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Advances in High-Resolution Imaging using Fourier Telescopy

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Fourier Telescopy is an essentially the reverse of long-baseline interferometry, wherein light is projected onto a distant (but non-astronomical) object by multiple small apertures and the reflected light is received by one or more large apertures. As in long-baseline interferometry, the principle of phase closure is applied to reconstruct the image. The projected light is coherent so that fringes are formed on the object of interest, and the light reflected from these fringe patterns then contains information about the corresponding Fourier components of the object. The use of phase closure allows recovery of the phase of these Fourier components, within an overall tip and tilt of the phase in the Fourier plane. The key benefits of the approach are (a) the realization of very high spatial resolution using sparse arrays, despite aberrations due to an intervening medium, and (b) high sensitivity due to the fact that large light-bucket receivers may be used to capture the time-encoded information. Potential applications are discussed, and recent verifications, advances, and extensions of the basic concept are presented.