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NEW COMMON PROPER MOTION STARS IN THE LSPM-NORTH CATALOGUE

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RESUMEN

Reportamos la identificación de nuevos pares de objetos con movimiento propio común, extraídos del catálogo LSPM-North. Se han incluido en nuestra lista objetos con diferencias en sus movimientos propios de entre 5% a 10% y separaciones de cuatro segundos de arco hasta aproximadamente doce minutos. La estrella primaria de uno de los pares que hemos detectado tiene una paralaje medida de 106 ± 55 mas, mientras que para otros 12 pares, las paralajes tienen valores entre 10 y 30 mas (con errores en el rango ± 0.7 mas to ± 2.3 mas). Si estos 13 sistemas están físicamente conectados y sus secundarias están localizadas a distancias similares a las de las primarias, entonces la población total de estrellas dentro de una esfera de 100 pc con centro en el Sol podría tener 13 nuevos miembros.

ABSTRACT

We report the identification of new wide common proper motion pairs extracted from the LSPM-North Catalogue. Objects with proper motion differences from 5% to 10% and separations from four seconds of arc up to approximately twelve arc minutes have been included in our list. The primary star of one of the pairs we have detected has a measured parallax of 106 ± 55 mas, while for another 12 of them the parallaxes are from 10 to 38 mas (with errors in the range ± 0.7 mas to ± 2.3 mas). If these 13 systems are physically connected and the secondaries are located at distances similar to the primaries, then the total population of stars within 100 pc of the Sun may have 13 new members.

Key Words: binaries: general — stars: kinematics

1. GENERAL

Recently published large astrometric and non-astrometric databases are becoming the ideal starting points to perform extensive searches in order to detect a number of objects with specific properties. Catalogues such as the Second U.S. Naval Observatory CCD Astrograph Catalog (UCAC2) (Zacharias et al. 2004), USNO B1.0 (Monet et al. 2003), 2MASS (Cutri et al. 2003) are continuously being inspected in order to find objects meeting different characteristics. This process is now being called *Data Mining* and has been successfully used in the detection of new high proper motion stars (Finch et al. 2007; Lépine 2005), companions to already known nearby stars (Lépine, Shara, & Rich 2002; Scholz et al. 2004), etc. Common proper motion (CPM) pairs are among the objects that –through the combination of different sources– may also be detected. Greaves (2004) has reported the identification of over 700 CPM pairs by comparing the proper motions quoted in the UCAC2. Gould & Chanamé (2004) have also performed a search for CPM companions to Hipparcos stars and have effectively provided new parallaxes for more than 400 of these companions. Another important –now historical– search was made by Halbwachs (1986) using the data of the AGK2/3. In order to detect new CPM pairs in both hemispheres we are searching new astrometric databases. In this paper we present the CPM pairs we were able to identify in the LSPM-North catalogue compiled by Lépine & Shara (2005).

2. SEARCH AND RESULTS

In order to detect new CPM stars we have searched the LSPM-North catalogue (the LSPM-North can be accessed through the VizieR On-line Data Catalog: I/280). The LSPM-North lists over sixty thousands stars north of the J2000 celestial equator which have proper motions larger than 150 mas yr^{-1}. Given its coverage, the LSPM-North considerably expands the old and traditional Luyten's LHS and NLTT compilations.

Since our search is focused on new (not previously identified) CPM pairs, we have decided to compare the proper motion of all stars in a radius of 15 arc minutes. Pairs of stars with differences in their

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proper motion of up to 10% have been included in a preliminary list. As a second step, we cross-identified the potential CPM stars in our preliminary list with the most recent edition of the WDS, among other compilations.

The last step in the process is to analyze which of the systems have real chances of being physical pairs and which should be considered as optical systems. This problem has already been addressed by Halbwachs (1986) and Poveda & Allen (2004), among many others.

In order to estimate the number of physical pairs in our sample, we have applied the criteria developed by Halbwachs (1986) (see also Halbwachs 1988). Basicaly, the method states that two conditions have to be met for a pair to be considered a physical one. Firstly,

$$(\mu_1 - \mu_2)^2 < -2(\sigma_1^2 + \sigma_2^2)\,\ln(p)\,, \qquad (1)$$

where μ_1 and μ_2 are the proper motions of the two stars in the pair; σ_1 and σ_2 the mean errors of those proper motions and p is the allowed difference in proper motion (in percentage terms).

The second condition imposes a limit to the relation

$$T = \rho/\mu\,, \qquad (2)$$

where ρ (in seconds of arc) is the angular separation between the stars of the pair and μ the proper motion (in second of arc yr^{-1}). If is $T < 1000.0$ years then the chances of having an optical pair in the group is on the order of 1.3%. On the other hand, if T falls between 1000.0 and 3500.0, then the chances of having an optical pair in the list increase up to 44%.

So far, we have found more than one hundred systems meeting condition one, with (ρ/μ) values below the one thousand limit, thus indicating a physical pair. Additional details, as well as a complete list of the pairs we have found, will be published soon.

This research has made use of Aladin.This research has made use of the VizieR catalogue access tool, CDS, Strasbourg, France. This publication makes use of data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation. This research has made use of the Washington Double Star Catalog maintained at the U.S. Naval Observatory. Partial support from the National Science Foundation through the Yale Southern Observatory is deepley acknowledged.

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