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Plasmonic wave assessment via optomechatronics system for biosensor application
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Abstract
Transduction biosensor (mass-based, optical and electrochemical) involves analysis, recognition and amplification in the acquired sample. In this work, the plasmonic-based biosensor was employed without using tags. It is crucial to determine angles of Brewster (Θb) and critical (Θc) for generating plasmonic resonance (Θr). The objective is to verify a cost-effective plasmonic biosensor through Fresnel simulation and experimentation of a developed optomechatronics system. The borosilicate glass, Au and Air layers were simulated with the Winspall 3.02 simulator. The optomechatronics system consists of: 1-optics (650 nm laser, slit, polarizer, photodiode), 2-mechanical (bipolar stepper motors, gears, stages) and 3-electronics (PIC18F4550, liquid crystal display (LCD) and drivers). Later, the software performs angular interrogation by reading the reflected beam from a rotating prism at 0.1125. Experimentation to simulation accuracy indicates that percentage differences for Θr and Θc are 1% and 0.2%, respectively. In conclusion, excellence verification was successfully achieved between experimentation and simulation. It proved that the low-cost optomechatronics system is capable and reliable to be deployed for the biosensor application.

Author Keywords
Biosensor; Electromagnetic; Microstepping; Optomechatronics; P-polarized; Plasmonic; Resonance

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