Analog computing with nonlinear flat optics

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Flat-optics devices exhibiting a linear local (LL) response are defined by a position-dependent, linear transfer function, which can be locally tailored by engineering metaatoms arranged within metasurfaces. Spatial dispersion, i.e., nonlocality, is usually regarded as a nonideality in LL flat-optics devices. However, the nonlocal response of metasurfaces has been recently indicated as an effective means to achieve advanced functionalities [2].

Despite the advantages, linear approaches — both local and nonlocal — face limitations related to the restricted numerical aperture and frequency bandwidth. Here we demonstrate that the combination of nonlinear and nonlocal effects in the same flat-optics device is a powerful strategy to achieve advanced image processing and analog computing functionalities with reduced structural complexity and increased efficiencies in terms of angular and frequency bandwidth [3].

References

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Short Bio:

Costantino De Angelis received his PhD from the University of Padova (1993) where he served as Assistant Professor of Electromagnetic Fields and Photonics. In 1998 he joined Brescia University where he is Full Professor of Electromagnetic Fields and Photonics since 2004. He is the head of the NORA group at the University of Brescia (https://nora.unibs.it/home) and his current research interest include nonlinear optics, nanophotonics, and optical metamaterials.
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