Ice Load Measurements on Known Structures Using Image Processing Methods

Authors : Azam Fazelpour, Saeed R. Dehghani, Vlastimil Masek, Yuri S. Muzychka

Abstract : This study employs a method based on image analyses and structure information to detect accumulated ice on known structures. The icing of marine vessels and offshore structures causes significant reductions in their efficiency and creates unsafe working conditions. Image processing methods are used to measure ice loads automatically. Most image processing methods are developed based on captured image analyses. In this method, ice loads on structures are calculated by defining structure coordinates and processing captured images. A pyramidal structure is designed with nine cylindrical bars as the known structure of experimental setup. Unsymmetrical ice accumulated on the structure in a cold room represents the actual case of experiments. Camera intrinsic and extrinsic parameters are used to define structure coordinates in the image coordinate system according to the camera location and angle. The thresholding method is applied to capture images and detect iced structures in a binary image. The ice thickness of each element is calculated by combining the information from the binary image and the structure coordinate. Averaging ice diameters from different camera views obtains ice thicknesses of structure elements. Comparison between ice load measurements using this method and the actual ice loads shows positive correlations with an acceptable range of error. The method can be applied to complex structures defining structure and camera coordinates.