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EFFICIENT NUMERICAL INTEGRATION OF TRIGONOMETRIC FUNCTIONS OF SEVERAL VARIABLES

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Modern methods of digital signal and image processing are characterized by new approaches to obtaining, processing, and analyzing information. There is a need to build mathematical models in which information can be specified not only by the values of a function at points, but also as a set of traces of a function on planes, as a set of traces of a function on lines [1-2].

There are algorithms for calculating integrals of rapidly oscillating functions of many variables (regular case) that are optimal in terms of accuracy, which, in their construction, provide for different types of information specification [3-4]. Approximate calculation of integrals of rapidly oscillating functions of many variables for the irregular case is a more complex, important task of digital signal and image processing. It is high time to build cubature formulas that would allow obtaining the results of solving the above-mentioned problem for different types of data specification [3-4].

The first step in solving such a problem is to build cubature formulas for the approximate calculation of triple integrals of trigonometric functions of general form.

The works [7] present a cubature formula for the approximate calculation of a triple integral of a trigonometric function in general form in the case when information about the function was specified by the corresponding traces on mutually perpendicular planes. The cubature formula was constructed using the interflatation operator (a new information operator that recovers a function from an existing set of known values of the function on the planes) with auxiliary functions in the form of piecewise-constant splines.

The purpose of this study is to build cubature formulas for the approximate calculation of triple integrals of trigonometric functions of general form, which in their construction use the interlineation operator, built on the basis of the interflatation operator, and the interpolation operator, built on the basis of the interflatation operator with auxiliary functions in the form of piecewise-constant splines. To obtain error estimates of the approximation on different classes of functions. To test the proposed cubature formulas, to show their effectiveness in terms of the amount of input information and to identify the potential capabilities of the proposed formula.

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