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Simulating the Sky: Digitizing Atmospheric Turbulence

It is known that light is an electromagnetic wave and hence, has an intensity and phase profile. In the real world, these properties are distorted by turbulence when light is allowed to propagate through an atmosphere –which it must do for many real-world applications. The need to utilize light in the real world has hence prompted significant studies of atmospheric turbulence. Generating atmospheric turbulence in a lab, however, is difficult for several reasons, and offers limited accuracy in terms of its reproducibility. This prompted us to study the effects that atmospheric turbulence has on light, and to create a system which digitally reproduced these effects, effectively creating turbulence from a purely digital framework! The ability to digitally simulate atmospheric turbulence offers a reliable and reproducible way to study and optimize optical systems for real-world applications such as free-space communication, remote sensing, and imaging through the atmosphere.

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