Measurement of Neglected Double Stars

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Abstract: Using the criterion of Robert G. Aitken "log rho = 2.8-0.2m" to select a group of neglected double stars for measurement will at least give the possibility that the majority of the group are physical doubles and will give the satisfaction that the measurement work could be useful.

I have written two articles for the now defunct "Double Star Observer" where I embarked on the measurement of neglected double stars. The double stars measured for these two articles were selected at random from the WDS neglected lists with just the object of measuring double stars with a CCD camera. I have had experience measuring double stars with the Celestron Microguide, the Retel filar micrometer and a video camera. My experience showed that the CCD camera in conjunction with recent star catalogs is the most accurate.

Working with my mentor Francisco Rica of the LIADA double star section, I have learned that there are various rudimentary methods that will give an indication of whether a double star is physical or optical. One of the easier methods is the criterion of Robert G. Aitken (1964) with his equation "log rho = 2.8-0.2m" where "m" is the apparent magnitude and rho the separation in arcseconds. Also some studies show that rho being less or equal to 10 arcseconds increases the possibility of the double being physical. I have used these two criterions for selecting a group of 45 neglected double stars for this article.

I began my selection of the possible double stars to be measured by using the program Astroplanner. This program allows a person to enter the neglected double star catalog (or any other catalog) with a set of prerequisites to select a group of desired objects or in this case neglected double stars. I had imposed limits that the primary component would be mag 10 or less with the separation between 4 and 10 arcseconds. The other limits were Right Ascension between 6:00 and 8:59 hours and the Declination between 25° and 70°. Naturally these last limits were necessary to take images in February and at a declination comfortable for my telescope setup. This selection gave me about 70 neglected doubles in this sector of the sky. I then applied the Aitken criterion to this group, and that left me with a group of about 45 doubles for measurement with the confidence that the majority could be physical doubles.

I have a permanent roll off roof observatory in a small village in the western part of Spain. My setup for the measurement consists of a Celestron 9.25 inch SCT telescope mounted on a Losmandy GM8 with the Astrometric go to system for finding the doubles. The CCD camera is a Starlight Xpress MX7-16 which gives a good size image with sufficient reference stars for fixing the plate reference. On the nights of Feb. 10th, 11th and 22nd I obtained four images of each double.

Measuring the doubles on quiet dark cold winter nights under the stars with very little wind is the most pleasurable part of the work. Next comes the hours in front of the computer fixing the plate scales and then measuring the doubles. I use the program Astrometrica with the USNO B1.0 or the UCAC 2 catalogs for fixing the plate scale. I use four images to come up with a decent average but some of the images were on the poor side thus leaving some of the measurements with just three results and one had just two results. Following is the table showing the results of the PA and separation measurements for these neglected doubles.

The average standard deviation in PA was 0.97°. The average standard deviation in separation was 0.15". The deviation in PA tends to be higher for the closer doubles as in this case. The O-C residuals of the plate reductions averaged between 0.15 and 0.4 which has been the norm for all my measurements over the last six years.

Approximately 66% of the measurements were in reasonable agreement with the listings in the neglected list. The rest, or 33% the difference, was notable to very notable.

As noted the list in this article is just a small sector of the sky. I hope to continue in this manner for the foreseeable future. If there are any questions or comments, I can be reached by contacting me through the Internet at jmryan@wanadoo.es.

Name	RA Dec	MgA	MgB	PA°	Sep"	Date	No.	Notes
ES1729	060306+4100	9.6	11.4	310.50	6.78	2005.153	4	
BRT2343	060830+2228	9.9	12.2	205.16	5.48	2005.153	4	1
ES579 BC	060830+4725	9.6	12.1	114.88	7.55	2005.153	4	
ES2279	061036+3744	9.4	11.5	290.38	6.57	2005.153	4	
J966	061048+3500	9.3	11.5	34.92	6.71	2005.153	4	
COU272	061224+2253	10.0	13.0	306.84	5.07	2005.153	3	
POU1144	061224+2351	10.0	11.7	301.90	5.54	2005.153	4	
POU1156	061306+2352	9.2	11.7	171.76	4.94	2005.153	4	
ES897	062306+5157	9.6	12.2	92.88	6.48	2005.153	4	
ES2564	062618+3802	10.0	11.5	261.90	6.33	2005.153	3	
MLB398	063106+6638	9.3	11.8	155.63	5.14	2005.153	4	
HJ2320	063242+2053	8.6	11.1	322.55	9.70	2005.153	4	
MLB751	063806+2826	10.0	12.0	234.36	6.70	2005.153	4	
MLB260	064154+6515	9.3	12.0	74.77	4.95	2005.153	2	
BRT2216	064342+3911	9.1	11.9	25.97	5.94	2005.153	3	
MLB927	064548+3718	10.0	11.5	272.93	4.54	2005.153	3	
ES1237	064654+4825	9.3	11.5	357.20	4.93	2005.153	4	
POU2047AB	065030+2427	9.8	12.6	215.64	8.34	2005.153	5	2
? ? AC	065030+2427	9.8	12.7?	152.70	8.22	2005.153	5	2
MLB399	065154+6727	9.6	11.6	259.91	6.88	2005.153	3	
MLB195	065342+6253	9.6	12.0	192.15	5.76	2005.153	4	
ES1324AB	070042+4527	10.5	11.8	175.34	6.80	2005.112	4	
ES1893	070054+6331	9.9	11.9	156.40	4.62	2005.115	3	
ES1079	070236+5039	8.2	11.7	326.30	6.35	2005.115	4	
WNO18ABC	070306+5410	0.0	0.0	59.07	9.39	2005.115	3	
ES713AB	070818+5241	8.6	13.7	46.23	6.17	2005.115	3	
STF1022	070924+3634	6.8	10.0	140.95	5.16	2005.115	3	
MLB162	070942+6045	8.7	12.3	111.22	6.36	2005.115	3	
SIN28Aa	071930+4939	8.5	12.9	321.18	9.53	2005.115	4	

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Name	RA Dec	MgA	MgB	PA°	Sep"	Date	No.	Notes
ES772AC	072600+5310	9.5	14.4	355.62	10.03	2005.112	4	
ES903	072606+5021	9.3	11.9	246.44	10.75	2005.112	4	
ES589	074830+4746	8.1	14.1	185.33	11.12	2005.112	4	
MLB262	075512+5944	9.5	13.0	264.29	7.37	2005.112	3	
MLB199	075806+6402	9.5	11.8	154.29	7.27	2005.112	4	
ES1387	080024+4243	10.7	11.4	141.10	5.39	2005.112	4	
ES907	080118+5117	10.5	11.7	111.05	6.33	2005.112	4	
STF1195AB	081236+3028	9.0	11.5	333.12	9.10	2005.112	4	
HO38AB	081354+2747	7.6	12.6	86.86	7.85	2005.112	3	
ES1636	081700+3948	10.4	13.1	231.53	10.45	2005.112	4	
HJ780AB	081706+3348	11.3	12.3	207.73	14.60	2005.112	4	3
HJ780BC	081706+3348	10.0	0.0	172.69	12.25	2005.112	4	3
ES714	081936+5316	10.0	13.4	194.27	7.64	2005.112	4	
ES595	083112+4746	9.0	13.7	238.59	9.07	2005.112	4	
ES597	084936+4526	9.2	12.5	266.82	7.20	2005.112	3	
LDS2294	085148+6308	11.0	11.3	13.62	4.8	2005.115	3	
STF3120AC	085606+4341	8.6	14.3	118.66	8.00	2005.112	3	

M denotes the number of images used in the measurements.

Note 1; The entry in the WDS shows the last PA as 21°. This has to be a mistake. The first entry was 208° and my result is 205.16° which agrees with the first entry.

Note 2; This is not a double but a triple. The triple is quite striking in its view; it looks like a large round object sitting on two small ball bearings, one bottom right and one bottom left almost in symmetry. The bottom right is the one listed but the bottom left I could not find in the catalog. The magnitude of the unlisted component is only slightly less than the B one. The only listing for this triple is the initial one of 1907. I cannot see how the discoverer missed the bottom left component.

Note 3; This double by John Hershel escaped my Aitken criterion. It should not be in the list but as I had imaged the triple I added it to my results. In the LIADA double star section, we have been measuring John Hershel doubles and the majority of them are optical and also in general, the current measurements do not agree with the original measurements made by John Hershel such as in this case.

References

Aitken, Robert G, 1964, *The Binary Stars,* Dover Publications, Inc., New York, N.Y.

John M. Ryan is a retired mechanical environmental engineer from the Chicago area in the United States. He is a member of the "s33" group of double star enthusiasts since its inception and a member of the LIADA double star section since 2001. He enjoys cruising around the Spanish countryside on his motorcycle and has a web site at http://jmryan.en.wanadoo.es/LaCalzada.index.html.