PURDUE INNOVATES | Office of Technology Commercialization

Software for Simulating Atmospheric Turbulence using Phase to Space Transform

Phase-to-space transform simulator reproduces atmospheric turbulence 300–1000× faster than traditional split-step methods.

Researchers at Purdue University have developed a new method to simulate atmospheric turbulence. This method uses a new concept known as the phase-to-space transform. Until now, two main approaches have been used to simulate turbulenceâ€”split-step propagation and overly simplistic models. Split-step propagation is time-consuming, while the overly simplistic models from the computer vision community are fast, yet miss the fundamental statistics. The Purdue researchers' method combines the speed of the computer vision models and near identical accuracy to split-step.

Technology Validation: The simulator is 300-1000x faster than mainstream split-step simulators.

Advantages:

- faster

- single-pass

- differentiable

- accurate to physical model

- better reconstruction ability

Applications:

- surveillance

- tracking

- detection

- biometrics

Technology ID

2021-CHAN-69438

Category

Artificial Intelligence & Machine Learning/Computer Vision & Image Recognition

Aerospace & Defense/Defense Electronics & Surveillance Technologies

Automotive & Mobility Tech/Micromobility & Smart Urban Infrastructure

Authors

Stanley H Chan

Nicholas Chimitt

Zhiyuan Mao

Further information

Parag Vasekar

psvasekar@prf.org

View online

- autonomous vehicles

- defense

TRL: 2

Intellectual Property:

Provisional-Gov. Funding, 2021-04-19, United States

Copyright, 2021-04-19, United States

Provisional-Gov. Funding, 2022-04-13, United States

Utility-Gov. Funding, 2023-04-13, United States

CON-Gov. Funding, 2025-08-21, United States

Keywords: Atmospheric turbulence, Computer Technology, Machine Learning, Phase-to-space transform, Simulation