Note on "A Method for Computing Certain Inverse Functions"

The method for computing certain inverse functions, one binary digit at a time, which was described by D. R. Morrison in a recent issue of *MTAC* [1] has been used in this laboratory. In particular, a subroutine for computing an inverse cosine, $x = \arccos y$, based on the method was given in [2] (part III, subroutine T4, p. 152–153). It was, however, pointed out by van Wijngaarden [3] that the method gives poor accuracy for certain values of the argument, namely, those for which one or more of the functions $\cos x$, $\cos 2x$, $\cos 4x \cdots \cos 2^k x$ are near unity. When x is near zero the error is, perhaps, of little importance since the equation $x = \arccos y$ does not then determine x with any great precision, but this is not the case when x is near $\pi/2$, $\pi/4$, etc. In general abnormally large errors may occur if, in Morrison's notation,

$$dy_n/dx = 0 \text{ for any } n \leq N,$$

since δ will then be of order $\sqrt{\epsilon}$ if $d^2y_n/dx^2 \neq 0$, and of larger order otherwise. The number of correct figures in the value obtained for an inverse cosine or similar function may, as a result, be only about half as many as Morrison suggests.

Although, in cases in which the above objection does not apply, digit by digit methods of computing functions may sometimes be useful in a digital computer on account of their simplicity, they are, in general, slow in operation, and unless storage capacity is very restricted other methods are, in our experience, generally to be preferred.

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1. D. R. Morrison, "A method for computing certain inverse functions," *MTAC*, v. 10, 1956, p. 202–208.
2. M. V. Wilkes, D. J. Wheeler, & S. Gill, *The Preparation of Programs for an Electronic Digital Computer*, Addison-Wesley Press, Cambridge, Mass., 1951.
3. A. van Wijngaarden, "Erreurs D'Arrondiment dans les Calculs Systématiques," Centre National de la Recherche Scientifique, *Colloques Internationaux*, v. 37, 1953, p. 285–293.

REVIEWS AND DESCRIPTIONS OF TABLES AND BOOKS

75[A].—Walter Schmidt, *Der Rechner*, Technischer Verlag Herbert Cram, Berlin, 1955, xix + 200 p. DM 18.00.

This gives on page n, $n = 1(1)200$, the product mn, to one place of decimals, where $m = p + \theta$, $p = 0(1)100$, $\theta = 0.1(.1).9$; $\frac{1}{6}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{5}{6}$, $\frac{1}{4}$, $\frac{3}{4}$. The format is satisfactory and the printing tolerable. The accuracy has not been checked.

There is a rather lighthearted introduction, which gives various examples of the use of the table.

J. T.