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Domain Wall Trajectory Determined by its Fractional Topological Edge Defects AAKASH PUSHP, TIMOTHY PHUNG, CHARLES RETTNER, BRIAN HUGHES, SEE-HUN YANG, LUC THOMAS, STUART PARKIN, IBM Almaden Research Center — A domain wall in a ferromagnetic nanowire is composed of elementary topological bulk and edge defects with integer and fractional winding numbers, respectively. The spatial arrangement of the defects reflects the chiral internal structure of the domain wall. By breaking the symmetry across the width of the nanowire we show that we can control the formation of these topological defects and thereby can form domain walls of a given chirality with high fidelity. Utilizing this capability, we show that the fractional topological edge defects of the domain wall determine its trajectory in branched nanowire networks. Our results can account for the motion of domain walls in complex networks of magnetic nanowires such as "Artificial Spin Ice" systems, explaining the formation of Dirac strings, and may also lead to fault-tolerant domain wall based memory and logic devices.

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