



Cmst

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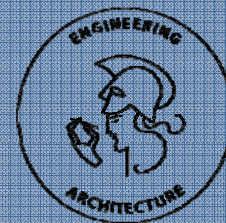
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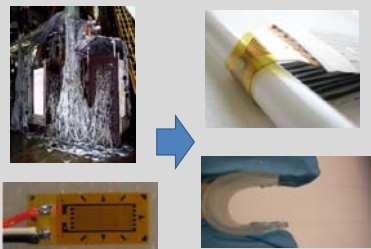
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Introduction

Electrical → Optical sensors



- EMI insensitive
- Distributed sensing
- High sensitivity
- Extremely robust

Fiber sensors



- Avoid cross-sensitivity
- Multiplexing
- Safety
- Embedding possibilities

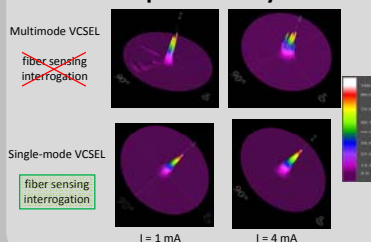
Miniaturizing read-out



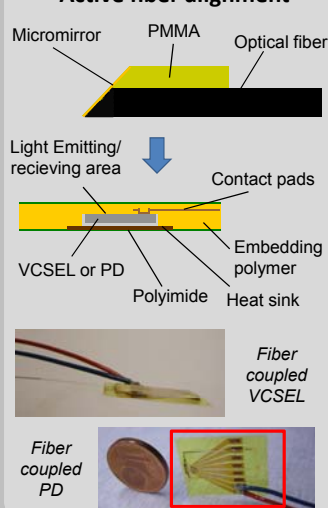
- Ultra-thin embedded optoelectronics
- Flexible package: VCSEL and photodetector (PD)

Coupling ultra-thin VCSEL and PD packages

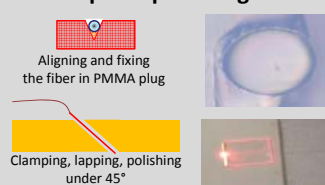
• Beam profile analysis



• Active fiber alignment

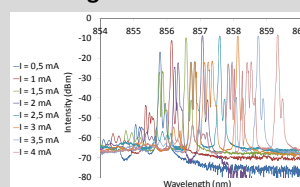


• Micromirror plug minimizing optical path length

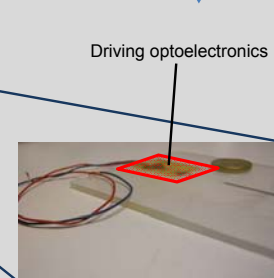
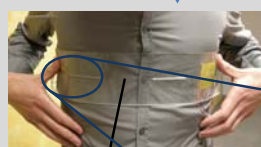
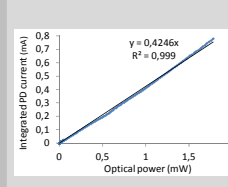


Building an embedded sensor system

• Driving VCSEL



• Photodetector



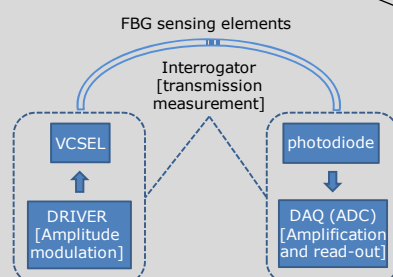
Sensing fiber with Bragg grating

Driving optoelectronics

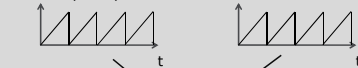
Ultra-compact and low-cost fiber sensor interrogation

Read-out principle, $f = 1 \text{ kHz}$, 100 kS/s

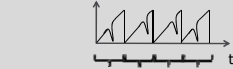
Schematic overview



VCSEL: optical power



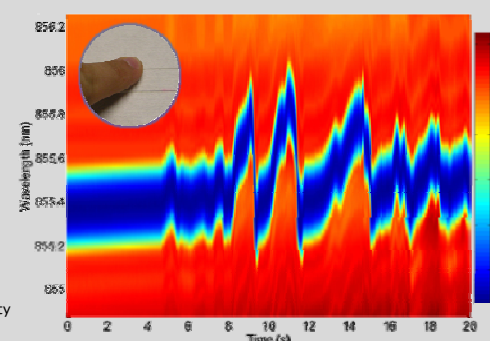
Photodetector: optical power/current



FBG measured in transmission

Color = λ intensity

Tactile sensing



Conclusion

We have developed an integrated fiber sensing system including embedded fiber sensors and low-cost compact fiber coupled driving and read-out optoelectronics. Dynamic interrogation of fiber Bragg gratings is demonstrated enabling high accurate and robust sensing in harsh environments.



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