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PROGRAM LIBRARY

DECUS NO.	8-501
TITLE	GALACTIC COORDINATES
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SOURCE LANGUAGE	4K FORTRAN

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RECORDS UNIT



DATE	DESCRIPTION	AMOUNT

GALACTIC COORDINATES

DECUS Program Library Write-up

DECUS NO. 8-501

ABSTRACT

This program consists of two parts: the first converts star positions from astronomical coordinates (right ascension and declination) to galactic coordinates (latitude and longitude); the other converts in the reverse direction.

USAGE

To convert from astronomical coordinates (right ascension and declination) to galactic latitude and longitude, we will start with the following set of axes:

+X1 AXIS THRU RA=6 HR 49 MIN, DEC=0 DEG
+Y1 AXIS THRU RA=12 HR 49 MIN, DEC=0 DEG
+Z1 AXIS THRU DEC=+90 DEG

Then

X1 = COS DEC COS (RA-6H49M)
Y1 = COS DEC SIN (RA-6H49M)
Z1 = SIN DEC

We will now rotate these coordinates about the +X1 axis so that the Z2 axis is thru RA=12 HR 49 MIN, DEC=27.4 DEG. The angle of rotation is R1=62.6 DEG:

$$\begin{bmatrix} X2 \\ Y2 \\ Z2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(R1) & \sin(R1) \\ 0 & -\sin(R1) & \cos(R1) \end{bmatrix} \begin{bmatrix} X1 \\ Y1 \\ Z1 \end{bmatrix}$$

Now we have:

+X2 AXIS THRU GALACTIC EQUATOR AT LONGITUDE=213 DEG
+Y2 AXIS THRU GALACTIC EQUATOR AT LONGITUDE=303 DEG
+Z2 AXIS THRU NORTH GALACTIC POLE

Finally, we rotate thru an angle of 213 degrees, then calculate the galactic latitude and longitude.

The program should be compiled, loaded and started in the usual manner. It will type:

HRS & MINS OF RIGHT ASCENSION=

and wait for the operator to key in these values with suitable terminators (spaces). Similarly the declination is entered. After a quarter second of calculation, the machine types out the answers and starts a new problem.

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C; FROM ASTRONOMICAL TO GALACTIC COORDINATES, BY A. MOSES, 20 OCT 71
2; FORMAT (/, "HRS & MINS OF RIGHT ASCENSION=")
3; FORMAT (E, E)
4; FORMAT (/, "DECS & MINS OF DECLINATION=")
5; FORMAT (/, "GALACTIC LATITUDE=", I, "DECS ", I, "MINS", /, "GALACTIC "
   "LONGITUDE=", I, "DECS ", I, "MINS", /, /, /)
RD=57.29578
DR=.1745329E-1
R=62.6*DR
SR=SINF(R)
CR=COSF(R)
1; TYPE 2
ACCEPT 3, D, EM
H=(360.-15.*(D-6.)-.25*(EM-49.))*DR
TYPE 4
ACCEPT 3, D, EM
D=(D+EM/60.)*DR
CD=COSF(D)
Z1=SINF(D)
Y1=CD*SINF(H)
X2=CD*COSF(H)
Y2=Y1*CR+Z1*SR
Z2=-Y1*SR+Z1*CR
IF (X2) 7, 8, 9
7; CLON=33.-RD*ATNF(Y2/X2)
GO TO 15
8; IF (Y2) 11, 12, 13
11; CLON=123.
GO TO 15
12; IC=90.*Z2
IH=MIN=M=0
GO TO 14
13; CLON=303.
GO TO 15
9; CLON=213.-RD*ATNF(Y2/X2)
15; IF (CLON) 16, 17, 17
16; CLON=CLON+360.
17; IH=CLON
D=IH
MIN=(CLON-D)*60.
CLAT=RD*ATNF(Z2/SQTF(X2*X2+Y2*Y2))
IC=CLAT
D=IC
M=(CLAT-D)*60.
14; TYPE 5, IC, M, IH, MIN
GO TO 1
END

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C; FROM GALACTIC TO ASTRONOMICAL COORDINATES, BY A. MOSES, 20 OCT 71
2; FORMAT (/, "DEGS & MINS OF GALACTIC LATITUDE=")
3; FORMAT (E,E)
4; FORMAT (/, "DEGS & MINS OF GALACTIC LONGITUDE=")
5; FORMAT (/, "RIGHT ASCENSION=", I, "HRS ", I, "MINS ", I, "TENTHS", /, /,
  "DECLINATION=", I, "DEGS ", I, "MINS", /, /, /)
RD=57.29578
DR=.1745329E-1
R=62.6*DR
SR=SINF(R)
CR=COSF(R)
1; TYPE 2
ACCEPT 3,D,EM
D=(D+EM/60.)*DR
CD=COSF(D)
Z2=SINF(D)
TYPE 4
ACCEPT 3,D,EM
D=(D+EM/60.-213.)*DR
Y2=CD*SINF(D)
X1=CD*COSF(D)
Y1=Y2*CR+Z2*SR
Z1=-Y2*SR+Z2*CR
IF (X1) 7,8,9
7; H=18.81667-RD*ATNF(Y1/-X1)/15.
GO TO 15
8; IF (Y1) 11,12,13
11;H=12.81667
GO TO 15
12;IC=90.*Z1
IH=MIN=M10=M=0
GO TO 14
13;H=.8166667
GO TO 15
9; H=6.816667+RD*ATNF(Y1/X1)/15.
15;IF (H-24.) 16,17,17
17;H=H-24.
16;IH=H
D=IH
EM=(H-D)*60.
MIN=EM
D=MIN
M10=(EM-D)*10.
D=RD*ATNF(Z1/SQTF(X1*X1+Y1*Y1))
IG=D
EM=IC
M=(D-EM)*60.
14;TYPE 5, IH, MIN, M10, IC, M
GO TO 1
END

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