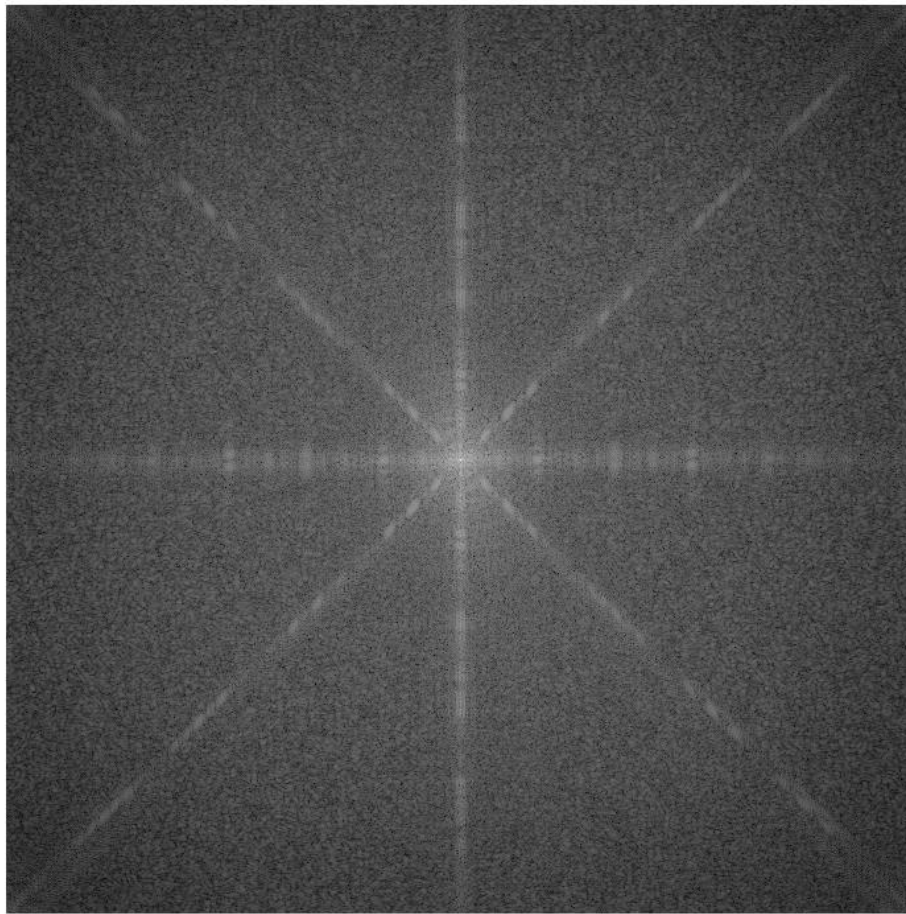
Version (in case you need to re-submit): 1

1) 2D Fourier spectrum

1) Spec1:



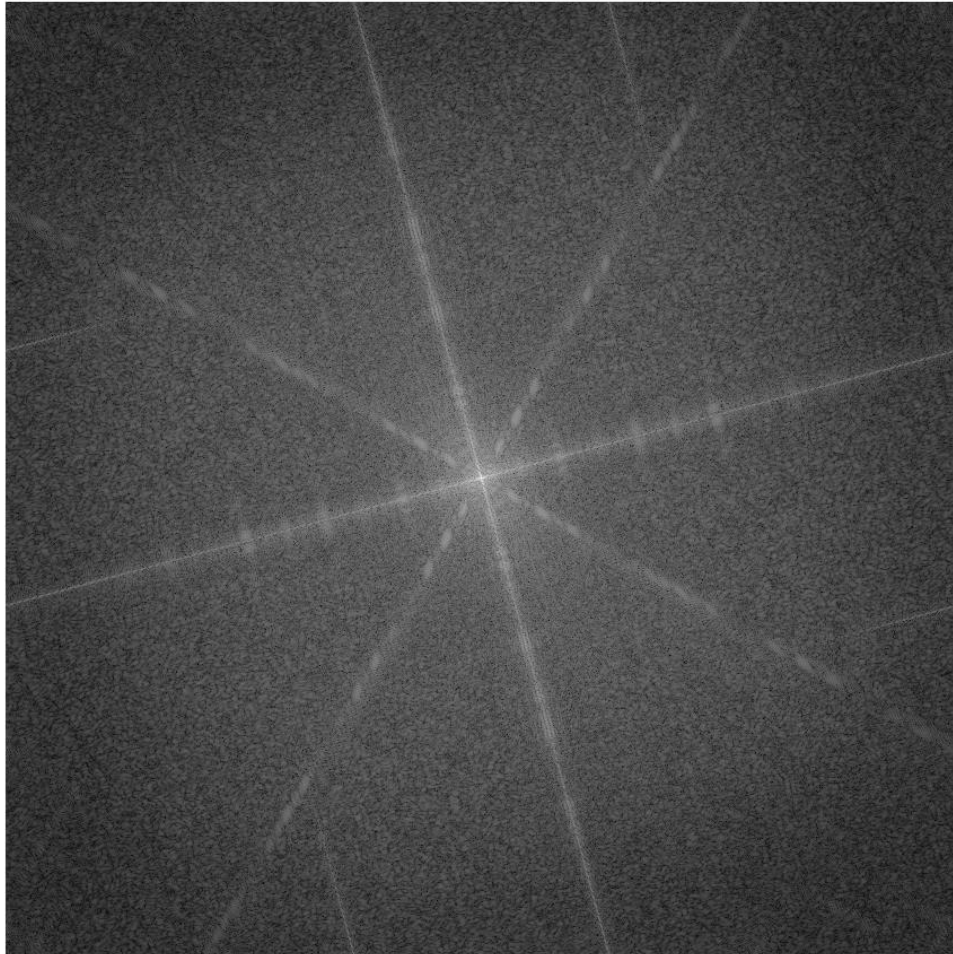
2) Spec2:



3) Are there any differences between *Spec2* and *Spec1*? How does shift affect the spectrum of the Fourier transform?

There are no differences between Spec1 and Spec2. The phase shift is the time delay.

4) Spec3:

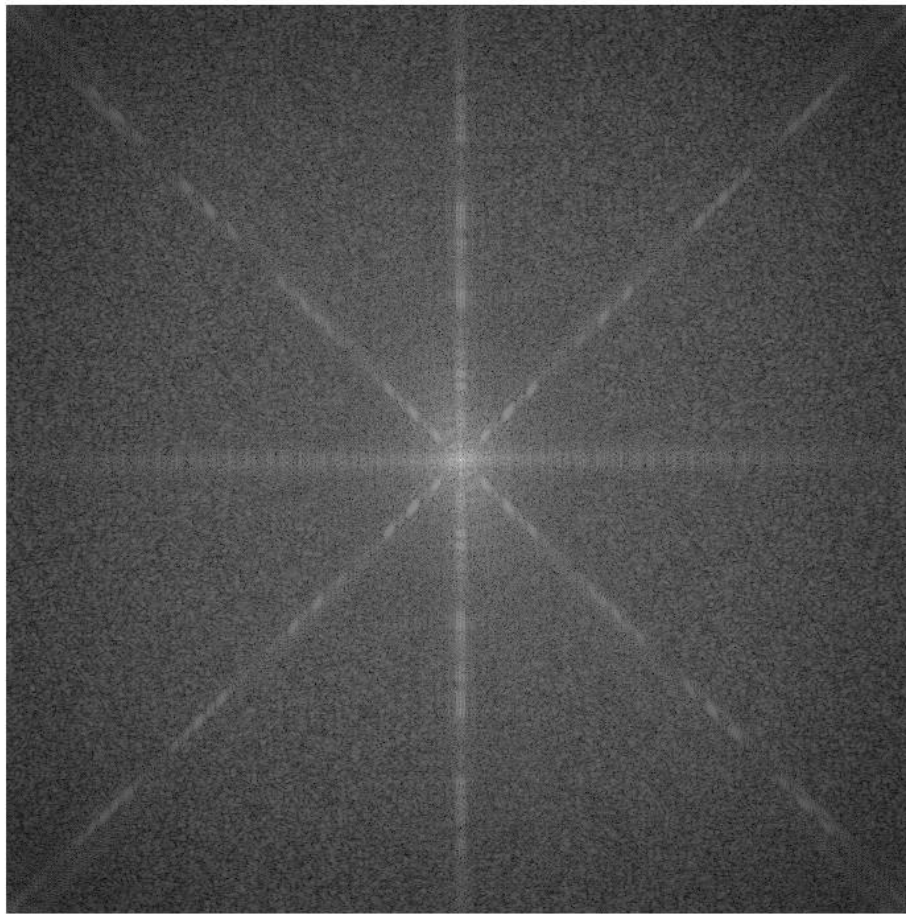


5) Are there any differences between *Spec3* and *Spec1*? How does rotation in the spatial domain affect the Fourier spectrum? (Ignore some distortions caused by the black area around the image after rotation (*cTP_rot*))

Yes, Spec3 is rotated.

If the image is rotated in the spatial domain, then the Fourier spectrum is rotated by the same amount.

6) Spec4:



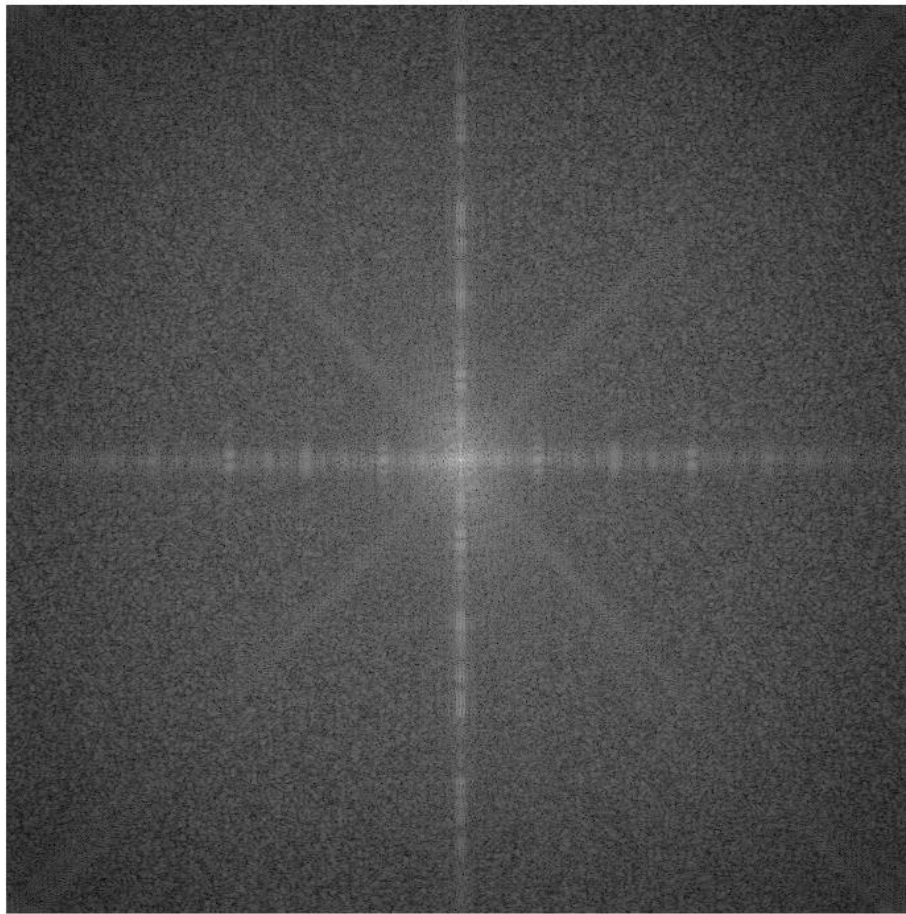
7) Compare *Spec4* and *Spec1* and explain how the elimination of vertical bars affected the spectrum. **HINT:** Look specially at the **horizontal** axes of the spectrum.

The small vertical lines on the horizontal axis got removed in Spec4.

8) Explain what would happen to the spectrum if the horizontal bars were eliminated from *cTP*?

The vertical line in the middle would disappear since it contains horizontal bars.

9) Spec5:



10) Compare *Spec5* and *Spec1* and explain how the elimination of diagonal bars affected the spectrum. **HINT:** Look specially at the diagonal axes of the spectrum.

The diagonal lines in the spectrum are almost eliminated

2) Period and Frequency

11) Where would these three dominant peaks appear if *v2* is transposed, i.e. if the vertical bars become horizontal?

On the top and bottom of the vertical axes of the spectrum.

12) What is the frequency of these stripes? Where would the three dominant peaks in the spectrum for this image appear?

The frequency is $f = 1/P = 1/4 = 0.25$ cycles/pixel

They would appear on the horizontal line (because the change is only on the horizontal axis) $1/4$ of the distance from the dc-term.

13) What is the frequency of these stripes? Where would the three most dominant peaks in the spectrum for this image appear?

They would be very close to the dc-term

3) The importance of the spectrum and the phase angle

14) $E1_E2$:



15) $E2_E1$:



16) Is the spectrum or the phase angle that has more effect on the structure of an image based on your visual analysis of the above results?

The phase angle has more effect. The first image contains the spectrum of E1 and the phase angle of E2 and it resulted in an image that is alike E2. The other way around for the second image.

*Don't forget to save the document as **.pdf** before submitting!*