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## Fiber Bragg Grating (FBG) sensing technology and its application in thermal errors monitoring of CNC machine tools

Yuegang Tan and Ruiya Li

Wuhan University of Technology, China

For a long time, Fiber Bragg Grating (FBG) based sensors were intensively studied for application in civil engineering structure, like bridges, dams, etc. Recently, due to the advantages of small volume, light weight, anti-electromagnetic interference, anti-oil corrosion, and multiple measuring points in one optical fiber, FBG-based sensors have attracted lots of interests and been widely investigated by researchers and engineers in industrial filed. Our research focuses on dynamical monitoring and diagnoses of mechanical systems based on distributed fiber Bragg grating sensors. The FBG-based sensors we developed for mechanical equipment (large steam turbine, aeroengine, large crane, heavy-duty CNC (computer numerical control) machine tools, etc.) involves the measurement of temperature, strain, force, pressure, and accelerator. Thermal error monitoring technology is the key technological support to solve the thermal error problem of heavy-duty CNC machine tools. FBG temperature sensors were utilized to detect the temperature field of main heat sources and the body structure in heavy-duty CNC machine tools to study the thermal characteristics of main heat sources and to establish the thermal error prediction model. Meanwhile, based on the advantage of multiple strain measuring points in one optical fiber, FBG-based strain sensors were studied and used to measure the thermal deformation of structural components (gantry beam, column and base) of the heavy-duty CNC machine tools using the integral relationship between the strain and deformation.

### Biography

Yuegang Tan is currently a Professor with the School of Mechanical and Electronic Engineering, Wuhan University of Technology, China. He received his PhD from Wuhan University of Technology in 2005. He has presided over many important scientific projects, such as National Natural Science Foundation of China, 863 Program of China, etc. He has authored or coauthored more than 90 journal and conference publications, 7 granted Chinese invention patent, and has published 2 academic books. Currently his research interests include optical fiber sensing technology, thermal errors of heavy-duty CNC machine tools, security of large-scale rotating machinery, structural health monitoring (SHM) and fault diagnosis of modern mechanical equipment, and underactuated robot technology. Mr. Ruiya Li is his PhD candidate, who is currently studying as a visiting research student with supervisor Prof. Duc Truong Pham in University of Birmingham, UK.

ygtan@whut.edu.cn

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