

DIGITAL METHOD FOR ASSESSING THERMOPHYSICAL PARAMETERS OF AN OBJECT ON ITS IMAGE

Babkova N.V., Ugolnikov S.V.

National Technical University

«Kharkiv Polytechnic Institute», Kharkiv

To optimize and monitor energy use, to carry out calculations of energy technological processes, correct data on the thermophysical characteristics of objects, materials used and their change over time and under various operating conditions are required. To obtain them, methods of analyzing information obtained by non-contact methods are increasingly used. Large amounts of information determine the task of developing a special technology for its processing. The experience of developing an algorithm and creating on its basis an information system for recovering surface temperature fields from a digitized image of an object is considered.

The review shows that methods for non-contact measurement of temperature fields, including in dynamics, with subsequent digital processing of the obtained data, are being intensively developed and widely introduced into practice. However, today there are a number of problems, the solution of which will increase the accuracy and metrological reliability of these methods, and make their applications more efficient. One of the directions of their solution is the creation of an information technology for identifying the thermal state of a physical object based on the use of models and methods for processing digital images.

As the initial information for the algorithm, the image of the object under study is used in the form of a "bmp"-format file. Preliminarily, the visual characteristics of the image are improved in order to make the most of the dynamic range of the display device, which helps to improve the accuracy of the temperature field reconstruction. To do this, apply the method of linear contrasting, the method of highlighting the range of brightness, converting the image to a negative, or a number of others.

To authenticate data on the temperature distribution over the surface of an object, a model of human color vision is used. Based on the use of the spectral sensitivity function of human vision, the wavelength (i.e. true temperature) corresponding to the color of the pixel in the image is set. In addition, a method for detecting temperature overlap zones and a comparison method is used, which makes it possible to more accurately determine the characteristics of color temperatures by color coordinates in the RGB system. Using the proposed method of interpretation of visual information allows you to restore the temperature field on the surface of the object under study.

The proposed information technology for analyzing a digital image of an object under study, obtained by a non-contact method, further makes it possible to refine the thermophysical characteristics of the surface, and their change in time will give an estimate of the parameters of thermal processes in the object and on its surface. The method of restoring the thermophysical parameters of an object from a digital photographic image reduces the complexity of the measurement process, increases the efficiency of the study, makes it possible to dynamically monitor both in time and in external conditions