Scientists put a new spin on traditional information technology

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Is it time for a communications paradigm shift? Scientists calculate that encoding and sending information via electron spin, instead of voltage changes, may mean tiny chips could transmit more information and consume less power.

Sending information by varying the properties of electromagnetic waves has served humanity well for more than a century, but as our electronic chips steadily shrink, the signals they carry can bleed across wires and interfere with each other, presenting a barrier to further size reductions. A possible solution could be to encode ones and zeros, not with voltage, but with electron spin, and researchers have now quantified some of the benefits this fresh approach might yield.

In a paper in the AIP's journal Applied Physics Letters, a team from the University of Rochester and the University of Buffalo has proposed a new communications scheme that would use silicon wires carrying a constant current to drive electrons from a transmitter to a receiver. By changing its magnetization, a contact would inject electron spin (either up or down) into the current at the transmitter end.

Over at the receiver end, a magnet would separate the current based on the spin, and a logic device would register either a one or a zero. The researchers chose silicon wires because silicon's electrons hold onto their spin for longer than other semiconductors. The team calculated the bandwidth and power consumption of a model spin-communication circuit, and found it would transmit more information and use less power

than circuits using existing techniques.

The researchers did find that the latency, or the time it takes information to travel from transmitter to receiver, was longer for the spin-communication circuit, but its other benefits mean the new scheme may one day shape the design of many emerging technologies.

More information: "Silicon spin communication" by Hanan Dery et al. is published in *Applied Physics Letters*.

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