NAG Fortran Library Routine Document

F06AAF (DROTG)

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of ***bold italicised*** terms and other implementation-dependent details.

1 Purpose

F06AAF (DROTG) generates a real Givens plane rotation with parameters c and s, such that, given real a and b:

$$\begin{pmatrix} c & s \\ -s & c \end{pmatrix}\begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} d \\ 0 \end{pmatrix}$$

The routine computes c, s and d as follows:

$$d = \sigma\sqrt{a^2+b^2};$$

$$c = \begin{cases} a/d, & \text{if} \quad d \neq 0, \\ 1, & \text{if} \quad d = 0, \end{cases} \qquad s = \begin{cases} b/d, & \text{if} \quad d \neq 0, \\ 0, & \text{if} \quad d = 0, \end{cases}$$

$$\text{where} \quad \sigma = \begin{cases} \operatorname{sign} a, & \text{if} \quad |a| > |b|, \\ \operatorname{sign} b, & \text{if} \quad |a| \leq |b|. \end{cases}$$

The routine also computes the value z defined as

$$z = \begin{cases} s, & \text{if} \quad |s| < c \quad \text{or} \quad c = 0, \\ 1/c, & \text{if} \quad 0 < |c| \leq s. \end{cases}$$

This enables c and s to be reconstructed from the single value z as

$$c = \begin{cases} \sqrt{1-z^2}, & \text{if} \quad |z| \leq 1, \\ 1/z, & \text{if} \quad |z| > 1, \end{cases} \qquad s = \begin{cases} z, & \text{if} \quad |z| \leq 1, \\ \sqrt{1-c^2}, & \text{if} \quad |z| > 1. \end{cases}$$

To apply the plane rotation to a pair of real vectors, call F06EPF (DROT); to apply it to a pair of complex vectors, call F06KPF.

2 Specification

```
SUBROUTINE F06AAF (A, B, C, S)
double precision       A, B, C, S
```

The routine may be called by its BLAS name ***drotg***.

3 Description

None.

4 References

None.

5 Parameters

1: A – ***double precision*** *Input/Output*

On entry: the value a, the 1st element of the vector which determines the rotation.

On exit: the value d.

2: B – ***double precision*** *Input/Output*

On entry: the value b, the second element of the vector which determines the rotation.

On exit: the value z, from which c and s can be reconstructed.

3: C – ***double precision*** *Output*

On exit: the value c, the cosine of the rotation.

4: S – ***double precision*** *Output*

On exit: the value s, the sine of the rotation.

6 Error Indicators and Warnings

None.