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Invited paper

Demonstration of All-Optical Pattern Recognition at 42Gbit/s

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Abstract

We demonstrate all-optical pattern recognition using semiconductor optical amplifier logic gates. For the first time, target patterns up to 256 bits long were successfully recognised and located in 42Gbit/s data.

Extended Abstract

The first experimental demonstration of a novel all-optical binary pattern recognition system is reported. The system detects and locates a programmable target sequence in a segment of an input data stream. Hybrid-integrated logic gates are employed, which consist of a planar silica Mach-Zehnder interferometer with a nonlinear semiconductor optical amplifier in each arm. The logic circuit incorporates a recirculating loop to enable the system to search for patterns of arbitrary length with only three gates. Latency grows in proportion to the target length, but will not restrict throughput for many applications of practical importance. Targets up to 256 bits long were successfully recognised in 42.6Gb/s input data.

The recognition system will be used as an initial sorting stage in the optoelectronic firewall being developed by EU FP6 project WISDOM to protect future optical packet-switched networks. Many other applications in high-speed packet-based systems are anticipated.

Roderick Webb

Roderick Webb received BSc and PhD degrees from Imperial College, London, and a BA from the Open University. He has a background in telecommunications research with British Telecom and Corning, including work on optical transmission systems, artificial neural networks and semiconductor optical amplifiers (SOAs). Now he is a member of the Photonic Systems Group at the Tyndall National Institute in Cork, Ireland, where he continues to investigate the use of SOAs in all-optical regenerators and logic systems.