

Title	Advanced Interference Cancellation Algorithms: Design, Development and Implementation using OCDMA technology.
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Summary:

In this proposal, the optimal cancellation factors in the weighted SIC and hybrid weighted SIC detections are estimated using two new approaches. The first one consists of using the fuzzy inference system while the second consists of using neural networks. By doing so, novel weighted SIC and hybrid weighted SIC detection schemes that exhibit many desirable features such as low complexity and stability are obtained. The theoretical results obtained in this work are validated by both simulation and experimentation. In our experimental validation, we apply our SIC results on the development of an advanced implementation of Optical Code Division Multiple Access system. As a first step, we design an optical CDMA encoder/decoder pair, where the decoder is intrinsically designed to implement simplified versions of our SIC results. In a second step, a multi OCDMA channel system will be built in order to evaluate the system performance in worst case high interference scenarios.

Objectives:

- Estimate the optimal cancellation factors in weighted SIC and hybrid weighted SIC detection schemes using a fuzzy logic/ neural network approach.
- Develop new multiuser weighted SIC and hybrid weighted SIC detection structures that enjoy low complexity and stability.
- Build an optical CDMA coding/decoding experimental demonstrator by implementing the new multiuser weighted SIC and hybrid weighted SIC detection schemes considering two different all-optical coding techniques: (1) Programmable liquid crystal phase-mask and (2) chirped fiber Bragg Grating technologies.
- Build an OCDMA network system composed of 4 to 16 channels, each of which running at a speed varying from 1 Gb/s (1 Gigabit Ethernet) up to 10 Gb/s (10 Gigabit Ethernet) all sharing the same wavelength. The new multiuser SIC will be applied in order to increase the number of channels sharing the same wavelength with a controllable performance.
- Perform 100 Gigabit/channel testing and evaluation performance using the same setup.