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VII DYNAMICAL ASTRONOMY IN LATIN AMERICA

VII ASTRONOMÍA DINÁMICA EN LATINOAMÉRICA

POSTER CONTRIBUTIONS ABSTRACTS

TITLE: NEAR-IR TRIGONOMETRIC PARALLAXES OF NEARBY STARS IN THE GALACTIC PLANE USING THE VVV SURVEY.

AUTHOR: ***Juan Carlos Beamín***
Universidad de Valparaiso, Chile

ABSTRACT: The VVV survey is a multiepoch near infrared ESO public survey using the VISTA 4.2m telescope, observing over 560 sq. degrees towards the most crowded regions of the sky, the galactic bulge and disk. We used the multiepoch K_S band observations, covering a ~ 5 years baseline to obtain mili and submili arcsec precision astrometry for a sample of 17 previously known high proper motion sources, including precise parallaxes for these sources for the first time. In this pioneer study we show the capability of the VVV project to measure high precision trigonometric parallaxes for very low mass stars (VLMS) up to distances of ~ 400 pc reaching farther than most other ground based surveys or space missions for these types of stars. Additionally, we used spectral energy distribution to search for evidence of unresolved binary systems and cool subdwarfs. We detected 9 systems that are most likely VLMS belonging to the Galactic halo based on their tangential velocities, and four objects within 60 pc that are likely members of the thick disk. A more comprehensive study of high proper motion sources and parallaxes of VLMS and brown dwarfs with the VVV is ongoing, including thousands of newly discovered objects (Kurtev et al. submitted).

TITLE: FINDING INVISIBLE EXOPLANETS

AUTHOR: ***Daniel Diego Carpintero***

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ABSTRACT: We show that, given the non-periodic transits of an exoplanet and assuming that the lack of periodicity is due to another, non transiting planet, it is possible to recover the six elements of both planets and the mass of the star. We apply our algorithm to the case of exoplanets Kepler 419b and c, for which we obtain orbital elements that allow to recover the transits with a precision of about a minute.

TITLE: BAYESIAN ESTIMATION OF UNCERTAINTIES FOR REDSHIFT INDEPENDENT DISTANCE MEASUREMENTS IN THE NED-D CATALOG

AUTHOR: ***Germán Chaparro***

Universidad Ecci, Colombia

ABSTRACT: Estimating the true uncertainties behind redshift-independent galactic distance measurements is of absolute importance in understanding the formation of large-scale structure. This is particularly relevant to identifying primordial cosmological anisotropies in the Hubble field. However, systematic errors re-ported for galactic distance measurements across the literature are not consistent with random errors arising from different distance measurements of a single source. In fact, reported systematic errors severely underpredict the underlying method-instrinsic uncertainties in estimating galactic distances (e.g. Tully Fisher, SBF, Sosies, etc). In this work we present a bayesian method for estimating these uncertainties for each relevant distance-estimation method in the 50-500 Mpc range using data from the literature compiled in the NASA/IPAC NED-D catalog.

TITLE: PARTICLE FILTER-BASED ESTIMATION OF ORBITAL PARAMETERS OF VISUAL BINARY STARS WITH INCOMPLETE OBSERVATIONS

AUTHOR: ***Rubén Matías Clavería Vega***

Universidad de Chile

ABSTRACT: Mass is arguably the most important property of a star, since it determines, to a great extent, the structure and evolution of the celestial body. In visual binary stars, mass estimation can be accomplished through the study of their orbital parameters –Kepler's Third Law enforces a strict mathematical relation between orbital period, orbit's size (semimajor axis) and the system's total mass.

Although in theory few observations on the plane of the sky may be enough to obtain a decent estimate for the orbit of a binary star, astronomers must frequently deal with the problem of partial measurements (that is, some observations having one component missing, in either (X, Y) or (ρ, θ) representation), which are often discarded. This article presents a particle-filter-based method to perform estimation and uncertainty characterization of orbital parameters. Moreover, the method here proposed uses a multiple imputation strategy to cope with the problem of missing data, incorporating the partial knowledge within the estimation scheme instead of discarding the incomplete observations.
The algorithm is tested on synthetic data of relative position of the stars. The following cases are studied: i) full data is available (ground truth); ii) some observations have one component missing and are discarded; iii) some observations have one component missing and multiple imputation approach is used. The performance of each scenario is evaluated in terms of accuracy and precision. In comparison to the case where partial observations are ignored, a significant drop in the empirical estimation variance is observed when the multiple imputation scheme is used, with no numerically significant decrease in the accuracy.

TITLE: REQUESTED INSIGHTS ON THE PROPERTIES OF THE ORION SPIRAL ARM. NGC 2302: FIRST RESULT

AUTHOR: ***Edgardo Costa***
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ABSTRACT: The spiral structure of the Milky Way (MW) is highly uncertain and is the subject of much controversy. Even the spiral structure close to the Sun and the real nature of the Local (Orion) arm, hereafter the LOA, are poorly known. Here we summarize the first result from an on-going program aimed at determining the properties of the LOA, based on a large and homogeneous set of kinematic and photometric data.
We have made a comprehensive study of the young LOA open cluster NGC 2302 (see Costa at al., 2015), which includes a UBV RI photometric analysis and determination of its kinematic properties - proper motion (PM) and radial velocity (RV) - and of its orbital parameters.
Making a geometric registration of our ad-hoc first and second epoch CCD frames (12 year timebase), we determined the mean PM of NGC 2302 relative to the local field of disk stars, and, through a comparison with the UCAC4 catalog, we transformed this relative PM into an absolute one. Using medium-resolution spectroscopy of 26 stars in the field of NGC 2302, we derived its mean RV. We obtained an absolute PM for NGC 2302 of $\mu_\alpha \cos\delta$, μ_δ = (-2.09,-2.11) mas yr^{-1}, with standard errors of 0.410 and 0.400 mas yr−1, respectively. The mean RV of NGC 2302 turned out to be 31.2 km sec^{-1}, with a standard error of 0.7 km sec^{-1}.

We determined the cluster's structure, center, and radius by means of a density analysis of star counts. This analysis revealed a remarkably spherical concentration of stars centered at α_{J2000} = 06:51:51.820, δ_{J2000} = -07:05:10.68, with a radius of 2.5′.
Photometric diagrams for several color combinations were built, which allowed us to identify the stellar populations present in the field of NGC 2302 and to carry out our photometric membership analysis. Isochrone fits to the photometric diagrams allowed to determine the fundamental parameters of NGC 2302, including reddening, distance, and age. Although densely contaminated by field stars, all photometric diagrams show a recognizable cluster sequence of bright stars (V ≤ 18). The color-color diagrams show the existence of more than one population, each affected by distinct reddening with the cluster sequence at E(B − V) = 0.23. The isochrone fits, displaced for this reddening and for a distance modulus of $(m - M)_0$ = 10.69 (distance, d = 1.40 kpc), indicate an age of log(t) = 7.90−8.00 with a slight tendency toward the younger age. The kinematic data and derived distance allowed us to determine the space motion of NGC 2302. This was done by adopting a time-independent, axisymmetric, and fully analytic gravitational potential for the MW. Inspection of the shape of the orbit of NGC 2302 and the resulting orbital parameters, indicate that it is a typical population I object.
REFERENCES: Costa, E., Moitinho, A., Radiszc, M., et al. 2015, A&A, 580, A4

TITLE: SEARCH FOR WIDE BINARIES IN THE SOUTHERN CELESTIAL HEMISPHERE USING SPM4

AUTHOR: ***Eddy Josue Davila Bracho***
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ABSTRACT: A search for wide binaries candidates in the southern celestial hemisphere is being carried out using propers motions from the SPM4 catalogue. The search for these systems consists in identifying pairs of stars within a range of angular separation on the sky that have common proper motion within errors. Additional important information like magnitudes, parallax, radial velocity, etc., is obtained from other catalogues to better characterize these objects. wide binaries are weakly bound systems, vulnerable to any nearby gravitational field. The study of their true separations in AU allows to know the properties of the gravitational field in the area of the Galaxy in which they are located. To date there are few known confirmed wide binaries, which motivates an extensive search for these types of systems in a high quality astrometric catalogue, such as SPM4. Its depth (V_{lim} = 17.5) and precision in proper motions ($\lesssim$5 mas/yr) allows to obtain a good number of reliable wide binaries candidates. We will present the first part of this investigation in which we evaluated the capability of SPM4 to detect already known wide binaries published in the literature. We find that SPM4 can detect wide binaries more easily for apparent separations above 10" and where both components are brighter than magnitude V=13.

TITLE: ANALYSIS OF THE BAYESIAN CRAMÉR-RAO LOWER BOUND IN PHOTOMETRY: STUDYING ACHIEVABILITY AND THE IMPACT OF PRIOR INFORMATION IN THE FLUX OF AN OBJECT

AUTHOR: ***Sebastian Espinosa***
Universidad de Chile

ABSTRACT: In photometry, an important topic of interest is to estimate the flux of a stellar-like object and evaluate the best precision that can be achieved. In this context we analyze bounds of precision on a CCD detector array in a Bayesian setting, where we have access to a prior distribution. We use the Bayesian Cramér- Rao (BCR) lower bound to analyze the gain in photometric performance in contrast with the parametric scenario where no prior information is available for the problem. We notice that the Bayesian performance bound depends not only on the variance of the prior distribution but also on its expected value (and, hence, on the Signal-To-Noise (SNR) ratio), so it is important to carefully study the potential BCR gains in terms of these quantities. The bound can be achieved through the conditional mean estimator but it is computationally expensive so we propose, under some assumptions, that the Maximum a Posteriori (MAP) its an interesting alternative to reach the BCR.

TITLE: FROM THE LANDGRAVE IN KASSEL TO ISAAC NEWTON

AUTHOR: ***Erik Høg***
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ABSTRACT: Landgrave Wilhelm IV established in 1560 the first permanent astronomical observatory in Europe. When he met the young Tycho Brahe in 1575 he recognized the genius and recommended him warmly to the Danish king Frederik II. Tycho received the island Hven and much support from the king. Wilhelm and Tycho must share the credit for renewing astronomy with very accurate observations of positions of stars by new instrumentation and new methods. Tycho's observations of planets during 20 years enabled Johannes Kepler to derive the laws of planetary motion. These laws set Isaac Newton in a position to publish the laws of physical motion and universal gravitation in 1687 – the basis for the technical revolution.

TITLE: VVV HIGH PROPER MOTION STARS

AUTHOR: ***Radostin Kurtev***
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ABSTRACT: Knowledge of the stellar content near the Sun is important for a broad range of topics ranging from planet searches to MilkyWay structure. The most powerful method to identify potentially nearby stars comes from proper motion (PM) surveys. All old optical surveys avoid or at least are substantially incomplete near the Galactic plane. The depth and breadth of the "Vista Variables in Vía Láctea" (VVV) near-IR survey substantially improves this situation. Taking advantage of the VVV survey database, we measured PMs in the densest regions of the MW bulge and southern plane in order to complete the census of nearby objects. We developed a custom proper motion pipeline based on VVV catalogues from the Cambridge Astronomy Survey Unit (CASU), by comparing first epoch of JHK_s, and the separate multi-epoch Ks-bands acquired later. Taking advantage of the large time baseline between the 2MASS and the VVV observations, we also obtained the 2MASS-VVV PMs. We build a near-infrared proper motion catalogue for the whole area of the VVV survey, which includes 3003 moving stellar sources. All of these were visually inspected, and are real PM objects. Our catalogue is in very good agreement with the proper motion data supplied from IR catalogs outside the densest zone of the MW. The majority of the PM objects in our catalog are nearby M-dwarfs, as expected. This new database allow us to identify 57 common proper motion binary candidates, among which are two new systems within 30 pc of the Sun.

TITLE: OPTICAL OBSERVATIONS OF SPACE DEBRIS IN GEO RING FROM VENEZUELA

AUTHOR: ***Elvis Lacruz***

Centro de Investigaciones de Astronomía – CIDA, Venezuela

ABSTRACT: Currently the population of objects in geostationary orbit is not known completely. It known that this populations is made up of 895 geostationary satellites into orbit, from the Syncom-3, in 1969 to EcoStar VIII, in 2016, and the amount of space debris were generated by two catastrophic events in this part of space. One was the breakup of Ekran-2 in 1978 and the other was the breakup of Transtage 13 in 1992. Knowing the positions and dynamics at each time step of the entire population, in this area of space, it is important for both satellites in active operations and for future satellites. For this reason, in the last two decades they have been implemented different systems for location of these objects, making detection and tracking from ground-based, through telemetry and optical techniques which are significantly contributing to the knowledge of the space debris environment. However, due to the complexity and nature of the problem today they are not fully identified and cataloged. This paper presents the first optical observations of space debris made from the National Astronomical Observatory of Venezuela, as well as used observational strategy that determines the processing for detecting space debris. Preliminary results show the detection and tracking of some objects.

TITLE: CHEMICAL COMPOSITIONS OF YOUNG STARS IN THE LEADING ARM OF THE MAGELLANIC SYSTEM10

AUTHOR: ***Zhang Lan***

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ABSTRACT: Chemical abundances of eight O- and B- type stars are determined from high-resolution spectra obtained with the MIKE instrument on the 6.5m Clay telescope. The sample is selected from 42 candidates of membership in the Leading Arm of the Magellanic System. Self-consistent atmospheric parameters are measured by two independent grids of model atmospheres and analysis procedures, confirming the consistency of the stellar parameter results. Abundances of seven elements, including He, C, N, O, Mg, Si, and S, of the stars are determined.

We find that among the seven B-type stars analyzed, the five stars that have radial velocities compatible with membership to the LA have an average [Mg/H] of -0.42 ± 0.16. This is significantly lower than the average of the remaining two stars [Mg/H] = -0.07 ± 0.06 which are kinematical members of the Galactic disk. Among the five LA members, four have individual [Mg/H] abundance compatible with that in the LMC. Within errors, we can not exclude the possibility that one of these stars has a [Mg/H] abundance consistent with the more metal-poor, SMC-like material. The remaining fifth star has a [Mg/H] close to MW values. Distances to the LA members indicate that they are at the edge of the Galactic disk, while ages are of the order of $\sim 60 - 70$Myr, lower than the dynamical age of the LA. It suggest a single start-forming episode in the LA. Both RV and distance of the LA members decrease with decreasing Magellanic longitude, which confirms the results from previous simulation and LA gas studies.
Therefore, our results demonstrate that parts of the LA are hydrodynamically interacting with the gaseous Galactic disk forming young stars that are chemically distinct from those in the Galactic disk.

TITLE: A SPECKLE SURVEY OF SOUTHERN HIPPARCOS VISUAL DOUBLES AND GENEVA-COPENHAGEN SPECTROSCOPIC BINARIES

AUTHOR: ***Rene Alejandro Mendez Bussard***
Universidad de Chile

ABSTRACT: The prospect of exquisite-precision parallaxes that will be enabled by the *Gaia* satellite dramatically changes the landscape of observational stellar astrophysics: If one considers the *Hipparcos* double stars that lie within 250 pc of the Solar system, a parallax determined by *Gaia* would (conservatively) yield an uncertainty well under 1% for all these objects. In this volume, there are 591 *Hipparcos* double star discoveries and 160 spectroscopic binaries from the Geneva-Copenhagen spectroscopic survey in the declination range of -20° to -90°. These two samples are important as a source of new binaries from which we will derive masses, component luminosities, and effective temperatures in the coming years. The northern hemisphere counterpart of these objects have been systematically observed at the WIYN Telescope by Horch, van Altena, and their collaborators (e.g. Horch et al. 2011). On the other hand, Tokovinin has shown the ability of HRCam at the CTIO/SOAR 4m telescope for binary star research, producing significant results (see for example Tokovinin et al. 2015, 2016). In this talk we present some preliminary results of an ongoing speckle survey with SOAR+HRCam that will complement and significantly extend those previous efforts, allowing us to compile a unique all-sky, volume-limited speckle survey of these two primary samples.

The immediate scientific return of our survey will be threefold. First, for the Hipparcos sample, we will be able to combine the astrometry obtained by us with data from the literatura (Hipparcos and other sources) to identify all Southern fast-moving pairs. In cases where there is at least one other observation besides Hipparcos, we will be able to make a determination as to whether orbital motion is observed. Second, we anticipate resolving roughly 20% of the spectroscopic sample for the first time. This will provide a list of stars for which mass ratios already exist and whose orbital periods will typically be short (P < 10 years). With follow up observations over the next several years, we can then determine orbits and individual masses of the components. Third, for all resolved systems, we will be able to derive magnitudes and colors for the components. This is important for connecting mass information to luminosity and temperature. In the longer term, if sustained observations of the interesting systems discovered by our survey can be made, orbital information will be forthcoming on a timescale comparable to that of Gaia parallaxes, completing the path to high-precision masses, luminosities, and colors for the stars in these systems.

Our survey, when complete, will open the door to many sensitive tests of stellar evolution theory, and a large number of new points on the MLR. With this we will truly be able to investigate effects such as metallicity and age on the MLR for the first time. In cases where one component has evolved off of the main sequence, age determinations will also be possible.

REFERENCES:

Horch, E. P., van Altena, W. F., Howell, S. B., Sherry, W. H., & Ciardi, D. R. 2011, AJ, 141, 180

Tokovinin, A., Mason, B. D., Hartkopf, W. I., Mendez, R. A., & Horch, E. P. 2015, AJ, 150, 50

Tokovinin, A., Mason, B. D., Hartkopf, W. I., Mendez, R. A., & Horch, E. P. 2016, arXiv:1603.07596 (accepted by AJ).

TITLE: NUEVOS CONVENIOS INTERNACIONALES DE TÉCNICAS ESPACIALES ENTRE ARGENTINA, CHINA Y FRANCIA

AUTHOR: ***Ana Maria Pacheco***

Observatorio Astronómico Félix Aguilar, San Juan, Argentina

ABSTRACT: En la actualidad es ampliamente aceptado que las modernas técnicas espaciales de observación: Very Long Basseline Interferometry (VLBI), Lunar Laser Ranging (LLR), Satellite Laser Ranging (SLR), Global Navigation Satellite System (GNSS) y Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS), son las que comandan las definiciones y materializaciones de los sistemas de referencia celeste y terrestre. En el Observatorio Astronómico Félix Aguilar (OAFA) se encuentran operativas, desde el año 2006, un sistema SLR y una estación permanente GNSS, de acuerdo con el convenio internacional de cooperación entre la Universidad Nacional de San Juan (UNSJ) y la Academia China de Ciencias. En el año 2014 este convenio se ha ampliado con el compromiso que prevé la puesta en funcionamiento de un radio telescopio de 40 metros de diámetro en la provincia de San Juan, proyecto al cual se ha denominado CART (China Argentine Radio Telescope). Por otro lado en el año 2013 el Instituto Geográfico Nacional de Francia (IGN) tomo la decisión de trasladar una estación DORIS, ubicada en la ciudad de Santiago, a un sitio cercano. Para lo cual se procedió al relevamiento de lugares aptos para la instalación de una baliza DORIS, que se llevaron a cabo en varios puntos de Chile y en el oeste de Argentina, más precisamente en la provincia de San Juan. Después de estudiar todas las posibilidades, el organismo francés ha elegido la sede central del OAFA, teniendo en cuenta que allí operan dos técnicas geodésicas espaciales que serán, en un futuro próximo, co-localizadas. El IERS considera los sitios co-localizados como los de mayor peso en la red ITRF. La concreción de estos trabajos posicionan al Observatorio Astronómico Félix Aguilar en una de las pocas estaciones en el mundo en contar con un Telescopio SLR, una estación GNSS, un Radio Telescopio apto para VLBI y una baliza DORIS, que serán de gran beneficio no sólo para la astronomía sino también para la geofísica y la geodesia.

TITLE: TIME RESOLVED PRECISSION DIFFERENTIAL PHOTOMETRY WITH OAFA´S DOUBLE ASTROGRAPH

AUTHOR: ***Federico Podestá***
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ABSTRACT: Por más de 50 años, el astrógrafo doble ubicado en la estación de altura Carlos U. Cesco del Observatorio Astronómico Félix Aguilar (OAFA), San Juan Argentina, se utilizó para observaciones e investigaciones dentro del campo de la astrometría. Los programas principales abarcaron el estudio de posiciones de asteroides y movimientos propios del hemisferio sur (SPM), siendo este último un proyecto a largo plazo a punto de culminar del cual el catálogo SPM4 es la versión más reciente. En este trabajo se presentan nuevas aplicaciones científicas a realizar con este telescopio en el campo de la fotometría. Las primeras experiencias demuestran el potencial del instrumento para estos nuevos usos.

TITLE: PROPER MOTION OF OPEN CLUSTER TRUMPLER 14

AUTHOR: ***Marie Madeleine Rodriguez Sanchez***
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ABSTRACT: Using data taken between 2003 and 2012 with the instruments WFI on ESO/MPI-2.2 m and Omega- CAM mounted on VST-2.6 m, relative proper motions were derived for stars in a 30´x7´ field of view of open cluster Trumpler 14 in the Carina Nebula. The reference frame for the proper motions was realised by field stars, selected from a color-magnitude V vs V-I diagram, based on a differential photometric reduction of the available data. A variable and dynamic distortion field was found in both cameras, that we suspect is related to the readout system of the CCDs. Such distortion made difficult to attain precise enough individual proper motions that could be used to assign a membership probability to the cluster to each measured star. Nonetheless we were able to distinguish the trend in proper motion of the cluster from the field stars. From the experience gained we suggest a new procedure aimed to improve the distortion correction to improve the obtained results.

TITLE: THE WIND SPEED IN THE VELA X-1 SYSTEM

AUTHOR: ***David Salzmann***

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ABSTRACT: The VELA X-1 is a binary system which consists of a neutron star and a massive B0.5 Ib-type supergiant. The x-ray spectra from this system were measured by the Chandra satellite. The spectrum clearly shows the Ly_{α} and He_{α} lines of four materials, namely, neon, magnesium, silicon and sulfur, altogether 8 lines. Due to the local wind in this binary system, these lines are Doppler shifted, and from this shift the wind speed was inferred. Our analysis is based on the notion that H- and He-like ions emitting these lines can exist only within well-defined plasma conditions. Using the basic principles of Plasma Spectroscopy, in photoionizing plasmas these conditions are defined by the ratio $\eta = \eta_{ph}/\eta_e$ (η_{ph} is the local photon density and n_e is the electron density). In fact, plotting the wind speed, w, as function of η , one finds a consistent slowly increasing behavior. As a second step, we combined the new results with data published in other research papers. These indicate that the photon density, and thereby η , at every point in the space between the two stellar bodies can be related to the distance from the neutron star. Using this relation, as well as published data about the distance between the two bodies, it is found that only the Ly_{α} lines from silicon and sulfur are emitted from the space between the two bodies, whereas the other six lines are emitted from the outer part of the supergiant atmosphere.