RTRGSM	CERN Program Library	E409

Author(s) : T. Håvie, K.S. Kölbig
Library: MATHLIB
Submitter :
Submitted: 01.12.1994
Language : Fortran
Revised:

Summation of Trigonometric Series

Function subprograms RTRGSM and DTRGSM compute the sum of the trigonometric series

$$f(x) \;=\; a_0 + \sum_{k=1}^{n} a_k \cos kx + \sum_{k=1}^{m} b_k \sin kx$$

for a given argument x in the range $-\pi \le x \le \pi$ and given coefficients a_k, b_k.
On CDC and Cray computers, the double-precision version DTRGSM is not available.

Structure:

FUNCTION subprogram
User Entry Names: RTRGSM, DTRGSM

Usage:

In any arithmetic expression, for t = R (type REAL), t = D (type DOUBLE PRECISION),

```
tTRGSM(X,A,N,B,M,IOP)
```

has the value $f(x)$.

X (Type according to t) Argument x.

A (Type according to t) One-dimensional array of dimension (0:d) where d $\geq$ N, containing the constant coefficient a_0 in A(0) and the cosine coefficients a_k $(k = 1, \ldots, n)$ in A(k).

N (INTEGER) The number n of cosine coefficients.

B (Type according to t) One-dimensional array of length $\geq$ M, containing the sine coefficients b_k $(k = 1, \ldots, n)$ in B(k).

M (INTEGER) The number m of sine coefficients.

IOP (INTEGER) An option number:
= 1 : the general case,
= 2 : all b_k are zero, i.e. $f(x) = f(-x)$,
= 3 : all a_k are zero, i.e. $f(x) = -f(-x)$.

Method:

Standard recurrence relations are used for calculating the sum (see Ref. 1).

Notes:

For a function $f(z)$ given in the range $a \le z \le b$, use the transformation

$$x \;=\; \frac{2\pi}{b-a}\left(z - \frac{b+a}{2}\right) \quad \text{for IOP} = 1,$$

$$x \;=\; \pi\,\frac{z-a}{b-a} \quad \text{for IOP} = 2 \text{ or IOP} = 3.$$

References:

1. W. Clenshaw, A note on the summation of Chebyshev series, MTAC (later renamed Math. Comp.) **9** (1955) 118–120.

•