SOFTWARE PACKAGE FOR PREPARING AND PROCESSING OF AN ASTRONOMICAL OBSERVATION

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Abstract. This paper presents an astronomical software package which draws celestial charts. It was conceived taking into account the technical possibilities available for the Romanian astronomers and the actual trend of the observational astronomy. The software package, now to its third version, comes to decrease the time to prepare an observation and to perform accurate charts for searching and identification.

Key words: software, astrometry, star database, celestial maps.

1. GLOBAL PRESENTATION

The name of this program is "CELESTIAL MAPS". It was written in Turbo Pascal medium, under the MS-DOS operating system (Makkai et al., 1991; Bălănescu et al., 1992; Cristea et al., 1992). Previous oral papers have announced both old version (Văduvescu and Bîrlan, 1992) and the recent version (Văduvescu and Bîrlan, 1994). This version (4.5) was conceived with about 10,000 instructions in five distinct unities. The menu-bar system makes the program very easy to use. The program can print the display. The technical needs are: PC (IBM or compatible, recommended up from 386), display (CGA, EGA, VGA, SVGA) and printer.

2. PROGRAM DESCRIPTION

The software package can be used for photometrical observations, photographical astrometry or CCD astrometry. The program gives accurate charts for searching a certain zone of the sky. The dimension of this zone can be established by the user. These charts can be evolved in three topographical types of projection, on a surface tangent to the celestial sphere in a common chosen point (the center of the chart).

The stars are plotted depending on their spectral class and magnitude. The spectral class dependence is noted on a color display and allows an optimal choice in photometry for the comparison star. For a realistic image of the projected zone, the dimensions of the stars are plotted in terms of stellar magnitudes.

The dimensions of the sky zone have a minimum of 0.0001 degrees. So, in comparison with other softwares, one can plot small field charts. For instance, the dimension of the field for the refractor in Bucharest is 2° × 2°. The program is used to make charts for astrometrical measurements, which use astrophotographical plates.

The charts have a good accuracy, because there are procedures for reducing the epoch of the star catalogues to the observation epoch. These procedures include the corrections for precession, nutation, aberration, parallax and proper motions (Meeus, 1986; Oproiu et al., 1989).

From its second version, the program produces files containing information about the stars which appear in the field. These files are used for the reduction of the observations.

To simulate general conditions for an observation, the program also provides a global image of the sky for a given date and site on the Earth surface. Thus, the program projects the celestial sphere on the tangent plane in zenithal point. This branch offers the position of the planets, Sun and Moon (Văduvescu, 1991).

Another branch of the program shows the sky projection on a tangent plane to the celestial sphere in the North or South equatorial pole. This branch feigns the apparent motions of the planets. Optionally, it is also possible to plot the constellation lines and their name.

This software is endowed with a search procedure; optionally it also displays some nonstellar objects contained in a database.

3. DATABASE

The first version of our program used FK5 catalogue (1535 stars).

Celestial Maps 4.5 uses two 2000-epoch catalogues of the stars: "Catalogue of Positions and Proper Motions" (319494 stars) and "Smithsonian Astrophysical Observatory Catalogue" (258996 stars), selected from a CD-ROM (NASA, 1990). This selection increases the speed of execution and decreases the disk space. The choice of one of these catalogues is made in the second branch of the program, by selecting the option "large data base". The files containing the stars (type files) represent stripes of 10° of declination. Thus, the user can install partial database, in conformity with the disk space and the field of interest. The simple data base file is also a type file. These files contain four denominations of the stars (PPM, SAO, HD, DM). Also, there is another file (text) which contains additional stars, that can be modified by the user. The package requires min 1 Mb (simple database), 16 Mb (SAO large database) and/or 20 Mb (PPM large database).

4. CONCLUSIONS

Celestial Maps is useful for both professional and amateur astronomers, by using it for the scientific research and didactical activity.

If this program is used for preparing an observation night, the time will be shortened roughly with 15 minutes for each chosen object. In this way, the routine will be reduced.

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