Spatial Similaritons

Optical **solitons** are remarkable nonlinear waves that do not spread either in space or time in a nonlinear optical medium as a result of compensation of the wave packet diffraction or dispersion by the nonlinearity of the medium. The solitons arise as long-term asymptotics of the wave evolution in conservative nonlinear systems whereas the similaritons generically play the same role in open nonlinear systems with gain or loss. Remarkably, both similaritons and solitons mimic particle behavior upon collisions: They are able to maintain their shape and identity, remaining virtually intact after the interaction is over! Recently, we have extended the similariton concept to **spatial similaritons** supported by **spatially inhomogeneous** optical media such as nonlinear graded-index waveguides and/or amplifiers. The particle-like nature of the newly discovered spatial similaritons is displayed in the figure:

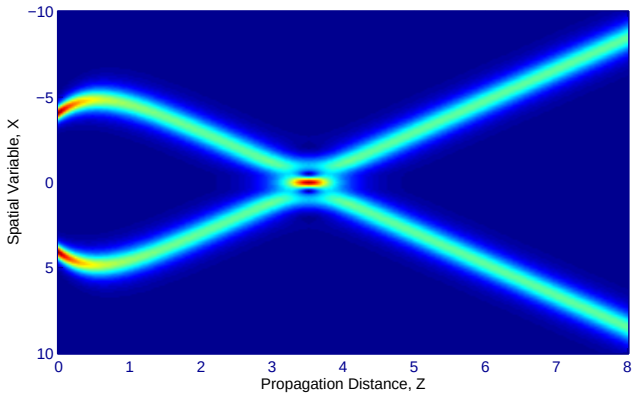

Fig. 1. Collision of two spatial similaritons in an inhomogeneous gain medium.

Potential applications will range from low-intensity optical beam steering in optoelectronics networks and devices to controllable optical switches.

References and links

1. S. A. Ponomarenko and G. P. Agrawal, "Optical similaritons in nonlinear waveguides", *Opt. Lett.,* **32**, 1659 (2007).
2. S. A. Ponomarenko and G. P. Agrawal, "Do Solitonlike Self-Similar Waves Exist in Nonlinear Optical Media?", *Phys. Rev. Lett.,* **97**, 013901 (2006).