Super resolution is one of the most fascinating and applicable fields in optical data processing. The urge to obtain highly resolved images using low-quality imaging optics and detectors is very appealing.

The field of super resolution may be categorized into two groups: diffractive and geometrical super resolution. The first deals with overcoming the resolution limits that are dictated by diffraction laws and related to the numerical aperture of the imaging lens. The second deals with overcoming the limitation determined by the geometrical structure of the detector array.

Various techniques have been developed to deal with both types of resolution improvements. In all approaches, the spatial resolution improvement needs the object to exhibit some sort of constraint (such as monochromaticity, slow variation with time, single polarization, etc.), related with an unused dimension of the object. The improvement is thus made at the price of sacrificing unused degrees of freedom in the other domains as time, wavelength, polarization, or field of view.

The methods pursuing super resolution utilize masks having diffractive features. They are classified here according to the nature of their structure:

1. Possessing full/piecewise periodicity
2. Spatially finite repeating random structures/random structure with finite period
3. Random structure with infinite period

The book is thus organized in the following way. Chapter 1 briefly presents the relevant theoretical background. Chapter 2 discusses several super resolution methods implementing diffractive masks having a certain degree of periodicity. In Chapter 3, we explore techniques utilizing diffractive masks having structures with a finite random period. Finally, in Chapter 4, the mask becomes fully random.

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