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Optical buffering in a bottle microresonator on an optical fiber. KALISTA SCHAUER, US Military Academy West Point — Manufacturing highly efficient optical communications and computing devices requires designing dense integrated photonic circuits. Unfortunately, surface roughness of microscopic optical signaling devices results in light attenuation, decreasing the efficiency of the optical devices. A microscopic optical buffer would alleviate these issues; a potential solution is the Surface Nanoscale Axial Photonics (SNAP) platform. The SNAP platform operates because of the propagation of whispering gallery modes (WGMs) around the surface of an optical fiber. Because WGMs undergo slow axial propagation, they can be mathematically described by the one-dimensional Schrödinger equation. In this project, we calculate solutions to the effective wave equation to model the circulation of whispering gallery modes. We study the evolution of Gaussian-shaped wave pulses in a bottle microresonator on an optical fiber. By analyzing the propagation of WGMs within the bottle microresonator, we can examine the feasibility of creating a microscopic optical buffer for use in optical signal processing. In this project, we find analytical and numerical solutions to the effective wave equation. We then use the numerical solutions to the effective wave equation to develop a model of the system in Mathematica.

Kalista Schauer
US Military Academy West Point

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