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ABSTRACT OF PAPER

Title of Paper: A modified Runge-Kutta solution of ordinary differential equations.

Time .... minutes.

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Member of Mathematical Association of America: Yes ☒ No ☐

(4)

ABSTRACT

The abstract should be in the form of a brief and concise statement of the main results or points of view of the paper, without demonstrations and with a minimum of formulae. It should not exceed 100 words and should be compressed if possible into a single paragraph. It should be written in the third person. The abstract should be typewritten and in a form suitable for immediate publication in the MONTHLY.

Suppose it is required that a particular solution to the differential equation

$$\frac{dy}{dx} = F(x,y)$$

be found. Suppose further that the points (x_{n-1}, y_{n-1}) and (x_n, y_n) lie on the particular solution curve and that they are given. Let $x_n + h = x_{n+1}$, $y_n + k = y(x_{n+1}) = y_{n+1}$. Here h, the step-size is fixed. Therefore, k, the change in y, must be evaluated to find the next point, (x_{n+1}, y_{n+1}), on the particular solution curve. The set of equations

(1) $$k_0^{(n-1)} = hF(x_{n-1}, y_{n-1}),$$

(2) $$k_1^{(n-1)} = hF(x_{n-1} + uh, y_{n-1} + uk_0^{(n-1)}),$$

(3) $$k_0^{(n)} = hF(x_n, y_n),$$

(4) $$k_1^{(n)} = hF(x_n + uh, y_n + uk_0^{(n)}),$$

(5) $$k^{(n)} = a_0k_0^{(n)} + a_1k_1^{(n)} + b_0k_0^{(n-1)} + b_1k_1^{(n-1)},$$

(6) $$y_{n+1} \doteq y_n + k^{(n)},$$

(7) $$b_0 = \frac{5-6u}{12u},$$ (8) $$b_1 = \frac{-5}{12u}$$

(9) $$a_0 = \frac{18u-5}{12u},$$ (10) $$a_1 = \frac{5}{12u},$$

describes a modified Runge-Kutta method of numerical integration, which has an accuracy of the order of h^3 and which requires only two substitutions into the differential equation for each step of integration. The value of u is dependent upon h and the differential equation.