Common Proper Motion Pairs in the LSPM-North Catalog

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Abstract: We report the identification of 96 Common Proper Motion Pairs (CPMP) detected among the stars listed in the Lepine – Shara Proper Motion (LSPM)-North Catalogue. The separations of these pairs range from about 5 seconds of arc up to almost 170 seconds of arc.

Introduction

For the past three years, we have been conducting a data mining search in order to provide improved coordinates, separations, position angles and proper motions for some of the double stars listed in the Washington Double Star (WDS) Catalog. Attention has been especially focused on LDS systems for which we identified some differences between the values quoted in various astrometric databases and those included in the WDS. We have also isolated those CPMP that - prima facie - were not found in the WDS.

In general the project serves a twofold purpose. On the one hand, it is aimed at searching for additional astrometric information about double stars and identifying new pairs. On the other hand, it seeks to introduce undergraduate students to the use of large databases through the tools proposed in some of the Virtual Observatory initiatives.

The databases we are currently searching include, among others, SuperCosmos (Hambly *et al.* 2001), UCAC3 (Zacharias *et al.* 2010), USNO B1.0 (Monet *et al.* 2003), SPM4 (Girard *et al.* 2011) and LSPM-North (Lepine and Shara, 2005).

Search and Results

In order to identify potential CPMP among the LSPM-North stars, we have followed a very simple process, namely, the proper motion comparison of each of the stars listed in the database (see López 2008 for preliminary results). This approach has proven to be very useful as it has allowed many authors to identify hundreds of new, previously unreported CPMP that are now included in the WDS. As an example, we can mention the searches performed by Greaves (2004, 2005), Caballero (2010), and Caballero *et al.* (2010). Another important search was that made by Halbwachs (1986) using the data of the AGK2/3. This search involved the development of specific criteria to decide when a pair of stars could be referred to as a CPMP, which led to the identification of a number of new pairs.

The first step in our Data Mining was to compile a preliminary list of CPMP, which was then cross-identified with the WDS we downloaded on July 27, 2011. As we found that many of the pairs in our list were already included in the WDS, all the stars in

common were deleted. We also deleted from our preliminary list some very close pairs which could not be confirmed by using other astrometric and non-astrometric compilations (such as 2MASS). The components of many of these very close pairs, although listed as two individual stars with different LSPM numbers in the LSPM-North Catalog, are identified as a single star in most of the databases checked. These pairs have been set apart for later analysis.

The next step in the process was to analyze which of the systems have real chances of being physical pairs and which ones should be regarded as optical systems. This problem has been addressed by Poveda *et al.* (1982), and Halbwachs (1986), among many others (see Benavides *et al.* 2010 for a summary of different methods). For our purposes, we adopted Halbwachs' (1986). Finally, in order to double check the nature of the CPMP found, we relied on the tools provided by Aladin to superimpose POSS1 and POSS2 images, as well as on some of the databases currently being used in our study. Having followed all these steps, we completed the identification of the 96 objects reported in this note.

Our results are presented in Table 1. With the exception of the last two columns, the data have been directly taken from the LSPM-North Catalog. RA and Dec are in degrees and proper motions in seconds of arc per year. Position angles and separations (epoch 2000.0) were computed from the corresponding RA and Dec given.

To our best knowledge, the CPMP herein reported are not included in the Washington Double Star Catalog (review made on September 28, 2011).

Acknowledgements

This research has made use of the Washington Double Star Catalog maintained at the U.S. Naval Observatory and the Aladin facilities.

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Common Proper Motion Pairs in the LSPM-North Catalog

Table 1: Identification and Astrometric Data

LSPM	2MASS	RA	Dec	pmRA	pmDec	Ve	PA	Sep
A 0008+1633		2.223711	16.565207	0.158	-0.119	20.07	325	13.8
B 0008+1634		2.221412	16.568356	0.158	-0.119	20.47		
A 0111+4248	01115514+4248024	17.979815	42.800587	0.126	-0.170	11.23	215	115.1
B 0111+4246	01114909+4246283	17.954638	42.774498	0.128	-0.182	15.00		
A 0122+2758	01221631+2758005	20.568094	27.966770	0.141	-0.081	19.17	108	5.0
B 0122+2757	01221667+2757590	20.569574	27.966341	0.141	-0.081	19.30		
A 0201+0218	02011509+0218257	30.312868	2.307160	0.217	-0.033	17.44	151	63.8
B 0201+0217	02011713+0217296	30.321337	2.291575	0.217	-0.033	18.87		
A 0316+0618	03165886+0618086	49.245281	6.302413	0.181	-0.122	19.50	210	75.9
B 0316+0617	03165635+0617027	49.234798	6.284081	0.181	-0.122	19.74		
A 0323+1506	03232730+1506520	50.863747	15.114393	-0.061	-0.152	14.73	185	67.9
B 0323+1505	03232686+1505444	50.861935	15.095627	-0.061	-0.152	16.13		
A 0329+7556	03292257+7556596	52.344208	75.949875	0.160	-0.129	17.37	302	36.9
B 0329+7557	03291399+7557193	52.308468	75.955353	0.160	-0.129	19.79		
A 0331+0749	03312821+0749469	52.867573	7.829704	0.163	-0.039	12.42	355	17.2
B 0331+0750	03312812+0750040	52.867180	7.834460	0.163	-0.039	18.72		
A 0339+5632	03391532+5632058	54.813854	56.534962	0.192	-0.058	15.20	166	24.3
B 0339+5631	03391602+5631422	54.816757	56.528400	0.192	-0.058	19.46		
A 0433+0013	04331784+0013595	68.324326	0.233273	-0.060	-0.151	11.43	41	18.9
B 0433+0014	04331867+0014140	68.327789	0.237227	-0.062	-0.149	16.85		
A 0449+4048	04493734+4048017	72.405609	40.800407	0.027	-0.213	14.02	205	6.5
B 0449+4047	04493709+4047557	72.404587	40.798763	0.027	-0.213	15.04		
A 0509+1038	05094259+1038438	77.427460	10.645508	-0.036	-0.177	15.15	317	45.4
B 0509+1039	05094048+1039170	77.418686	10.654724	-0.036	-0.177	18.99		
A 0524+0315	05244976+0315154	81.207329	3.254313	0.271	-0.127	10.71	246	48.2
B 0524+0314	05244682+0314557	81.195084	3.248834	0.253	-0.120	14.94		
A 0535+0824	05351532+0824193	83.813843	8.405370	0.141	-0.067	11.14	349	140.0
B 0535+0826	05351350+0826367	83.806290	8.443538	0.141	-0.062	17.20		
A 0546+1306	05461292+1306098	86.553902	13.102634	0.085	-0.146	12.03	170	34.2
B 0546+1305		86.555527	13.093266	0.085	-0.146	18.32		
A 0546+1116	05461726+1116466	86.571915	11.279618	-0.124	-0.155	16.50	207	53.8
B 0546+1115	05461559+1115587	86.564980	11.266311	-0.124	-0.155	18.21		
A 0550+0939	05501174+0939492	87.548943	9.663702	0.258	0.235	16.01	317	16.2
B 0550+0940	05501099+0940011	87.545845	9.667006	0.258	0.235	17.75		
A 0551+5051	05515028+5051566	87.959549	50.865734	-0.127	-0.084	10.34	336	6.2
B 0551+5052	05515002+5052022	87.958458	50.867302	-0.127	-0.084	99.90		

Table continues on next page.

Common Proper Motion Pairs in the LSPM-North Catalog

Table 1 (continued): Identification and Astrometric Data

LSPM	2MASS	RA	Dec	pmRA	pmDec	Ve	PA	Sep
A 0610+2802	06102564+2802236	92.606796	28.039850	-0.100	-0.143	10.80	171	161.0
B 0610+2759	06102756+2759447	92.614799	27.995678	-0.097	-0.144	13.53		
A 0610+4439	06104398+4439498	92.683350	44.663815	0.193	-0.143	16.73	39	142.0
B 0610+4441	06105244+4441395	92.718620	44.694263	0.179	-0.140	17.93		
A 0625+1634	06253267+1634050	96.386032	16.567974	-0.203	-0.156	15.83	116	52.7
B 0625+1633		96.399773	16.561554	-0.203	-0.156	18.23		
A 0628+2829	06282826+2829230	97.117722	28.489660	-0.115	-0.152	16.03	148	100.2
B 0628+2827	06283227+2827578	97.134407	28.465990	-0.115	-0.152	17.59		
A 0649+2942	06495322+2942038	102.471741	29.701172	-0.028	0.189	14.13	182	34.2
B 0649+2941	06495313+2941296	102.471397	29.691668	-0.028	0.189	16.08		
A 0653+3026	06531618+3026039	103.317375	30.434402	-0.132	-0.087	15.93	187	7.3
B 0653+3025	06531611+3025567	103.317078	30.432396	-0.132	-0.087	16.29		
A 0705+4129	07053254+4129100	106.385712	41.486076	0.138	-0.094	14.05	135	87.2
B 0705+4128	07053804+4128084	106.408615	41.468975	0.138	-0.094	14.47		
A 0720+3657	07203806+3657475	110.158623	36.963203	-0.015	-0.160	12.28	5	12.6
B 0720+3658	07203816+3658000	110.159035	36.966675	-0.015	-0.160	15.44		
A 0727+4228	07275077+4228198	111.961609	42.472118	0.060	-0.155	16.33	173	32.1
B 0727+4227	07275114+4227480	111.963135	42.463280	0.060	-0.155	18.17		
A 0749+2435	07495456+2435131	117.477325	24.586933	-0.014	-0.178	11.89	342	96.9
B 0749+2436	07495237+2436454	117.468231	24.612555	-0.014	-0.178	15.26		
A 0750+0429	07505800+0429003	117.741684	4.483431	-0.165	-0.052	16.50	189	5.0
B 0750+0428	07505795+0428553	117.741463	4.482053	-0.165	-0.052	99.90		
A 0802+1326	08022370+1326239	120.598778	13.439995	-0.102	-0.141	14.58	142	73.3
B 0802+1325	08022677+1325259	120.611588	13.423889	-0.102	-0.141	19.54		
A 0802+2851	08024181+2851062	120.674217	28.851751	-0.135	-0.154	14.90	149	87.4
B 0802+2849	08024523+2849513	120.688492	28.830944	-0.135	-0.154	20.50		
A 0802+0019	08025006+0019091	120.708595	0.319218	-0.119	-0.141	13.37	115	78.7
B 0802+0018	08025481+0018359	120.728416	0.309999	-0.119	-0.141	16.83		
A 0813+1527	08133754+1527150	123.406326	15.454165	-0.152	-0.017	12.16	296	148.0
B 0813+1528	08132832+1528193	123.367905	15.472042	-0.155	-0.017	18.44		
A 0822+1145	08223314+1145055	125.638107	11.751541	-0.205	-0.045	12.92	148	7.6
B 0822+1144	08223341+1144590	125.639244	11.749749	-0.205	-0.045	99.90		
A 0840+6144	08400461+6144444	130.019257	61.745708	-0.075	-0.228	18.36	75	84.7
B 0840+6145	08401613+6145065	130.067261	61.751823	-0.075	-0.228	19.07		
A 0855+3732	08555987+3732108	133.999359	37.536369	-0.174	0.038	14.30	125	80.2
B 0856+3731	08560536+3731242	134.022247	37.523430	-0.174	0.038	17.04		

Table continues on next page.

Common Proper Motion Pairs in the LSPM-North Catalog

Table 1 (continued): Identification and Astrometric Data

LSPM	2MASS	RA	Dec	pmRA	pmDec	Ve	PA	Sep
A 0900+0643	09005207+0643315	135.216965	6.725435	-0.154	0.053	13.91	199	44.7
B 0900+0642	09005111+0642491	135.212997	6.713663	-0.154	0.053	16.71		
A 0902+0600	09025127+0600280	135.713638	6.007769	-0.149	0.111	9.80	16	105.6
B 0902+0602	09025320+0602095	135.721680	6.035985	-0.144	0.107	14.71		
A 0906+7226	09065614+7226093	136.734039	72.435852	0.175	-0.465	16.03	74	24.5
B 0907+7226	09070133+7226162	136.755661	72.437744	0.175	-0.465	17.93		
A 0929+0350	09290981+0350079	142.290894	3.835543	-0.119	-0.167	15.83	228	37.8
B 0929+0349	09290794+0349424	142.283096	3.828474	-0.119	-0.167	16.13		
A 1100+0100	11005917+0100076	165.246567	1.002118	-0.320	-0.084	13.20	150	41.5
B 1101+0059	11010055+0059316	165.252304	0.992129	-0.320	-0.084	19.25		
A 1102+2353	11020198+2353085	165.508163	23.885649	-0.157	-0.100	14.55	119	97.7
B 1102+2352	11020821+2352211	165.534134	23.872486	-0.157	-0.100	16.95		
A 1118+6048	11182861+6048015	169.619308	60.800423	0.137	-0.058	17.78	184	23.8
B 1118+6047		169.618286	60.793842	0.137	-0.058	20.42		
A 1135+3109	11351194+3109267	173.799683	31.157419	-0.161	-0.046	16.63	351	131.3
B 1135+3111	11351029+3111363	173.792801	31.193417	-0.157	-0.042	18.28		
A 1147+1640	11471686+1640074	176.820114	16.668682	-0.294	-0.090	16.57	154	8.4
B 1147+1639	11471712+1639599	176.821182	16.666594	-0.294	-0.090	16.63		
A 1148+0018	11485156+0018038	177.214844	0.301060	-0.176	-0.003	14.82	155	4.6
B 1148+0017	11485169+0017596	177.215378	0.299896	-0.176	-0.003	99.90		
A 1149+4022	11493844+4022063	177.410156	40.368320	-0.077	-0.260	15.38	130	21.3
B 1149+4021		177.416107	40.364502	-0.077	-0.260	21.71		
A 1206+1218	12060212+1218190	181.508850	12.305192	-0.006	-0.182	13.29	269	38.1
B 1205+1218	12055952+1218187	181.498032	12.305099	-0.006	-0.182	16.57		
A 1209+2818	12094182+2818088	182.424179	28.302420	-0.168	-0.055	18.83	194	13.4
B 1209+2817	12094158+2817557	182.423172	28.298798	-0.168	-0.055	19.36		
A 1223+0625	12234348+0625103	185.931183	6.419538	-0.183	-0.029	14.06	159	23.4
B 1223+0624	12234403+0624483	185.933487	6.413444	-0.183	-0.029	18.52		
A 1233+0824		188.306030	8.401087	-0.172	0.132	18.46	147	111.0
B 1233+0822		188.322800	8.375109	-0.172	0.132	19.34		
A 1235+4402	12355441+4402497	188.976837	44.047047	0.188	-0.266	13.00	299	36.9
B 1235+4403		188.964417	44.052071	0.188	-0.266	19.60		
A 1236+1457	12361340+1457171	189.055771	14.954708	-0.159	-0.118	16.20	14	80.5
B 1236+1458	12361476+1458352	189.061432	14.976391	-0.159	-0.118	18.25		
A 1300+7548	13000780+7548217	195.032379	75.806023	-0.212	-0.022	12.42	188	25.4
B 1300+7547	13000680+7547565	195.028183	75.799042	-0.212	-0.022	20.59		

Table continues on next page.

Common Proper Motion Pairs in the LSPM-North Catalog

Table 1 (continued): Identification and Astrometric Data

LSPM	2MASS	RA	Dec	pmRA	pmDec	Ve	PA	Sep
A 1310+3252	13102143+3252584	197.589218	32.882919	-0.173	0.011	14.55	360	66.5
B 1310+3254	13102143+3254049	197.589188	32.901382	-0.173	0.011	17.40		
A 1311+1106	13114181+1106247	197.924225	11.106891	-0.111	-0.130	12.89	253	146.8
B 1311+1105	13113230+1105406	197.884598	11.094645	-0.115	-0.122	17.83		
A 1324+4619		201.216278	46.332203	0.065	-0.156	18.82	304	8.2
B 1324+4620		201.213547	46.333462	0.065	-0.156	19.88		
A 1352+2806	13520228+2806488	208.009491	28.113567	-0.188	0.054	14.53	1	11.4
B 1352+2807	13520229+2807001	208.009537	28.116730	-0.188	0.054	14.62		
A 1358+3842	13584494+3842328	209.687134	38.709114	-0.201	-0.021	14.50	348	39.8
B 1358+3843	13584423+3843117	209.684204	38.719929	-0.201	-0.021	18.17		
A 1359+0632	13590955+0632003	209.789810	6.533382	-0.143	0.114	9.95	254	5.6
B 1359+0631	13590918+0631586	209.788300	6.532964	-0.140	0.112	99.90		
A 1424+1804	14243602+1804140	216.150085	18.070560	-0.149	-0.070	16.48	225	33.3
B 1424+1803	14243437+1803503	216.143234	18.063992	-0.149	-0.070	18.53		
A 1433+5101	14335998+5101076	218.499924	51.018799	0.094	-0.120	16.33	263	71.6
B 1433+5100		218.468552	51.016392	0.094	-0.120	19.59		
A 1504+1422	15043948+1422115	226.164474	14.369870	-0.259	-0.003	13.37	231	26.4
B 1504+1421	15043807+1421549	226.158569	14.365274	-0.259	-0.003	20.70		
A 1516+6054	15164985+6054374	229.207733	60.910431	0.048	-0.440	13.25	178	92.1
B 1516+6053	15165035+6053054	229.209808	60.884872	0.048	-0.440	20.03		
A 1623+2438	16233762+2438152	245.906784	24.637602	-0.098	-0.145	10.54	169	135.3
B 1623+2436		245.914368	24.600647	-0.103	-0.150	19.57		
A 1646+0347	16462350+0347583	251.597961	3.799562	-0.172	-0.067	15.39	340	11.7
B 1646+0348	16462324+0348093	251.596848	3.802606	-0.172	-0.067	19.06		
A 1709+1730	17090307+1730569	257.262756	17.515816	-0.154	0.006	16.20	358	5.0
B 1709+1731	17090305+1731019	257.262695	17.517214	-0.154	0.006	99.90		
A 1712+0132	17124318+0132044	258.179993	1.534555	-0.152	0.023	13.59	145	22.4
B 1712+0131	17124404+0131460	258.183533	1.529444	-0.152	0.023	15.42		
A 1729+0746	17295145+0746570	262.464386	7.782518	-0.022	-0.171	12.07	306	6.9
B 1729+0747	17295107+0747010	262.462830	7.783637	-0.022	-0.171	99.90		
A 1734+4858	17343968+4858049	263.665314	48.968109	-0.054	0.155	14.38	145	55.4
B 1734+4857	17344290+4857195	263.678741	48.955494	-0.054	0.155	14.43		
A 1738+3939	17380857+3939154	264.535706	39.654312	-0.055	0.150	16.66	157	21.2
B 1738+3938	17380927+3938558	264.538635	39.648884	-0.055	0.150	19.94		
A 1823+0403	18231983+0403164	275.832642	4.054560	-0.170	0.009	16.52	9	79.0
B 1823+0404	18232070+0404343	275.836243	4.076203	-0.170	0.009	17.57		

Table continues on next page.

Common Proper Motion Pairs in the LSPM-North Catalog

Table 1 (continued): Identification and Astrometric Data

LSPM	2MASS	RA	Dec	pmRA	pmDec	Ve	PA	Sep
A 1823+2022	18235962+2022487	275.998413	20.380228	-0.166	-0.078	18.13	51	87.7
B 1824+2023	18240446+2023441	276.018585	20.395603	-0.166	-0.078	18.73		
A 1847+4629	18473898+4629083	281.912445	46.485729	-0.012	0.166	15.56	187	15.1
B 1847+4628		281.911713	46.481560	-0.012	0.166	20.45		
A 1932+1723	19325604+1723567	293.233582	17.399023	0.172	-0.198	15.20	160	150.6
B 1932+1721	19325969+1721355	293.248779	17.359795	0.165	-0.210	18.18		
A 1933+6526	19330164+6526519	293.256775	65.447746	-0.156	-0.103	18.48	233	17.5
B 1932+6526	19325939+6526414	293.247406	65.444839	-0.156	-0.103	18.58		
A 2059+4224	20594623+4224537	314.942627	42.414928	0.169	0.024	15.25	347	38.2
B 2059+4225	20594548+4225310	314.939484	42.425278	0.169	0.024	19.95		
A 2106+5924	21061829+5924018	316.576233	59.400482	-0.110	-0.119	10.91	332	120.3
B 2106+5925	21061099+5925483	316.545776	59.430096	-0.108	-0.115	16.19		
A 2131+4700	21310438+4700581	322.768341	47.016220	0.209	0.255	12.66	346	9.2
B 2131+4701	21310416+4701071	322.767456	47.018715	0.209	0.255	99.90		
A 2133+5001	21330337+5001032	323.264099	50.017563	-0.168	-0.037	12.83	326	66.2
B 2132+5001	21325948+5001577	323.247894	50.032719	-0.168	-0.037	17.47		
A 2146+1550	21463230+1550389	326.634827	15.844217	0.309	0.116	16.16	324	154.9
B 2146+1552	21462606+1552449	326.608826	15.879240	0.304	0.121	16.56		
A 2203+4358	22033629+4358592	330.901184	43.983105	0.145	0.050	15.33	86	13.3
B 2203+4359	22033752+4359000	330.906311	43.983345	0.145	0.050	19.20		
A 2211+1819	22114389+1819141	332.932892	18.320580	-0.068	-0.135	13.58	171	17.3
B 2211+1818	22114408+1818570	332.933685	18.315830	-0.068	-0.135	15.00		
A 2217+4242	22172686+4242141	334.362030	42.703918	0.188	-0.017	14.56	173	19.8
B 2217+4241		334.362915	42.698444	0.188	-0.017	19.96		
A 2222+2309	22223361+2309496	335.640106	23.163803	-0.167	-0.122	13.55	204	119.0
B 2222+2308	22223008+2308010	335.625397	23.133631	-0.182	-0.111	16.50		
A 2248+2723	22481493+2723024	342.062347	27.383993	0.171	-0.017	14.90	115	6.6
B 2248+2722	22481537+2722596	342.064209	27.383219	0.171	-0.017	99.90		
A 2255+3325	22550566+3325060	343.773682	33.418304	0.153	-0.073	16.23	204	9.9
B 2255+3324		343.772369	33.415791	0.153	-0.073	99.90		
A 2256+5919	22561349+5919087	344.056244	59.319046	0.124	0.107	11.50	352	152.8
B 2256+5921	22561075+5921399	344.044769	59.361080	0.125	0.113	18.20		
A 2312+2701	23124700+2701045	348.195831	27.017931	0.169	-0.024	11.61	109	53.5
B 2312+2700	23125076+2700468	348.211578	27.013012	0.161	-0.025	19.30		
A 2326+1952	23261725+1952155	351.571899	19.870993	-0.134	-0.104	18.62	181	31.9
B 2326+1951	23261721+1951436	351.571777	19.862135	-0.134	-0.104	20.56		

Table concludes on next page.

Common Proper Motion Pairs in the LSPM-North Catalog

Table 1 (conclusion): Identification and Astrometric Data

LSPM	2MASS	RA	Dec	pmRA	pmDec	Ve	PA	Sep
A 2330+3330	23305581+3330582	352.732513	33.516159	-0.125	-0.090	13.73	359	41.4
B 2330+3331		352.732269	33.527664	-0.125	-0.090	99.90		
A 2335+6750	23353800+6750016	353.908508	67.833778	0.139	0.063	10.56	331	133.9
B 2335+6751	23352650+6751585	353.860474	67.866264	0.141	0.060	17.89		
A 2337+2127	23374838+2127412	354.451599	21.461403	-0.023	-0.213	17.93	1	19.6
B 2337+2128		354.451752	21.466843	-0.023	-0.213	19.92		
A 2343+1345	23431810+1345430	355.825378	13.761855	-0.029	-0.170	17.38	119	160.1
B 2343+1344	23432774+1344263	355.865570	13.740560	-0.027	-0.170	17.93		
A 2349+1108	23491766+1108514	357.323578	11.147657	0.084	-0.154	14.50	46	17.0
B 2349+1109	23491849+1109032	357.327026	11.150946	0.084	-0.154	18.89		
A 2352+4625	23521505+4625520	358.062805	46.431141	0.165	0.033	16.98	347	56.4
B 2352+4626	23521383+4626470	358.057739	46.446415	0.165	0.033	17.58