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Miniaturized optical sensor for cursor control

**Michael Linde Jakobsen, Henning Larsen, Finn Pedersen, Henrik Pedersen,
Carsten Dam Hansen, Jørgen Stubager and Steen G. Hanson**

Risø National Laboratory

and

Jørgen Korsgaard

OPDI Technologies, Denmark

A miniaturized optical displacement sensor that can be mounted in a single chip has been built during an industrial collaboration with the Danish company OPDI Technologies A/S. The system is based on shearing a speckle pattern arising from a moving surface across a lens array, which here acts as a grating. In some respects, the function is similar to the function of an eye of a dragonfly. The use of a lens array will in this setup make it possible not only to get the directional information of the movement but also to optically establish a dynamic high-pass filtering, thus removing the major part of the low-frequency speckle noise from the signal.

The system is intended for optical cursor control, and will – compared to existing systems - bring about a higher number of counts pr. inch and will address a larger range of applications due to the laser source (VCSEL), the electronic processing and the optics all being imbedded in a single chip.

In short, the optical element, which consists of a single piece of injection-moulded *ultem*, performs a complex function, which would have been almost impossible, should it have been performed electronically in the ASIC. The master for the lens array part is made by the local nanoplotter (<http://www.risoe.dk/ofd/lso/nanoplotter.htm>), While the larger lenses and the merging of the two parts is established at another Danish company.

The same technique is applicable for a range of other measurement schemes, including torsional vibrations, linear and angular displacement and in-plane vibrations.