

Editorial

## Introduction to the Special Issue on “Optomechatronics”

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The field of optomechatronics combines the synergistic effects of optics, mechanics and electronics for efficient sensor development. Optical sensors for the measurement of mechanical quantities, equipped with appropriate electronic signal (pre)processing have a wide range of applications, from surface testing, stress monitoring, and thin film analysis to biochemical sensing. The aim of this special issue is to provide an overview of current research and innovative applications of optomechatronics in sensors.

The present special issue addresses, *inter alia*, optical sensor principles [1–3], fiber-optic sensors [3–14], surface analysis [10,15], thin film measurement [15], FGB sensors [6], and biochemical sensors [16]. In particular, an efficient combination of optics, electronics and micromechanics is a basis for the development of novel measurement instrumentation. Optical sensors for the measurement of mechanical quantities (see, e.g., [1])—here referred to as optomechatronical sensors—provide an abundance of advantages as compared to conventional, e.g. electrical or mechanical sensors. Optical sensing of mechanical quantities has become a major field of measurement technology. The progress in CCD (charge coupled device) cameras and the development of efficient hardware and software systems has resulted in fast, compact and reliable measurement devices, and thus in a growing interest for technical applications. The advantages of optomechatronical techniques are numerous: (i) non-contacting, and thus generally non-perturbing; (ii) very high spatial and temporal resolution; (iii) adaptable to technical surfaces; (iv) rigid for industrial use; and (v) appropriate for long range diagnostics, *i.e.*, the measurement distances can be quite large. Progress in microelectronics, optics and mechanics advances with new material technologies. Mechatronic systems involve mechanical processes supplemented by an electronic system. Other embodiments of mechatronic systems include (micro)optic components to form optomechatronical systems.

In the present issue, both fundamental aspects [3,9,10,12,17] and technical applications [1,16,18] of optomechatronics are covered. For example, an optical measurement system for the detection of mechanical quantities (surface structure, roughness, vibration, rotation, *etc.*) can be considered as an interaction of optics (the detectors), electronics (data acquisition and analysis) and (micro)mechanics.

Furthermore, optomechatronical systems are set up for the measurement of surface structures, thin surface films, surface movements, bulk properties and gravimetric quantities.

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