Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 83 (1999)

Artikel: Bridge deformation monitoring with fiber optic sensors
Autor: Inaudi, Daniele / Casanova, Nicoletta / Vurpillot, Samuel
DOI: https://doi.org/10.5169/seals-62865

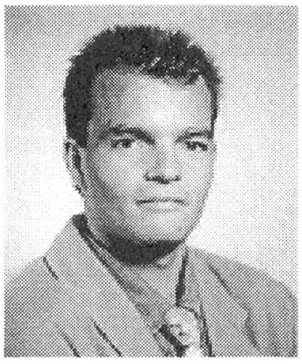
Bridge Deformation Monitoring with Fiber Optic Sensors

Daniele INAUDI
Dr
SMARTEC
Grancia, Switzerland

Daniele Inaudi holds a degree in physics and a Ph.D. from the Swiss Federal Institute of Technology in Zurich and Lausanne, respectively. He is co-founder and R&D director of SMARTEC SA, a company active in the domain of civil structural monitoring.

Nicoletta CASANOVA
Civil Eng.
SMARTEC / IMM
Grancia, Switzerland

Nicoletta Casanova received her civil engineering degree from the Swiss Federal Institute of Technology in Zurich. She is co-founder and director of SMARTEC SA. She is also technical director of the Institute of Material Mechanics IMM.



Samuel VURPILLOT
Dr Eng.
IMAC-EPFL
Lausanne, Switzerland

Samuel Vurpillot holds a degree in civil engineering from the Swiss Federal Institute of Technology Lausanne. He is manager of the SOFO project and is working on a Ph.D. dealing with the automatic analysis of monitoring data from bridges.

Abstract

The security of civil engineering works demands a periodical monitoring of the structures. In many civil structures like bridges, tunnels and dams, the deformations are the most relevant parameter to be monitored. Fiber optic deformation sensors, with measurement bases of the order of one to a few meters, can give useful information both during the construction phases and in the long term.
SOFO is a structural monitoring system using fiber optic deformation sensors. It is able to measure deformations between two points in a structure, which can be from 20 cm up to 10 meters (or more) apart with a resolution of two microns (2/1000 mm) even over years of measurements. The system is composed of optical deformation sensors adapted to direct concrete embedding or surface mounting, the cable network, the reading unit and the data acquisition and analysis software. The system is particularly adapted to precise short and long-term monitoring of deformations. The SOFO system is successfully used in a number of bridges, tunnels, dams and geostructures.
This paper briefly summarizes the measurement principle of the SOFO system and presents two examples of application to the monitoring of existing and refurbished bridges. The Lutrive concrete bridge was instrumented with 40 sensors to monitor its curvature variations under static, dynamic and thermal loading. From the curvature measurements and using a double-integration algorithm it was possible to retrieve the vertical displacements of the bridge. The Versoix bridge was instrumented with more that 100 sensors to monitor the different phases of its enlargement and refurbishment. The sensors were used to characterize the interaction between concrete of very different ages and to follow the horizontal and vertical displacements of the bridge during construction, static loading testing and in the long term.
The combination of adequate monitoring techniques and numerical simulations is a powerful tool that enables the understanding of complex structural phenomena. In this way the design of more durable structures can be enhanced.

Leere Seite
Blank page
Page vide