VOLUME 13: THE ATLAS OF IDENTIFICATION CHARTS

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ABSTRACT

The process of editing a large atlas of charts is presented. The different steps include the extraction processes of the interesting information out of the GSC and DSS CDROMs, the elimination of the noise, the technical aspects to produce the different charts (D and G part) and the difficulties linked to the number and the size of the files produced.

Key words: star charts; edition; LaTeX.

1. INTRODUCTION

A significant number of the stars measured by the Hipparcos satellite are uneasy to identify. They represent one tenth of the sample of about 120 thousand stars. To ensure a correct identification and to help people making additional measurements of these stars, an atlas of identification charts has been prepared.

The original idea (Mégevand 1991), used for the Hipparcos Input Catalog Annex 2 (Grenon et al. 1992) was to prepare the charts with the Guide Star Catalog "GSC" (Lasker et al. 1990). In some situations however, it was impossible to get a correct chart from the GSC, the field around the star being too crowded, polluted by interstellar matter, having a background gradient due to a neighbouring bright star, and the like.

The atlas is therefore set in two parts, drawn with very different methods, according to the presence of the star in the GSC, and depending on the topography and content of the field:

G part The main part is composed of 10877 charts drawn from the data of the GSC.

D part For those more cumbersome situations, a bitmap image has been extracted from the Digitized Sky Survey "DSS" (Djorgovski et al. 1992). This part represents 776 charts.

2. THE EDITORIAL PROCESS

The editorial process includes the following steps, which are detailed in the following sections:

1. Data extraction from the GSC and DSS CDROMs, putting for each field the relevant information in individual LaTeX macro files for the G part and individual images for the D part.
2. Single chart building using LaTeX for the G part and adding an adequate PostScript header for the D part.
3. Page composition made with LaTeX, assembling 35 charts for the G part or 24 charts for the D part, with appropriate headers, footers, and scales.

The Volume 13 consists of 311 pages for the G part and 33 pages for the D part.

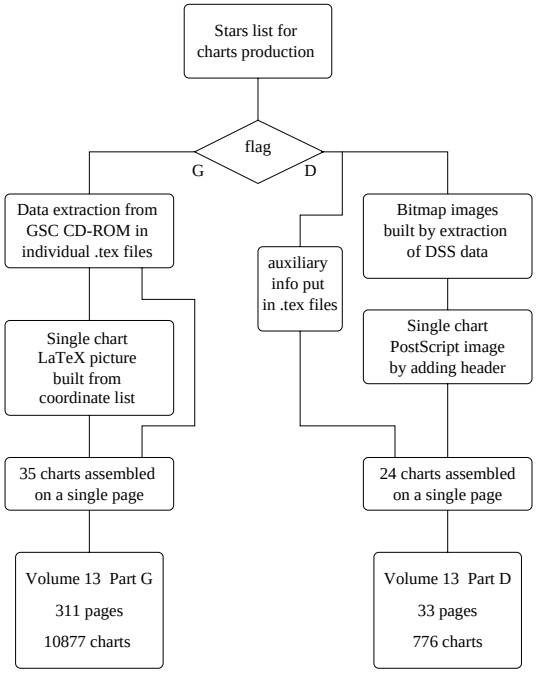

Figure 1. The general algorithm of the edition process

3. PROCESSING OF THE G PART DATA

The GSC catalog used is version 1.1. It is distributed on two CDROMs, and contains data for nearly 19 million objects brighter than sixteenth magnitude, of which more than 15 million are stars.

The catalog is divided into 7.5 degrees declination zones. These zones are then subdivided into regions bounded by small circles segments of right ascension and great circles segments of declination. This allows to keep an about constant amount of data in each region.

The data for each chart is extracted from the CDROMs by a Fortran program which creates a data file containing the coordinates and magnitude of the field stars, as well as the HIP number, the magnitude, the Hipparcos corrected coordinates and the filter of the plate used for the central star. A cursor made by two horizontal line segments is added.

These data are embedded in LaTeX macros (see figure 2), for later processing.

```
\hip{000428}
\aaa{00}{05}{10.2}
\ddd{+45}{47}{13}
\fil{V}
\mag{ 9.95}
\mar{13}{15}{1523}{2378}
\sta{1523}{2378}{06}{ 9.44}{15 SEP 83}{V}
\sta{0415}{2704}{03}{12.98}{15 SEP 83}{V}
\sta{1467}{1677}{03}{12.59}{15 SEP 83}{V}
\sta{1897}{1502}{02}{13.05}{15 SEP 83}{V}
\sta{1199}{1261}{04}{11.75}{09 SEP 83}{V}
\sta{2291}{2085}{02}{13.22}{09 SEP 83}{V}
\sta{2030}{2892}{01}{14.48}{09 SEP 83}{V}
\sta{1702}{1450}{04}{11.48}{15 SEP 83}{V}
\sta{2331}{2827}{03}{12.39}{15 SEP 83}{V}
\sta{2843}{2777}{02}{13.69}{15 SEP 83}{V}
\sta{0607}{1166}{01}{14.28}{15 SEP 83}{V}
\sta{2612}{1483}{02}{13.35}{09 SEP 83}{V}
\sta{2118}{2969}{01}{14.09}{15 SEP 83}{V}
\sta{0477}{2671}{07}{ 8.03}{15 SEP 83}{V}
\sta{0165}{2408}{03}{12.46}{15 SEP 83}{V}
\sta{1782}{1998}{03}{12.31}{15 SEP 83}{V}
...
```

Figure 2. Part of the data file for HIP000428

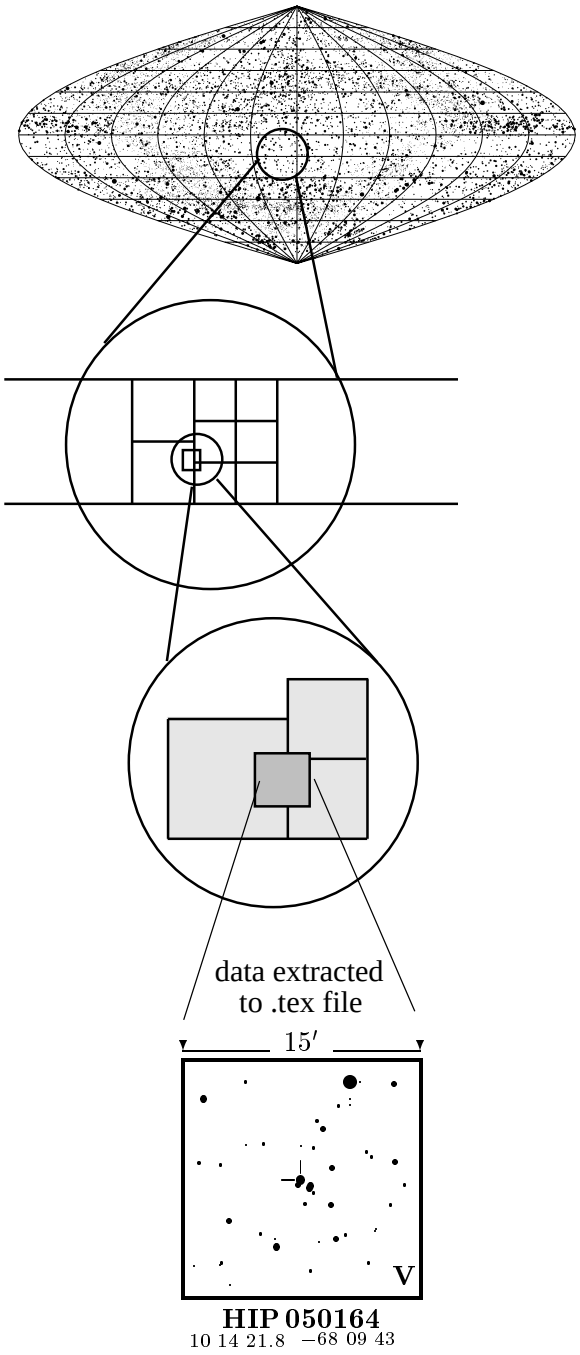

Figure 3. Identification chart extraction from the GSC

An iterative process is then run to correct the shape of the cursor, in case it overlaps another object.

The editing process then double loops through pages and single charts to draw individual pictures and assemble them in the atlas. The process is detailed in section 5.

The entire process has been reprocessed by a slightly modified program to produce the individual PostScript files to be included in the Hipparcos ASCII CDROMs.

4. PROCESSING OF THE D PART DATA

The DSS is distributed as two sets of 61 and 40 CDROMs, equal to 600 GB of data. The part I is digitized from the SERC Southern Sky Survey and the SERC J Equatorial extension. They are mainly IIIa J plates, with the exception of some V-band plates. The Part II (northern sky) is digitized from the 583 E plates from the 1950-55 epoch Palomar sky survey

These 600 GB are compressed by a factor ten using

a H-transform wavelet technique. To be able to process these data efficiently, they were decompressed and the original 16 bits/pixel encoding was replaced by a 4 bits/pixel one. This was achieved without a significant loss of quality. Then the files were recompressed. After that, all the data fit on a single 9 GB disk.

The extraction process use the original `getimage` function, slightly modified to access these data. The extracted field is oversized by a 1.414 factor to enable the rotation and clipping mandatory to get homogeneously oriented charts. Each field is extracted into an individual bitmap image file, and a companion file containing the data needed to label the charts.

A PostScript header file (see figure 4), whose execution rotates the bitmap to put the North upside, and then clip the image to the desired size, is added to each bitmap image. This header draws a small circle at the position of the star, as measured by Hipparcos.

```
...
/angle -1.61 def
/angcc angle 45 add def
...
/fenetre
{ newpath
  pmin pmin moveto
  pmax pmin lineto
  pmax pmax lineto
  pmin pmax lineto
  closepath } def
...
/croix
{ 0.001 setlinewidth
  newpath  s1 s3 s5 s7 closepath } def
...
fenetre clip
croix
angle rotate

angcc sin 1 sub 0.5 mul
angcc cos 1 sub 0.5 mul  translate
...
```

Figure 4. Part of the PostScript *header used to create the D chart for HIP038336*

The edition process is, as for the G part, a LaTeX program drawing the individual charts by putting the useful info and an convenient cross-hair cursor around the Hipparcos star, then looping through the charts to set the pages (see section 5.).

One should note that the high proper motion stars aren't in the plate position anymore, as indicated by the distance between the little circle cursor and the cross-hair cursor (see third chart of the last row in figure 8).

As for the G part, every chart has been reprocessed to get the individual charts for the Hipparcos ASCII CDROMs.

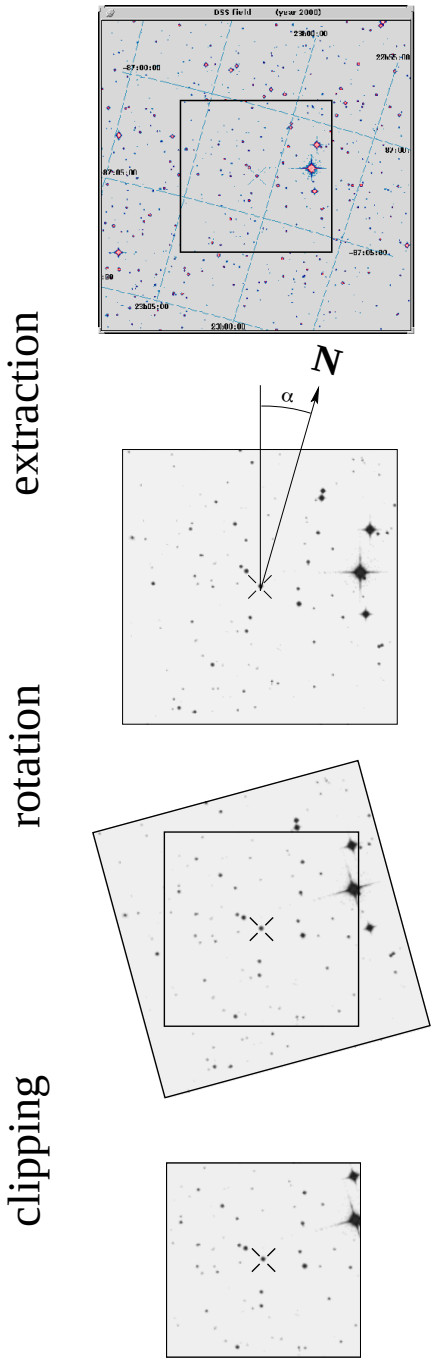

Figure 5. Successive image transformations for the DSS charts

5. ASSEMBLY OF THE ATLAS

For each part, a list of the desired HIP numbers is created in a driver file. This list is read by a LaTeX program (see figure 6), which is looping through the list, calling the appropriate routine depending on the part G (figure 7) or part D (figure 8) beeing compiled.

The G routine loops through the auxiliary file prepared by the extraction process for each chart. In this file, central and field objects are described by parameters embedded in LaTeX macros, as shown in figure 2.

A special font was created to ensure a good quality for the identification charts, independently of the output resolution.

The D routine incorporates the encapsulated PostScript files prepared by the extraction process,

In addition to the map, each chart contains the coordinates of the Hipparcos stars, the field size, and for the G part a magnitude scale. Appropriate headers and footers are added.

Altogether, around 30000 files were created, corresponding to 1 GB of data. The complete PostScript file for the atlases is larger than 100 MB.

```
...
\newcommand{\chart}[1]{%
   \begin{picture}(3000,3800)%
      \put(20,900){\framebox(2960,2960){}}%
      \message{[\hipdir/#1 ->}%
      \openin3=\hipdir/#1\relax
      \read3 to \tmp
      \loop
        \read3 to \tmp
        \ifeof3\noteofbfalse
           \else\noteofbtrue\fi
        \ifnoteofb\tmp
      \repeat
      \closein3
   \end{picture}\hfil
}%
...
   \openin2=\listfile
     \read2 to \hippage
     \setcounter{page}{\hippage}%
     \resetchart
     \linethickness{1pt}%
     \pageframe
     \loop
          \read2 to \filename
          \ifeof2\noteofafalse
             \else\noteofatrue\fi
          \ifnoteofa\testchart
  \chart{\filename}%
          \stepchart
  \message{(\mychart)]}%
     \repeat
...
     \closein2\hfill~
...
```

Figure 6. Part of the LaTeX program used to create the G part

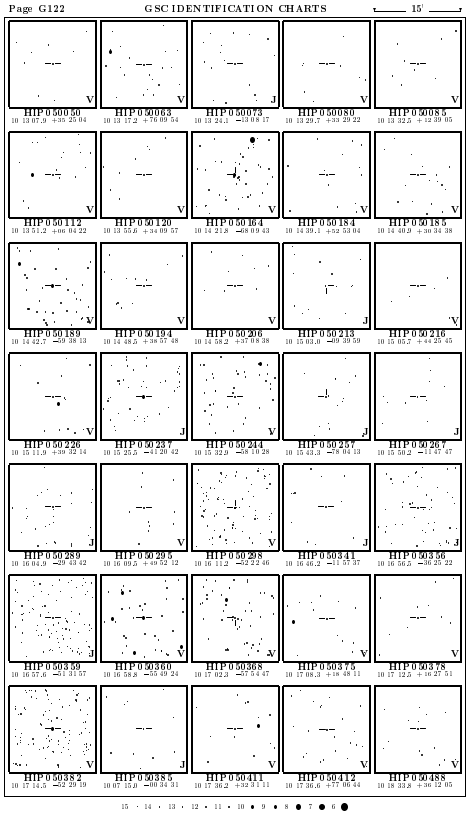

Figure 7. Extract from the G part (scaled 1:2.6)

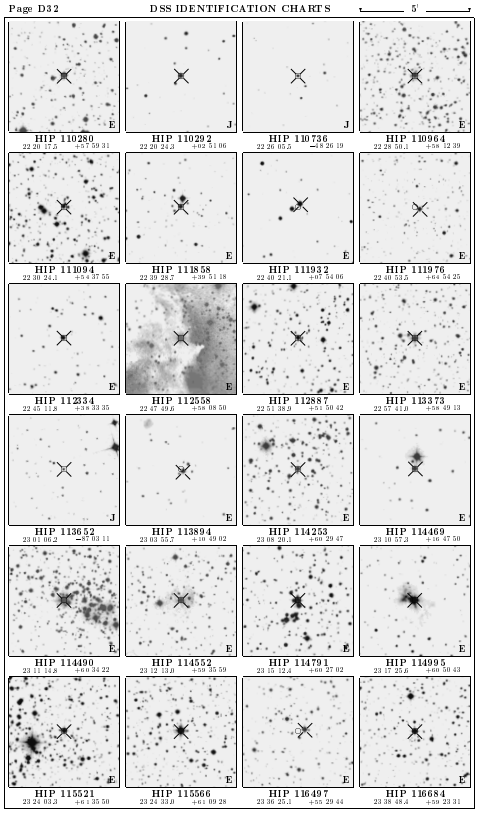

Figure 8. Extract from the D part (scaled 1:2.6)

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