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there is a price to pay in terms of entropy, which is usually very costly. a practical, although not optimum, inverse filter can be synthesized, as given by where A(fX) and f?fX) are the corresponding amplitude and phase filters. The restored Fourier spectra that we would like to achieve is the rectangular spectral distribution bounded by Tm and D?X. The restored spectral distribution is the shaded areas. It is evident that the blurred image can be restored for some degrees of restoration error. By defining the degree of restoration as given by where D?X is the spatial bandwidth of interest, a plot can be drawn. The degree of restoration increases rapidly as Tm decreases. However, as Tm approaches zero, the transmittance of the inverse filter also approaches zero, which leaves no transmittance of the inverse filter. A perfect degree of restoration, even within the bandwidth, D?fX, cannot actually be obtained in practice. Aside from this consequence, the weak diffracted light field from the inverse filter would also cause poor noise performance. The effects on image restoration due to the amplitude, the phase, and the combination of amplitude and phase filters are shown to reasonably good restoration result as compared with the complex filtering. This is the consequence of the image formation (either in the spatial or in the Fourier domain); the phase distribution turns out to be a major quantity in the effect of image processing as compared with the effect due to amplitude filtering alone. In other words, in image processing, is as well as image formation, the amplitude variation, in some cases, can actually be ignored. A couple of such examples are optimum linearization in holography and phase-preserving matched filters. An image restoration result obtained from an inverse filter can indeed be restored. In addition, we have also seen that the restored image is embraced with speckle noise, also known as coherent noise. This is one of the major concerns of using coherent light for processing. Nevertheless, coherent noise can be actually suppressed by using an incoherent light source. Serious defects of inverse filter? Diffraction limits the set of frequencies over which the transfer function S(fX,fY) is nonzero to a finite range. Outside this range, S=0 and its inverse is ill. Within the range of frequencies for which the diffraction-limited transfer function is nonzero, it is possible that transfer function S will have isolated zeros. The inverse filter takes no account of the fact that there is inevitably noise present in the detected image, along with the desired signal. The Wiener filter least-mean-squared-error filter? A new model for the imaging process is adopted. The detected image is represented by where n(x,y) is the noise associated with the detection process. The object o(x,y) is regarded as a random process, as well as the random noise. We assume that the power spectral densities (i.e. the distributions of average power over frequency) of the object and the noise are known, the are represented by F?fX,fY) and F?fX,fY). The mean-squared difference between the true object o(x,y) and the estimate of the object (x,y) is filter is often referred to as a Wiener filter, after its inventor, Norbert Wiener. If the SNR is high (F?fX/f?fX<<1) If the SNR is low (F?fX/f?fX>>1) Wiener filter? Diffraction, rather than absorption, is used to attenuate frequency components. Only a single interferometrically generated filter is required, albeit one with an unusual set of recording parameters. The filter is bleached and therefore introduces only phase shifts in the transmitted light. Certain postulates underlie this method of recording a filter. The maximum phase shift introduced by the filter is much smaller than 2p?radians, and therefore The phase shift of the transparency after bleaching is linearly proportional to the silver present before bleaching. The filter is exposed and processed such that operation is in the linear part of the H&D curve, where density is linearly proportional to the logarithm of exposure? The exposure produced by this interferometrical recording is where A is the square root of the intensity of the reference wave at the film plane, a is the square root of the intensity of the object wave at the origin of the film plane, a?is the carrier frequency introduced by the off-axis reference wave, f?is the phase distribution associated with the blue transfer function S, and T is the exposure time. The displacement in the q direction is proportional to the displacement in the p direction. To conclude this section, we note that one interesting application of optical processing of broadband signals is its application to synthetic aperture radar. A broadband microwave signal is first converted in two-dimensional raster-scanned format, similar to the preceding example. If the raster-scanned format is presented at the input plane of a specially designed optical processor, an optical radar image can be observed at the output plane. The displacement in the q direction is proportional to the displacement in the p direction. To conclude this section, we note that one interesting application of optical processing of broadband signals is its application to synthetic aperture radar. A broadband microwave signal is first converted in two-dimensional raster-scanned format, similar to the preceding example. If the raster-scanned format is presented at the input plane of a specially designed optical processor, an optical radar image can be observed at the output plane.

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Microsoft Word document content, including a title bar, header, body text, and footer. The text is heavily garbled and contains many symbols and characters, likely due to encoding issues or corruption. It includes a title bar with the text "Microsoft Word - [unclear].doc", a header with "Document Information", and a body of text that is mostly illegible. The footer contains the text "Microsoft Word - [unclear].doc" and "Document Information".

effects on image restoration due to the amplitude, the phase, and the combination of amplitude and phase filters are shown? ... In view of these results, we see that using the phase filter alone would give rise to a reasonably good restoration result as compared with the complex filtering. This is the consequence of the image formation (either in the spatial or in the Fourier domain); the phase distribution turns out to be a major quantity in the effect of image processing as compared with the effect due to amplitude filtering alone. ... In other words, in image processing, is as well as image formation, the amplitude variation, in some cases, can actually be ignored. A couple of such examples are optimum linearization in holography and phase-preserving matched filters. ... An image restoration result obtained from an inverse filter? ... A linear blurred image can indeed be restored. In addition, we have also seen that the restored image is embraced with speckle noise, also known as coherent noise. This is one of the major concerns of using coherent light for processing. Nevertheless, coherent noise can be actually suppressed by using an incoherent light source. ... Diffraction limits the set of frequencies over which the transfer function $S(f_x, f_y)$ is nonzero to a finite range. Outside this range, $S=0$ and its inverse is ill. Within the range of frequencies for which the diffraction-limited transfer function is nonzero, it is possible that transfer function S will have isolated zeros. The inverse filter takes no account of the fact that there is inevitably noise present in the detected image, along with the desired signal. ... The Wiener filter least-mean-squared-error filter? ... A new model for the imaging process is adopted. The detected image is represented by where $n(x, y)$ is the noise associated with the detection process. The object $o(x, y)$ is regarded as a random process, as well as the random noise. ... We assume that the power spectral densities (i.e. the distributions of average power over frequency) of the object and the noise are known, the are represented by $F_o(f_x, f_y)$ and $F_n(f_x, f_y)$. The mean-squared difference between the true object $o(x, y)$ and the estimate of the object $\hat{o}(x, y)$ is? ... The transfer function of the optimum restoration filter is given by This type of filter is often referred to as a Wiener filter, after its inventor, Norbert Wiener. If the SNR is high ($F_o/F_n \ll 1$) If the SNR is low ($F_o/F_n \gg 1$)? ... Diffraction, rather than absorption, is used to attenuate frequency components. Only a single interferometrically generated filter is required, albeit one with an unusual set of recording parameters. The filter is bleached and therefore introduces only phase shifts in the transmitted light. ... Certain postulates underlie this method of recording a filter. The maximum phase shift introduced by the filter is much smaller than 2π radians, and therefore The phase shift of the transparency after bleaching is linearly proportional to the silver present before bleaching. ... The filter is exposed and processed such that operation is in the linear part of the H&D curve, where density is linearly proportional to the logarithm of exposure? ... The exposure produced by this interferometrical recording is where A is the square root of the intensity of the reference wave at the film plane, a is the square root of the intensity of the object wave at the origin of the film plane, α is the carrier frequency introduced by the off-axis reference wave, ϕ is the phase distribution associated with the blue transfer function S , and T is the exposure time. ... [The displacement in the q direction is proportional to the displacement in the p direction. ... To conclude this section, we note that one interesting application of optical processing of broadband signals is its application to synthetic aperture radar. A broadband microwave signal is first converted in two-dimensional raster-scanned format, similar to the preceding example. If the raster-scanned format is presented at the input plane of a specially designed optical processor, an optical radar image can be observed at the output plane. ... To conclude this section, we note that one interesting application of optical processing of broadband signals is its application to synthetic aperture radar. A broadband microwave signal is first converted in two-dimensional raster-scanned format, similar to the preceding example. If the raster-scanned format is presented at the input plane of a specially designed optical processor, an optical radar image can be observed at the output plane.

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