

Double Star Measures Using the Video Drift Method - XII

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Abstract: Position angles and separations for 254 multiple star systems are presented using the video drift method. A proposed new double star, not currently in the WDS, is shown with nearly identical Gaia proper motions and parallaxes for the components.

Introduction

This is Paper XII in our continuing series on double star measurements using the video drift method first proposed by Nugent and Iverson 2011. We continue our practice of preferentially measuring multiple star systems listed in the Washington Double Star Catalog (WDS) that have not been measured for a minimum of 10-15 years and have less than 10 measurements. Measurements are limited to systems with a separation greater than 3.47". This separation represents the current minimum resolution of the video drift method with our equipment.

Methodology

The techniques used in this paper are the same as in our previous paper (Nugent and Iverson, 2018). All measurements were made with a pair of Meade 14-inch LX-200 telescopes (focal length 3556 mm at f/10, scale factor 0.6"/pixel). Astronomical video data collection systems require a onetime aspect ratio calibration. The reader is referred to our previous discussion of the problem and calibration procedure (Nugent and Iverson, 2014).

For systems in which either the primary and/or secondary star is faint, image enhancement techniques were employed. Co-author Iverson used a variation of the drift method employing an integrating video camera (Iverson and Nugent 2015) while co-author Nugent used a Collins I3 image intensifier with a non-

integrating camera. The faintest system measured in Table 1 had primary/secondary magnitudes of +10.61, +15.3. Thirty-two systems had WDS magnitudes in the +13.5 to +15.3 range.

Occasionally we would come across systems in which there was a large magnitude difference between the components. At a nominal gain setting for our video cameras the fainter (secondary) component was usually not visible thus no measurements could be acquired of its position. If it was visible, the primary (brighter) component was overly saturated on the video chip sensor and thus too large to be measured by the restricted size of the measurement aperture in the Limovie program. The solution is to make two separate drift runs at different gain settings so that each component was visible and thus could be measured; then combine the measurements from both runs to derive a position angle and separation.

Other systems had very close separations causing the components to merge at our nominal scale factor of 0.6"/pixel. This issue was resolved by using a magnification script on the video. The video was enlarged significantly into three sections (typically scale 0.2"/pixel or less) allowing the components to be resolved and measured. Both of the above techniques are described in detail in Paper 11 of this series (Nugent and Iverson 2018).

(Text continues on page 502)

Double Star Measures Using the Video Drift Method - XII

Table 1. Results of 254 double stars using the video drift method

Object	Designation	PA °	PA SEM °	Sep "	Sep SEM "	Avg. Date	Mag 1	Mag 2	Samples	Nights
00002-2519	COO 273	10.6	1.15	8.70	0.160	2017.24	10.13	10.20	3	1
00042+2701	SMA 1	161.4	0.09	13.44	0.017	2018.77	9.96	10.84	15	3
00043+4235	HJ 1932AB	306.0	0.06	7.02	0.011	2018.77	8.64	9.50	25	5
00043+4235	WAL 4AC	188.1	0.04	47.19	0.052	2018.77	8.64	9.83	25	5
00093+2517	FYM 132AC	161.7	0.02	62.52	0.022	2018.83	7.77	12.4	30	6
00093+2517	GIC 2AB	236.3	0.03	29.69	0.016	2018.83	7.77	11.46	30	6
00118+1952	HJ 1943AB	236.5	0.10	12.22	0.019	2018.83	10.03	11.5	15	3
00118+1952	HJ 1943AC	47.8	0.12	15.32	0.095	2018.83	10.03	13.7	3	1
00118+1952	HJ 1943AD	248.0	0.04	55.58	0.055	2018.83	10.03	13.89	20	4
00187+2545	HJ 1015AB	286.9	0.27	5.35	0.042	2018.82	9.78	10.95	3	1
00187+2545	HJ 1015AC	252.0	0.23	27.97	0.298	2018.77	9.78	13.57	5	1
00379-2740	BRT2845	334.7	1.58	5.72	0.156	2017.78	10.35	12.	3	1
00391-2533	SKF 759	107.6	1.30	7.70	0.172	2017.78	11.4	11.8	6	1
00408-3246	HJ 3384	265.9	0.79	5.88	0.086	2017.78	10.09	10.83	7	1
01025-2137	SEE 10	312.2	1.06	5.76	0.118	2017.78	8.05	10.89	5	1
01130+3004	STT 26AC	340.8	0.05	117.69	0.057	2018.83	6.34	13.59	20	4
01172+0201	HDO 45	103.6	0.03	38.23	0.044	2018.93	7.36	9.65	20	4
01227+1712	STTA 16	137.2	0.04	72.03	0.083	2018.93	7.22	10.19	20	4
01428+2421	GRF 1	4.1	0.04	46.93	0.058	2018.93	9.45	9.68	20	4
02002+0641	STF 198	117.9	0.03	45.56	0.040	2018.93	9.22	9.80	20	4
02110+2912	CHE 66	161.7	0.03	37.18	0.023	2018.93	9.81	10.64	15	3
02415+4015	AG 46	344.1	0.04	39.39	0.033	2018.87	9.59	10.18	10	2
02521+3718	STF 316	135.1	0.03	14.36	0.016	2018.93	9.46	9.74	15	3
03015+0513	BAL2604	14.2	0.06	11.37	0.023	2018.93	9.4	9.5	15	3
03090+4415	STF 351	115.4	0.05	27.10	0.035	2018.93	9.18	9.87	15	3
03143+2057	HJ 2178	213.7	0.070	17.86	0.019	2018.93	9.8	10.6	15	3
03254-0109	SCJ 2	183.1	0.02	16.92	0.023	2018.93	9.03	9.96	15	3
04254+0221	HJ 2230	324.9	0.01	34.73	0.029	2018.93	9.65	9.88	15	3
04494+4414	SKF1383	272.0	0.04	54.15	0.051	2018.93	8.32	9.79	15	3
05264-1210	GAL 384	192.9	0.06	12.07	0.021	2018.87	9.3	9.5	10	2
05378+0245	SKF1528	127.4	0.04	41.91	0.054	2018.93	9.20	10.16	15	3
05400+2232	AG 99	143.6	0.13	7.61	0.026	2018.87	9.62	10.17	5	1
05499+2259	ARN 91A	132.4	0.08	112.19	0.405	2018.87	8.37	8.99	5	1
05499+2259	POU 789	251.0	0.10	12.66	0.028	2018.87	8.99	10.7	5	1
05504+1422	SKF2490	236.0	0.05	53.03	0.027	2018.87	8.99	10.21	5	1
08025-2447	J 1507	323.6	0.60	6.96	0.075	2018.77	9.76	11.06	9	1
08026-2733	HJ 4037AB	244.6	0.55	6.52	0.066	2018.72	7.22	8.41	7	1
08026-2733	HJ 4037AC	74.4	0.26	64.46	0.293	2018.89	7.22	9.22	3	1
08036-2213	B 2163AB	219.9	1.75	8.08	0.235	2018.89	10.08	10.8	3	1
08036-2213	B 2163AC	173.4	0.83	41.52	0.633	2018.55	10.08	13.78	3	1

Table 1 continues on the next page.

Double Star Measures Using the Video Drift Method - XII

Table 1 (continued). Results of 254 double stars using the video drift method

Object	Designation	PA °	PA SEM °	Sep "	Sep SEM "	Avg. Date	Mag 1	Mag 2	Samples	Nights
08039-3133	LDS 201AB	240.5	0.44	46.11	0.339	2018.72	8.80	9.71	2	1
08053-1802	ARA 208	127.1	1.41	8.91	0.246	2018.89	10.41	11.24	3	1
08074+0012	BAL1132	265.0	0.52	6.62	0.064	2018.72	9.33	10.9	8	1
08098-2449	JAW 5AB	284.8	0.55	26.89	0.277	2018.55	9.22	10.85	3	1
08098-3822	HJ 4049AB	322.3	1.39	9.44	0.204	2018.89	9.82	11.1	3	1
08104+0020	BAL1133	316.1	0.54	6.45	0.066	2018.77	9.42	10.7	9	1
08108-3236	COO 68AB	155.0	1.49	7.58	0.227	2018.22	8.74	9.11	3	1
08108-3236	COO 68AC	21.2	1.19	15.71	0.283	2018.22	8.74	13.02	3	1
08151-2819	LDS 208	173.3	1.60	8.96	0.242	2018.22	10.80	11.5	3	1
08156-1859	ARA 397	308.7	1.76	6.53	0.252	2018.89	10.57	11.1	3	1
08189-2311	ARA1728	67.2	1.42	9.33	0.233	2018.55	10.52	11.32	3	1
08226-1041	HJ 784AC	11.1	0.71	18.09	0.233	2018.22	10.23	10.88	3	1
08296-3836	SKF1454AB,C	234.5	0.42	58.52	0.364	2018.22	8.62	9.27	2	1
08313-1938	J 1524AB	316.9	1.03	5.94	0.124	2018.22	10.83	11.3	8	1
08313-1938	J 1524AC	219.6	0.84	13.04	0.176	2018.22	10.83	13.4	7	1
08317-1640	LDS 222	256.8	0.67	6.75	0.109	2018.22	10.91	11.05	12	1
08366-1846	ARA 402	152.1	1.19	11.80	0.242	2018.22	10.40	10.9	3	1
08385-2502	B 161	317.9	0.66	7.70	0.111	2018.22	9.23	10.78	9	1
08405-2101	ARA1058	141.9	0.86	11.59	0.166	2018.22	7.88	10.95	3	1
08417-2018	J 2645	306.2	1.82	6.81	0.242	2018.22	10.9	11.2	3	1
08457-2121	J 1531	14.9	2.53	7.68	0.362	2018.22	10.51	10.98	3	1
08531-2718	JRN 7	139.3	4.01	7.55	0.513	2019.22	11.0	11.5	2	1
08591-3203	PRO 79	47.1	2.44	8.32	0.285	2018.22	11.3	11.3	3	1
09023-2724	B 173	283.0	0.77	7.01	0.106	2018.22	9.67	11.2	6	1
09050+1134	TOK 125AC	244.3	0.15	140.73	0.392	2018.22	8.67	9.33	2	1
09050-2512	BRT2964AB	226.5	1.12	5.65	0.107	2018.22	10.85	11.1	8	1
09065-3213	HJ 4173AB	301.1	2.17	13.01	0.410	2018.22	11.1	12.2	2	1
09065-3213	HJ 4173AC	243.5	2.07	14.09	0.445	2018.22	11.1	11.5	2	1
09119-3814	WFC 80	224.4	1.73	7.32	0.192	2018.22	9.94	10.70	3	1
09153+0531	HJ 124AB	70.8	1.32	15.40	0.435	2018.22	9.16	11.54	2	1
09153+0531	HJ 124AC	242.4	0.39	62.05	0.456	2018.22	9.16	11.45	2	1
09153+0531	SKF1841AD	274.3	0.91	17.62	0.318	2018.22	9.21	13.78	2	1
09155-3815	SWR 69AB	300.9	1.02	23.52	0.361	2018.22	11.06	11.36	3	1
09188-1025	A 125AC	80.3	0.42	51.74	0.400	2018.22	8.48	10.86	2	1
09200-2747	HJ 4199AB	110.5	0.72	11.60	0.147	2018.22	8.29	9.48	8	1
09238-2340	HDO 123AC	188.8	0.46	53.65	0.481	2018.22	8.07	11.01	2	1
09257-1917	XMI 92AB	44.8	1.43	16.62	0.421	2018.22	11.32	11.42	2	1
09257-1917	XMI 92AC	271.3	0.61	30.15	0.424	2018.22	11.32	11.28	2	1
09327-2826	I 1616AB	236.4	0.76	33.06	0.463	2018.22	9.44	9.74	2	1
09327-2826	I 1616AC	280.0	1.86	14.24	0.467	2018.22	9.44	13.03	2	1

Table 1 continues on the next page.

Double Star Measures Using the Video Drift Method - XII

Table 1 (continued). Results of 254 double stars using the video drift method

Object	Designation	PA °	PA SEM °	Sep "	Sep SEM "	Avg. Date	Mag 1	Mag 2	Samples	Nights
09387-2644	HJ 2501AC	94.0	1.81	10.80	0.470	2018.22	10.05	10.47	2	1
09387-2644	HJ 2501CD	135.8	1.36	25.80	0.643	2018.22	10.47	12.24	2	1
09413+0256	GRV 796AB	250.8	1.26	36.07	0.771	2018.22	10.58	13.84	2	1
09413+0256	DAM 805AD	82.0	0.15	159.21	0.470	2018.22	10.58	10.9	2	1
09425-2108	HJ 4233	310.5	1.41	12.74	0.389	2018.22	8.27	10.98	2	1
09451-3835	HJ 4239	195.2	2.02	9.40	0.280	2018.22	8.62	9.94	2	1
09470-3228	HJ 4244A,BC	29.4	1.45	11.75	0.289	2018.22	10.05	10.05	3	1
09504-3320	HJ 4253AB,C	36.7	1.82	11.99	0.371	2018.22	10.27	10.53	2	1
09504-3320	TOB 5AB,D	286.5	0.69	40.93	0.456	2018.22	10.27	11.23	2	1
10013-2246	HDO 124AB	8.4	1.22	12.99	0.260	2018.22	7.83	9.96	3	1
10013-2246	HDO 124AC	54.8	0.51	42.70	0.346	2018.22	7.83	12.36	3	1
10271+1804	STF 1434	282.2	0.41	6.44	1.356	2018.29	9.49	9.68	8	1
10336+1513	STF 1446	249.6	0.18	5.48	0.045	2018.29	9.29	10.03	3	1
10374-1103	J 2075	61.3	0.55	6.61	0.069	2018.22	8.32	10.55	7	1
10535-2008	HO 533BC	131.9	1.72	13.53	0.450	2018.22	9.60	10.7	3	1
10535-2008	HO 533BD	297.4	0.89	40.13	0.627	2018.22	9.60	13.50	3	1
11035-3245	TRC 3	345.7	2.623	10.06	0.387	2018.35	11.2	13.7	3	1
11037-2941	HDS1577	3.3	1.21	10.74	0.266	2018.35	10.00	12.79	3	1
11062-2850	LDS4059AB	234.5	2.44	13.51	0.533	2018.35	10.61	15.3	3	1
11062-3827	HJ 4402AB	121.0	2.24	9.46	0.352	2018.35	10.1	11.1	3	1
11062-3827	HJ 4402AC	77.7	1.92	15.29	0.418	2018.35	10.1	14.2	3	1
11074-0114	BAL 865	219.4	2.45	9.22	0.417	2018.22	10.9	10.9	5	1
11090-3625	SKF1214	155.2	2.25	8.61	0.308	2018.35	11.0	11.2	3	1
11118-3045	BRT2985	252.6	1.29	4.46	0.133	2018.35	11.0	11.3	7	1
11121-1224	WFC 292	310.0	1.34	10.88	0.254	2018.35	9.58	13.0	3	1
11144-0225	HJ 178AB	34.3	1.24	18.46	0.368	2018.35	12.07	11.0	3	1
11144-0225	HJ 178AC	196.6	0.50	42.16	0.346	2018.35	12.07	13.28	3	1
11144-0225	HJ 178BC	201.9	0.57	59.84	0.574	2018.35	11.0	13.28	3	1
11145+0516	STF1518BC	353.8	1.96	3.47	0.127	2018.36	11.26	11.5	3	1
11164-2200	B 2274	359.4	0.31	9.63	0.173	2018.35	8.67	11.7	3	1
11244-0158	BAL 535	116.1	0.914	7.64	0.134	2018.35	11.10	13.1	9	1
11248-0829	TDS7844	319.7	1.61	15.95	0.460	2018.35	10.55	11.61	3	1
11251-2320	ARA1787	204.7	2.32	10.50	0.381	2018.35	11.65	13.8	3	1
11272-1604	LDS4100AB	158.8	0.59	49.95	0.522	2018.35	10.80	14.43	3	1
11273-3044	I 76	50.4	1.17	7.23	0.123	2018.35	11.57	12.0	9	1
11276-2343	HJ 4437AB	318.8	1.74	11.43	0.343	2018.22	10.95	11.0	3	1
11296-2428	JC 16AB	81.8	0.26	8.23	0.037	2018.22	5.82	8.60	9	1
11296-2428	JC 16AC	112.4	0.08	166.14	0.262	2018.22	5.82	8.86	3	1
11301+2958	STTA 111	33.8	0.04	66.84	0.098	2018.37	6.95	9.49	15	3
11309-2012	B 2280	31.2	1.08	9.33	0.162	2018.35	7.90	11.52	3	1

Table 1 continues on the next page.

Double Star Measures Using the Video Drift Method - XII

Table 1 (continued). Results of 254 double stars using the video drift method

Object	Designation	PA °	PA SEM °	Sep "	Sep SEM "	Avg. Date	Mag 1	Mag 2	Samples	Nights
11316-3338	I 1543AC	160.1	0.84	26.75	0.370	2018.35	9.85	12.6	3	1
11360-1050	J 1577AB	274.4	1.65	7.86	0.294	2018.35	10.85	13.5	3	1
11360-1050	J 1577AC	83.9	1.06	19.94	0.395	2018.35	10.85	13.6	3	1
11368-2426	HJ 4456AB	118.6	1.06	13.25	0.330	2018.35	7.15	10.82	1	1
11368-2426	HJ 4456AC	339.3	0.06	38.77	0.046	2018.35	7.15	13.29	3	1
11401-0326	DAM 73AB	11.1	1.48	18.53	0.466	2018.35	12.32	13.85	3	1
11416+3145	STT 575AB	311.1	0.03	43.96	0.040	2018.37	5.79	9.75	30	6
11489-3556	SEE 136	255.3	1.38	7.08	0.154	2018.35	11.3	12.7	8	1
11495-1937	LDS 368AB	91.3	1.34	9.11	0.331	2018.35	12.1	12.9	3	1
11495-1937	DAM 75BC	77.2	0.99	14.98	0.246	2018.35	13.3	13.6	9	1
11512+3322	ARG 101	272.9	0.08	45.76	0.081	2018.36	6.27	9.28	20	4
11529+3050	STF 1576	240.7	0.12	5.33	0.035	2018.37	9.11	9.45	18	3
11534-2434	HJ 4479	94.3	1.39	6.93	0.260	2018.22	8.86	9.92	3	1
11567-3216	DUN 116AC	37.6	0.47	29.96	0.231	2018.35	7.67	11.60	3	1
11567-3216	DUN 116BC	122.8	0.52	21.63	0.179	2018.35	7.83	11.60	3	1
12269-3728	HJ 4510AB	41.8	1.12	19.39	0.336	2018.36	9.73	10.38	2	1
12440-2727	UC 2393AC	330.0	0.47	40.55	0.364	2018.36	10.19	9.60	3	1
13112+3050	STF 1729AB,C	274.9	0.10	8.61	0.105	2018.36	9.61	11.06	5	1
13189+0030	A 2585BC	233.5	0.71	12.87	0.200	2018.36	9.38	13.9	3	1
13216-0926	BRT 447	54.4	2.23	7.94	0.319	2018.35	11.84	12.5	3	1
13225-1703	GWP1995AB	86.3	0.20	136.93	0.527	2018.36	12.3	12.5	3	1
13300-1430	HJ 2654	319.0	1.30	19.00	0.423	2018.36	11.37	13.00	3	1
13307-2327	HJ 2655	270.1	0.916	11.40	0.216	2018.36	10.00	13.3	3	1
13344+2617	STF 1760	64.2	0.07	8.73	0.014	2018.37	8.77	9.12	15	3
13385-0325	GWP2049	262.5	2.08	15.27	0.570	2018.36	12.2	12.5	3	1
13407+2804	BUP 151	223.1	0.04	89.74	0.074	2018.36	6.36	12.4	5	1
13451+1822	STF 1782AB	185.3	0.03	30.38	0.032	2018.37	7.98	9.81	15	3
13493+1742	S 655AB	85.9	0.03	46.27	0.038	2018.37	8.96	9.98	25	5
13493+1742	S 655AC	10.9	0.05	57.39	0.019	2018.37	8.96	13.93	13	3
13493+1742	S 655BC	326.4	0.03	63.64	0.045	2018.37	9.98	13.93	15	3
14095+3549	HJ 540	211.1	0.08	8.95	0.009	2018.37	9.39	10.04	10	2
14510+0943	SLE 1028AD	105.2	0.01	193.17	0.038	2018.37	8.44	12.40	10	2
14510+0943	STF 1886AB	224.1	0.07	7.89	0.025	2018.37	7.61	9.73	18	3
17594+2929	STF2247AB	188.4	0.05	11.62	0.011	2018.55	9.17	9.88	20	4
17594+2929	WAL 88AC	230.4	0.03	56.07	0.022	2018.55	9.17	12.49	20	4
18434+3533	SLE 688AD	16.3	0.05	109.77	0.085	2018.55	8.91	12.71	5	1
18434+3533	STF2378AB	189.9	0.04	11.47	0.021	2018.55	8.91	9.88	20	4
18434+3533	STF2378AC	243.2	0.02	210.24	0.049	2018.54	8.91	12.1	10	2
18434+3533	STF2378BC	245.8	0.03	203.54	0.063	2018.54	9.88	12.1	10	2
18445+3400	STTA172	5.3	0.03	64.88	0.047	2018.55	7.91	8.66	20	4

Table 1 continues on the next page.

Double Star Measures Using the Video Drift Method - XII

Table 1 (continued). Results of 254 double stars using the video drift method

Object	Designation	PA °	PA SEM °	Sep "	Sep SEM "	Avg. Date	Mag 1	Mag 2	Samples	Nights
19039+3409	BU 1285AB	288.8	0.36	11.16	0.083	2018.62	7.30	12.8	15	3
19039+3409	BU 1285AC	208.1	0.06	41.78	0.047	2018.62	7.30	10.7	25	5
19201+2639	STTA181AB	359.5	0.03	63.48	0.057	2018.62	7.39	7.50	25	5
19201+2639	STTA181AC	169.5	0.05	31.61	0.053	2018.62	7.39	12.8	25	5
19201+2639	STTA181BD	42.6	0.02	94.04	0.075	2018.62	7.50	12.10	25	5
19434+3158	AG 235	199.0	0.05	12.64	0.029	2018.51	8.57	9.6	15	3
19500+1757	ABH 126AE	143.4	0.02	71.01	0.048	2018.60	7.99	13.42	15	3
19500+1757	H 4 99AB	83.2	0.03	25.64	0.018	2018.60	7.99	11.07	25	5
19500+1757	H 4 99AC	255.5	0.03	68.76	0.048	2018.60	7.99	9.10	25	5
19500+1757	H 4 99AD	339.6	0.03	44.05	0.040	2018.60	7.99	13.23	25	5
19517+3108	STT 389AC	182.2	0.03	13.30	0.037	2018.54	7.12	9.53	10	2
20014+1045	STF2613AB	354.3	0.79	3.50	0.050	2017.24	7.48	8.02	9	2
20035+3601	STF2624AC	326.8	0.04	42.32	0.038	2018.60	7.09	9.26	25	5
20035+3601	STF2624AD	171.1	0.04	28.97	0.052	2018.60	7.09	12.90	25	5
20057+3536	ES 24BC	241.4	0.26	11.31	0.181	2018.59	8.82	13.8	10	2
20057+3536	ES 24BD	85.6	0.94	17.12	0.243	2018.58	8.82	13.11	5	1
20057+3536	SHJ 316AB	322.8	0.03	69.44	0.053	2018.60	7.79	8.82	25	5
20106+3338	S 738AB	106.2	0.03	42.15	0.030	2018.55	7.76	8.43	20	4
20123+3205	STF2649AB	151.4	0.04	21.59	0.032	2018.60	7.86	9.85	25	5
20123+3205	STF2649AC	283.8	0.01	130.97	0.013	2018.60	7.86	11.41	25	5
20123+3205	STF2649AD	36.1	0.01	175.89	0.029	2018.60	7.86	10.63	25	5
20133+3502	ARY 23AB	28.2	0.03	81.55	0.058	2018.55	8.48	8.89	20	4
20133+3502	ARY 23BC	339.4	0.01	65.01	0.010	2018.55	8.89	10.56	20	4
20133+3502	SKF2392BD	345.5	0.23	13.95	0.102	2018.54	8.89	12.8	5	1
20140-0052	ABT 15AE	224.6	0.03	80.98	0.054	2018.78	7.87	12.83	5	1
20140-0052	BU 1485A,BC	105.0	0.02	74.95	0.044	2018.78	7.87	10.12	5	1
20140-0052	BU 1485BC,D	65.2	0.13	23.15	0.026	2018.78	10.12	12.2	5	1
20462+1554	STF2725AB	11.7	0.83	6.10	0.090	2017.78	7.54	8.20	6	2
20482-1303	HJ 2997	195.5	1.68	8.39	0.262	2018.75	10.42	11.3	3	1
20484-1812	S 763AB	293.6	0.73	15.43	0.206	2018.75	7.24	7.79	3	1
20484-1812	S 763CD	332.6	1.68	9.14	0.276	2018.75	11.72	12.0	4	1
20489-2037	HJ 2998AB	141.2	1.81	5.55	0.260	2018.75	9.72	9.96	3	1
20510+0211	BAL1573	225.3	1.24	5.64	0.117	2018.75	12.82	12.84	9	1
20532-0240	BRT 508	208.0	2.04	8.21	0.290	2018.75	10.46	14.2	1	1
20557-1625	DAM 219	117.3	0.92	8.20	0.144	2018.75	11.3	12.5	9	1
20577-3248	ENO 6	23.8	0.80	13.60	0.163	2018.75	10.14	13.8	12	1
20582+1038	LBU 11AC	151.6	0.21	72.46	0.279	2018.75	9.04	11.82	3	1
20584+1050	BUP 220BD	224.2	0.24	67.39	0.294	2018.75	9.88	12.01	3	1
20586-0434	BRT 511	82.4	1.21	4.04	0.107	2018.75	10.8	11.5	9	1
20588-0921	BU 764AB,D	140.8	0.11	134.05	0.283	2018.75	9.80	9.18	3	1

Table 1 continues on the next page.

Double Star Measures Using the Video Drift Method - XII

Table 1 (continued). Results of 254 double stars using the video drift method

Object	Designation	PA °	PA SEM °	Sep "	Sep SEM "	Avg. Date	Mag 1	Mag 2	Samples	Nights
20588-0921	BU 764AB,C	109.6	0.14	102.80	0.291	2018.75	9.80	9.60	3	1
20588-0921	BU 764AB,E	86.1	0.35	54.52	0.346	2018.75	9.80	12.1	3	1
20588-0921	BU 764CE	311.9	0.33	57.32	0.348	2018.75	9.60	12.1	3	1
20588-0921	BOO 1DF	195.3	0.72	18.32	0.248	2018.75	9.18	14.5	4	1
20595-2212	ARA1937	124.3	1.93	11.48	0.389	2018.75	12.6	12.9	3	1
21017-1032	AOT 96	104.3	1.39	10.94	0.304	2018.75	10.73	13.0	3	1
21021+1016	J 158	163.2	1.72	4.76	0.140	2018.75	10.93	13.1	5	1
21069+3845	SMR 40AP	289.1	0.13	154.70	0.450	2017.78	5.35	12.84	1	1
21069+3845	SMR 40AO	279.8	0.19	162.47	0.350	2017.78	5.35	12.65	1	1
21140-2513	BRT3098	341.7	1.58	4.54	0.134	2018.62	13.02	13.06	9	1
21146-2935	B 2492	239.3	1.10	6.54	0.149	2018.62	10.21	10.91	9	1
21162-0003	LYS 41	234.2	2.43	6.35	0.289	2018.62	11.0	13.0	3	1
21215-2442	SEE 441AC	316.5	0.17	102.76	0.269	2018.75	9.31	10.94	3	1
21216-1825	ARA 502	123.2	2.55	6.79	0.460	2018.75	12.3	13.2	3	1
21223-3500	HJ 5264	46.6	1.44	16.26	0.348	2018.75	9.47	12.9	3	1
21247-3106	HJ 5266	256.2	1.10	10.74	0.183	2018.75	8.72	11.7	3	1
21255+0203	STT 439AB,C	221.9	0.91	14.63	0.242	2018.75	7.53	11.33	3	1
21264-0117	BAL 623	217.1	1.47	14.31	0.337	2018.75	11.03	12.11	3	1
21274-1112	J 2347	32.8	1.73	14.06	0.420	2018.75	10.62	14.0	3	1
21275-1112	J 2348	38.4	1.82	9.36	0.269	2018.75	11.0	12.3	3	1
21334+3058	KU 132AB	256.4	0.12	53.63	0.125	2018.62	10.15	10.69	1	1
21358+3101	HJ 939AB	175.8	0.24	15.59	0.130	2018.60	8.06	12.78	10	2
21358+3101	HJ 939CD	343.8	0.19	15.07	0.128	2018.62	11.07	14.67	10	2
21358+3101	STF2808AC	286.3	0.08	42.83	0.099	2018.62	8.06	11.07	10	2
21358+3104	HJ 940	329.2	0.13	20.97	0.099	2018.62	10.75	11.90	1	1
21416-2813	HJ 3046AB	56.9	0.71	28.97	0.302	2018.75	10.72	12.64	3	1
21416-2813	UC 4530AC	246.1	0.30	79.92	0.346	2018.75	10.72	13.88	3	1
21420-2439	SEE 453	325.2	0.89	11.47	0.166	2018.75	8.40	12.3	3	1
21429-1551	ARA 130	49.8	2.13	8.72	0.289	2018.75	12.6	13.6	3	1
21442+0953	S 798AC	317.7	0.12	143.91	0.676	2018.83	2.53	8.74	5	1
21452-0616	HDO 167AC	37.3	0.91	12.03	0.189	2018.75	8.26	12.3	3	1
21452-0616	HDO 167AD	111.6	0.74	27.77	0.387	2018.75	8.26	13.5	3	1
21519+0905	STF2833	337.5	0.12	8.95	0.029	2018.82	7.84	10.20	5	1
22038+6438	STF2863AB	275.4	0.84	8.20	0.060	2017.78	4.45	6.40	5	2
22218+1515	STF2897	98.4	0.15	16.89	0.029	2018.82	9.48	10.37	5	1
22485-0536	LDS4997AB	255.3	0.33	86.53	0.499	2018.75	9.43	14.13	2	1
22499-2154	ARA1943	295.0	1.82	11.59	0.381	2018.75	11.60	12.55	3	1
22558+4334	HDS3262	166.7	0.12	28.78	0.060	2018.83	8.00	9.54	5	1
22568-3856	WG 285	343.2	1.58	14.72	0.327	2018.75	10.37	12.8	3	1
22579-2250	RST4115	42.6	0.97	13.81	0.212	2018.75	9.17	14.0	3	1

Table 1 concludes on the next page.

Double Star Measures Using the Video Drift Method - XII

Table 1 (conclusion). Results of 254 double stars using the video drift method

Object	Designation	PA °	PA SEM °	Sep "	Sep SEM "	Avg. Date	Mag 1	Mag 2	Samples	Nights
23000-1024	BU 9025AC	272.1	1.57	14.51	0.477	2018.75	12.7	13.7	3	1
23033+0653	HJ 3161	254.5	1.72	11.41	0.354	2018.75	10.78	13.8	3	1
23088+1058	A 1238AB,CD	291.7	0.24	75.15	0.319	2018.75	7.67	11.16	3	1
23112+0500	HJ 980AB	190.0	0.93	50.90	0.391	2018.75	12.68	12.79	3	1
23112+0500	HJ 980BC	201.8	1.64	9.13	0.258	2018.75	12.68	12.79	4	1
23145+2027	HJ 982AB	172.3	0.07	39.61	0.051	2018.77	7.16	13.63	20	4
23145+2027	HJ 982AC	217.2	0.05	46.51	0.031	2018.77	7.16	13.18	20	4
23147-1041	FOX 271AC	224.7	0.86	31.38	0.309	2018.76	6.14	12.5	3	1
23147-1041	FOX 271AD	131.0	0.01	114.09	0.043	2018.82	6.14	12.95	20	4
23228+2034	STF3007AB	92.4	0.76	5.50	0.090	2017.78	6.74	9.78	6	2
23299-2035	HJ 3196AB,C	18.8	0.49	20.70	0.160	2017.24	8.34	10.63	3	1
23482-1642	TOK 354AB	60.6	0.09	110.00	0.170	2017.24	7.59	10.12	3	1
23483-2624	B 618AB	78.1	1.90	6.10	0.190	2017.24	9.76	12.2	3	1
23483-2624	B 618AC	170.8	0.69	12.60	0.150	2017.24	10.89	10.91	3	1

Table 1 Notes

- All magnitudes taken from the WDS catalogue. All position angle/separation measurements are for the Equator and Equinox of date.
- SEM is the standard deviation (SD) of all the drift run PA's and Sep's divided by the square root of the number of nights: $SEM = SD / \sqrt{nights}$
- The column "samples" is the number of separate drift runs made using both the video drift and modified video drift methods. An individual "drift run" contains hundreds to thousands of video frames. Each video frame produces a unique PA and Sep measurement. "Nights" is the number of nights drift runs were made for that system.

Table 2. Gaia Position, magnitudes, proper motions (pm), and parallaxes of new double star components

RA	DEC	mag	pm RA mas/yr	pm RA error mas/yr	pm DEC mas/yr	pm DEC error mas/yr	parallax mas	parallax error mas	measured PA	measured SEP "	Date
13h 22m 23.2s	-17° 02' 41.9"	13.39	4.1609	0.0428	1.8318	0.0349	2.128	0.025	330.3	10.8	2018.36
13h 22m 23.6s	-17° 02' 51.1"	13.35	4.1713	0.0422	2.1125	0.0341	2.158	0.024			

Double Star Measures Using the Video Drift Method - XII

(Continued from page 494)

New Double Star

A POSS2 image (epoch 1988.29) of a double star system not currently in the Washington Double Star Catalog is shown in Figure 1. Overlaid on the components are the Gaia proper motions (errors less than 2% in direction and magnitude) which show a common motion for the pair. The Gaia parallaxes are small at 2.158 and 2.128 mas with an 11% quoted error (0.025 mas). Distances are thus 463 ± 55 pc and 470 ± 51 pc for the components. Within the error margins of the Gaia distances and proper motions, the components could very well be a physically connected system. The coordinates, magnitudes, position angle, separation, their Gaia proper motions and parallaxes are given in Table 2. Our measurements for this system are PA = 330.3 deg, separation = 10.8", date of measurement 2018.36. This double star system is given the preliminary designation NUG 1.

Acknowledgements

This research makes use of the Washington Double Star Catalog maintained at the US Naval Observatory and the Aladin Interactive Sky Atlas, Centre de Données Astronomiques de Strasbourg: <http://aladin.u-strasbg.fr/java/nph-aladin.pl>. This work has made use of data from the European Space Agency (ESA) mission Gaia (<https://www.cosmos.esa.int/gaia>), processed by the Gaia Data Processing and Analysis Consortium (DPAC, <https://www.cosmos.esa.int/web/gaia/dpac/consortium>).

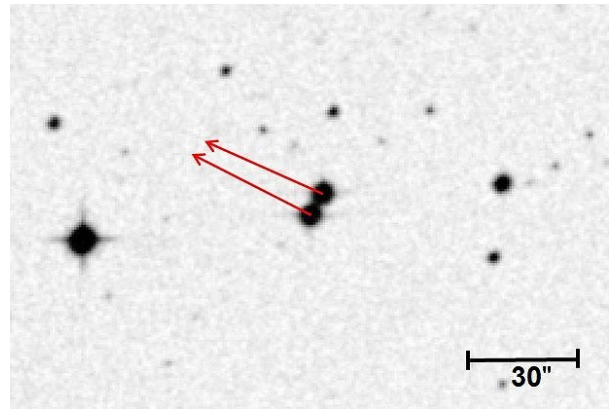


Figure 1. New double star. RA = 13h 22m 23.6s, DEC = -17° 2' 51.1". Proper motion components from the Gaia catalog. Palomar Digital Sky Survey image from the Aladin Interactive Sky Atlas.

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