

## Hipgal

Hipgal Version 2.0 (© 2000 by Lund Observatory) is a simple PC program to search and extract data from the Hipparcos Catalogue (ESA SP-1200, 1997). The program uses a special version of the catalogue, in which the following data are stored for each of 116,812 stars:

column	variable	name	unit	explanation
1	–	–	–	Hipparcos identifier (HIP number)
2	$l$	long	deg	galactic longitude (0 to 360 deg)
3	$b$	lat	deg	galactic latitude (–90 to +90 deg)
4	$p$	par	mas	parallax
5	$\mu_l$	pm.long	mas/yr	proper motion in galactic longitude
6	$\mu_b$	pm.lat	mas/yr	proper motion in galactic latitude
7	$\sigma_p$	se.par	mas	standard error (s.e.) in parallax
8	$\sigma_{\mu_l}$	se.pm.long	mas/yr	s.e. in longitude proper motion
9	$\sigma_{\mu_b}$	se.pm.lat	mas/yr	s.e. in latitude proper motion
10	$V$	V	mag	visual magnitude
11	$B-V$	B-V	mag	colour index
12	<i>mult</i>	mult	–	multiplicity index (integer from 0 to 6)

### Notes:

(1)  $\mu_l$  and  $\sigma_{\mu_l}$  are true arcs, i.e. they contain the factor  $\cos b$ .

(2) *mult* > 0 for stars known or suspected to be double or multiple. *mult* = 1 for suspected non-singles (flag S in Field H61); *mult* = 2, 3, 4, 5, 6 for flag C, G, V, O, X in Field H59. See the Hipparcos Catalogue for further details.

Under Windows 95/98, Hipgal is started by selecting **Start ▶ Programs ▶ hipgal**. The use of the program is almost self-explanatory, once the basic principles have been grasped.

With Hipgal one can select stars based on a combination of criteria, and then produce a file listing the above data for the selected stars. For instance, selecting all stars with  $V \leq 0$  will produce the following list:

```
30438 261.21 -25.29 10.42 -19. 24.5 0.53 0.56 0.53 -0.62 0.16 1.
32349 227.23 -8.89 379.2 864. -1023.5 1.58 1.28 1.29 -1.44 0.01 4.
69673 15.07 69.11 88.84 -2277. 96.5 0.74 0.46 0.65 -0.05 1.24 2.
71683 315.74 -0.68 742.12 -3168. 1930. 1.4 1.67 1.02 -0.01 0.71 2.
```

(the stars are, in the order listed: Canopus, Sirius, Arcturus and  $\alpha^1$  Cen).

Selection criteria are of the form  $X < X_0$ ,  $X \leq X_0$ ,  $X > X_0$ ,  $X \geq X_0$ ,  $X = X_0$ , or  $X \neq X_0$ , where  $X$  is any of the 11 variables listed above and  $X_0$  is a limit value. The operators  $\leq$ ,  $\geq$  and  $\neq$  are written as  $<=$ ,  $>=$  and  $\#$  in Hipgal. The following steps are needed to define a criterion: (1) click on the variable, (2) click on the relational operator, (3) type the limit value, (4) click the button "Put

Criterion on Stack". If only a single criterion is needed (such as  $V \leq 0$  in the example above), then you can immediately produce an output file by clicking on "Search & Output".

Several criteria can be combined by means of the Boolean operators AND, OR, NOT using postfix logic (also known as Reverse Polish Notation). Criteria and Boolean operators are put on the stack, which is then evaluated from top to bottom according to the postfix logic. For instance, to select stars with  $|b| > 60$  deg, one must specify that the latitude  $b$  is either greater than 60 deg, or less than  $-60$  deg. Here is an example of what the stack may look like:

```
lat > 60.0
lat < -60.0
----- OR -----
par > 10.0
-----AND-----
mult = 0.0
-----AND-----
V < 8.0
-----AND-----
```

This would select stars in the galactic polar regions ( $|b| > 60$  deg) that are within 100 pc from the Sun ( $p > 10$  mas), single (mult = 0), and brighter than 8th magnitude ( $V < 8$ ). A test search through the catalogue shows that these criteria would result in a list of 925 stars. This is what the HIPGAL dialog window looks like after the test search:

