



University of Central Florida

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Parallel Processing with Wavelength-Independent Optoelectronic Logic Gate

Boolean exclusive OR (XOR) and exclusive NOR (XNOR) logic gates are used for data mining, pattern extraction, data traffic control, and data routing in telecommunication applications due to their usefulness in label switching, parity checking, and pattern recognition.

Currently available all-optical logic gates cannot process multiple signals at different wavelengths simultaneously as conventional logic gates are wavelength-dependent. The innovation at UCF functions by implementing multiple, simultaneous input signals while searching and detecting a target code in multiple channels at the same time. This way, input data can be processed in real-time, and allows for true parallel processing in multiple channels. This parallel processing provides an advantage over other approaches, both all-optical and electrical, and enables n-bit pattern extraction in real-time streaming data.

Advantages

Alternatives founded on nonlinear loop mirrors do not match the setup's higher power efficiency. Those based on semiconductor nonlinearities cannot match its ability to maintain signal quality in the case of on-off keying (OOK) formatted input signals.

Technical Details

The new optoelectronic logic gate is wavelength-independent due in part to interferometric switches as comparators of optical bits and electrical bits. In the processing imprint stage the logic gate is separated into two parts consisting of a single interferometric switch for single bit operation to imprint electrical input data on an optical signal, and the comparator stage, consisting of two parallel interferometric switches wherein input data is superimposed on the optical signals compared with target data in the electrical realm. The comparator stage is the key to simultaneous processing, as all relative timing signals can be sent to it at the same time. With the optoelectronic logic gate, a user can locate and detect real-time streaming input data without needing prior knowledge of the data other than its rate. The setup can be scaled with the inclusion of multiple interferometric switches and multiple mode-locked optical frequencies thus detecting much longer target patterns, faster, in streaming data.

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US Issued Patent

8,521,037 B2



Benefits

- Processes multiple signals at different wavelengths simultaneously
- Enables n-bit pattern extraction in real-time streaming data
- Relatively high power efficiency
- Maintains OOK formatted input signal
- Scalable

Applications

- Telecommunications
 - Data mining, pattern extraction, data traffic control, data routing
 - Label switching, parity checking, pattern recognition

Tech Field

Communications

Keywords

optoelectronic logic gate, optical logic device, optical data processing, pattern recognition, telecommunications, parallel processing, XOR, XNOR, data mining, pattern extraction, data traffic control, data routing, label switching, parity checking

If you or your company are interested in this opportunity, Contact:

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