Development of an optical fiber refractometer and its applications

Project Leader
TAUE, Shuji, Dr. Eng.
Associate Professor, Electronic and Photonic Systems Engineering

1. Objective

This project is aimed at:

Using commercially available optical fibers, we have developed a highly sensitive refractometer for optical communications. [1]. Its performance, with high sensitivity and electromagnetic immunity, promises applicability in rapid diagnostics [2] and observation of molecular reactions in electromagnetic fields [3].
The aim of this project is to develop and demonstrate a new optical fiber based sensor structure.

2. Project Outline

To that end, the project will consist of the following phases:

(a) Development and optimization of measurement systems for various applications;
(b) Development and experimental verification of a new sensor structure with optical fibers; and
(c) Performance evaluation of the resulting sensor.

3. Expected Performance

In this project, the successful candidate would be expected to:

(a) Work independently when planning, preparing and carrying out the experiments;
(b) Report research progress at weekly laboratory meetings; and
(c) Supervise masters and undergraduate students in the laboratory.

4. Required Skills and Knowledge

The successful candidate for this project will have the following knowledge and skills:

(a) Basic understanding of physics, electromagnetics, and optics; and
(b) Ability to use development tools such as Matlab, Labview and BeamProp for measurement and analysis.

References

1) Shuji Taue, et al., "Experimental Analysis of Optical Fiber Multimode Interference Structure and its Application to Refractive Index Measurement," Jpn. J. Appl. Phys., Vol. 51 (45), 04DG14(2012).
2) S. Miyamura, et al., “Rapid, high-sensitivity detection of biomolecules using dual-comb biosensing,” Sci. Rep., Vol. 13, 14541 (2023).
3) Y. Asakuma, et al., “Microwaves reduce water refractive index,” Sci. Rep., Vol.12, 11562(2022).

See my webpage:

(URL) https://www.kochi-tech.ac.jp/profile/en/taue-shuji.html

See our admission guidelines:

https://www.kochi-tech.ac.jp/english/admission/ssp_aft19oct/ssp_application_guideline.html

Contact

E-mail: taue.shuji@kochi-tech.ac.jp