

ABSTRACT

In the beginning of this thesis, the overview of the research methods, development, application in the nearby years and the basic Knowledge of FBG sensing technology was given successively. Next, simulated the spectral characteristics of FBG sensor when the sensor was applied with certain value of temperature and strain, the temperature sensitivity and strain sensitivity of FBG sensor obtained are $14.2\text{pm}/^{\circ}\text{C}$ and $1.226\text{pm}/\mu\xi$ respectively. Then, the methods for solving the cross-sensitivity problem of FBG sensor when using FBG sensor to Simultaneous measure of temperature and strain was introduced. following that, a solution based on the temperature compensation method was designed and simulated for verification. After that, the influence of parameters on FBG sensor was analyzed and simulated by verying bandwidth, reflectivity, grating length and refractive index, and the distance between the two sensor wavelengths suitable for Nur-Sultan is 4.7nm , which was calculated by using the simulation results. Finally, the impact of measuring instrument on the accuracy of sensor measurement results was briefly discussed and simulated.

All of the propose designs were tested by using simulation software OptiSystem 16.1.