Speech recognition using photonic reservoir computing with semiconductor optical amplifiers

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***Abstract*—We show that it is possible to use a network of optical amplifiers to achieve similar performance as a tanh-based reservoir on a speech recognition task with isolated digits.**

***Keywords*—reservoir computing, photonics, speech recognition**

I. Introduction

Reservoir Computing is a methodology coming from the field of machine learning and neural networks that has been successfully used in pattern classification problems. Instead of feeding inputs directly into a linear classifier, the classifier takes its input from a reservoir with recurrence where the inputs have been mixed. One classical implementation employs a recurrent neural network with hyperbolic tangent functions in the nodes as a reservoir. On an isolated digit speech recognition task, with 3 dB SNR babble noise added [2], these tanh reservoirs achieve a performance around 7 %. In a previous paper we have already shown that a network of Semiconductor Optical Amplifiers (SOA) can be used as a reservoir on a simple signal classification task, making it an interesting hardware implementation [1]. Here, such an SOA network will be used for speech recognition.

II. Results

Figure 1 shows the performance of a simulated network of SOAs, with different delays for the interconnections, on this isolated digit recognition task. It shows that there exists an optimal delay in the network resulting in an optimal performance of around 5 %. The dashed line shows the result achieved by classical tanh methods without any delay.

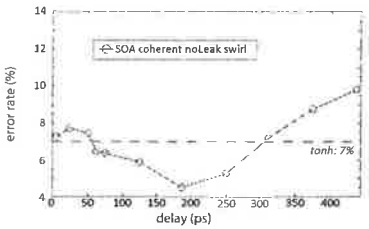

Fig. 1. Result of a network of SOAs with different delay in between them on a isolated digit recognition task

III. Conclusions

We have shown that a network of SOAs can be used as a reservoir for reservoir computing on a more complex task and identified delay as an important design parameter.

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