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Spatial Analogue of Quantum Spin Dynamics via Spin-Orbit Interaction[1] VANITA SRINIVASA, JEREMY LEVY, University of Pittsburgh — We theoretically demonstrate the mapping of electron spin dynamics from time to space in quantum wires with built-in spatially uniform and oscillating Rashba spin-orbit coupling in orthogonal directions. The presence of the spin-orbit interaction introduces pseudo-Zeeman couplings of the electron spins to effective magnetic fields. By periodically modulating the spin-orbit coupling along the quantum wire axis, it is possible to create the spatial analogue of spin resonance, without the need for real magnetic fields. The mapping of time-dependent operations onto a spatial axis suggests a new mode for quantum information processing in which gate operations are encoded into the band structure of the material. We describe a potential realization of such a material within nanowires at the interface of $LaAlO_3/SrTiO_3$ heterostructures.

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