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Monitoring Possibility of Sailing Ships' Masts

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Marine structures like: marine vessels, submarines and offshore structures surrounded by a harsh marine environment are exposed to long-term cyclic loadings comes from continuously acting sea waves and short-term extreme loads such as severe storms, seaquakes or even collisions. The marine environment (sea water) results in fast corrosion, erosion and scour processes. Those phenomena increase the size of an existing damage and also initiate its growth. Any damage of a marine structure can results in endanger human life, ecologic and economical catastrophe.

The idea of the marine SHM is to build a system that is able to evaluate a condition of a monitoring structure in different environmental and exploitation conditions. One of the most promising sensors for that purpose is those based on fibre optics technology, especially Fibre Bragg Grating (FBG) sensors. FBG sensors can be successfully used for static and dynamic measurements. Recognition of practical application possibilities of fibre optic experimental techniques based on FBG sensors in the SHM of sailing ships masts is our aim. Practical implementation of safety system based on optical sensors meets several difficulties. In the paper monitoring system of the foremast of scholar ship - frigate "Dar Młodzieży", is presented. Research on STS Dar Młodzieży was carried out during nine days voyage at Baltic Sea. Research was related to characteristics of Dar Młodzieży's foremast during her normal operation. The main goal of this research was to determine the size of stress/strain of foremast above topmast crosstrees where three steel jib stays are mounted. To achieved this goal, during this research special attention was paid to setting the sails and taking in the sails. In the SHM system FBG strain, temperature and two kinds of piezoelectric acceleration sensors have been used. During SHM system designing FBG sensors are verified and compared with classical deformation sensors and electrical strain gauges. Stability, sensitivity and error bounds of FBG strain sensors have been determined in different marine environmental conditions. The piezoelectric acceleration sensors are used for ship movements (e.g. yawing) recording. Typical piezoelectric sensors have been compared with seismic type accelerometers.

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Ключевые слова:

Содержание.

Abstract
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