INVESTIGATION OF 635 DOUBLES IN THE MELBOURNE ASTROGRAPHIC CATALOGUES −71° to −81° WITH AN ANGULAR SEPARATION LESS THAN 15″

Part VII

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The present paper gives the results of the search and counts of 635 doubles with an angular separation less than 15″ in different magnitudes for different values of Δm in the Melbourne Astrographic Catalogues −71° to −81°. The number of optical doubles by Struve's and Kreiken's formulae has been computed. The ratio T : O (observed to optical) computed from Struve's formula is a little larger than that computed from Kreiken's formula. The values of T : O are compared with those given by the author (Goyal 1962). The average galactic concentration obtained by comparing the distributions in the galactic latitudes $0° < |\beta| \leqslant 20°$ and $|\beta| > 40°$ is 5·270.

Introduction

The present paper is a continuation of my previous papers (Goyal 1962, 1964*a*, 1964*b*, 1965, *in press*; Goyal and Mithal 1964; Goyal and Varma 1966). I have searched the Melbourne Astrographic Catalogues (of declinations −71° to −81°) for doubles with an angular separation $d \leqslant 15''$ and picked 635 pairs. The observed distributions in $0'' < d \leqslant 5''$; $5'' < d \leqslant 10''$ and $10'' < d \leqslant 15''$ in different intervals of Δm, the difference of magnitudes between the components, have been tabulated in Tables I to III. The last column gives the number of opticals computed by Kreiken's formula (Goyal 1962).

The numbers in the last columns of Tables I to III in the faint magnitudes for $5'' < d \leqslant 10''$ and $10'' < d \leqslant 15''$ are quite large, sometimes larger than the actual number of pairs picked up, which reveals that the catalogues are not complete in the fainter magnitudes.

The values of T : O, given in Table IV, from Struve's formula are a little larger than those from Kreiken's formula (Goyal 1962). Further, the large values of T : O reveal that quite a large number of doubles might turn out true binaries.

The distributions according to galactic latitude β lying between $0° < |\beta| \leqslant 20°$, $20° < |\beta| \leqslant 40°$ and $|\beta| > 40°$ are given in Tables V to XIII.

Observed distribution of stars according to d, m and Δm

$\frac{\Delta m}{m}$	<0·3	0·3–0·6	0·6–0·9	0·9–1·2	1·2–1·5	1·5–1·8	1·8–2·1	2·1–2·4	>2·4	T	O
TABLE I											
$0'' < d \leqslant 5''$											
<9·0	1	0	0	0	0	0	0	0	1	2	0·3
9·0–10·0	0	1	0	0	1	0	0	1	1	4	1·3
10·0–11·0	7	2	3	2	4	2	0	1	2	23	2·7
11·0–12·0	9	8	5	5	6	1	2	0	0	36	4·8
12·0–13·0	22	12	10	1	0	0	0	0	0	45	4·2
Totals	39	23	18	8	11	3	2	2	4	110	13·3
TABLE II											
$5'' < d \leqslant 10''$											
<9·0	0	2	1	1	0	1	3	0	10	18	2·7
9·0–10·0	3	10	6	5	3	3	2	0	11	43	11·7
10·0–11·0	16	12	7	3	8	5	6	7	12	76	24·3
11·0–12·0	8	11	12	16	12	5	3	0	0	67	43·2
12·0–13·0	42	27	21	6	0	0	0	0	0	96	37·8
Totals	69	62	47	31	23	14	14	7	33	300	119·7
TABLE III											
$10'' < d \leqslant 15''$											
<9·0	1	1	1	0	2	0	0	0	10	15	8·1
9·0–10·0	3	2	2	2	1	0	0	1	10	21	35·1
10·0–11·0	7	4	2	2	0	3	4	11	6	39	72·9
11·0–12·0	12	14	7	15	12	5	2	0	0	67	129·6
12·0–13·0	44	34	5	0	0	0	0	0	0	83	113·4
Totals	67	55	17	19	15	8	6	12	26	225	259·1

TABLE IV

Declination	Doubles	0″–5″	5″–10″	10″–15″
−71° to −81°	T	110	300	225
	OS	12·7	114·3	242·9
	OK	13·3	119·7	259·1
	T: OS	8·661	2·625	0·926
	T: OK	8·271	2·506	0·868
+32°	T: OS	11·073	3·423	1·030
	T: OK	9·760	2·988	0·980
+33°	T: OS	9·177	2·750	0·894
	T: OK	8·169	2·442	0·795

Note: OS and OK are the number of opticals from Struve's and Kreiken's formulae.

Observed distribution of stars according to d, m, Δm and β

$\frac{\Delta m}{m}$	< 0·3	0·3–0·6	0·6–0·9	0·9–1·2	1·2–1·5	1·5–1·8	1·8–2·1	2·1–2·4	> 2·4	T
TABLE V										
$0'' < d \leq 5''$; $0° < \beta \leq 20°$										
< 9·0	1	0	0	0	0	0	0	0	0	1
9·0–10·0	0	0	0	0	1	0	0	1	1	3
10·0–11·0	0	2	0	0	2	2	0	0	1	7
11·0–12·0	2	1	2	1	2	1	1	0	0	10
12·0–13·0	14	7	1	0	0	0	0	0	0	22
TABLE VI										
$0'' < d \leq 5''$; $20° < \beta \leq 40°$										
< 9·0	0	0	0	0	0	0	0	0	0	0
9·0–10·0	0	0	0	0	0	0	0	0	0	0
10·0–11·0	5	0	1	2	0	0	0	1	0	9
11·0–12·0	2	6	3	1	2	0	0	0	0	14
12·0–13·0	6	4	0	0	0	0	0	0	0	10
TABLE VII										
$0'' < d \leq 5''$; $\beta > 40°$										
< 9·0	0	0	0	0	0	0	0	0	1	1
9·0–10·0	0	0	0	0	0	0	0	0	0	0
10·0–11·0	2	0	1	0	2	0	0	0	0	5
11·0–12·0	0	0	0	2	0	0	0	0	0	2
12·0–13·0	3	3	1	0	0	0	0	0	0	7
TABLE VIII										
$5'' < d \leq 10''$; $0° < \beta \leqslant 20°$										
< 9·0	0	1	0	1	0	0	0	0	3	5
9·0–10·0	3	5	3	3	1	1	0	0	5	21
10·0–11·0	6	8	2	1	5	0	4	1	7	34
11·0–12·0	3	5	8	6	6	3	0	0	0	31
12·0–13·0	33	13	4	1	0	0	0	0	0	51
TABLE IX										
$5'' < d \leq 10''$; $20° < \beta \leq 40°$										
< 9·0	0	0	1	0	0	1	3	0	7	12
9·0–10·0	0	0	1	1	0	2	1	0	3	8
10·0–11·0	3	0	1	1	2	3	1	3	4	18
11·0–12·0	2	3	1	5	4	0	3	0	0	18
12·0–13·0	11	7	4	0	0	0	0	0	0	22

These tables are constructed only for zones $-71°$ to $-77°$, since the zones $-78°$ to $-81°$ have no doubles in galactic latitudes $|\beta| > 40°$. The approximate galactic latitude β was found with the help of the Ohlsson's (1932) tables. The average galactic concentration by comparing the observed number of doubles in $0° < |\beta| \leqslant 20°$ and $|\beta| > 40°$ was found to be 5·270 which is smaller than those for the Oxford and the Hyderabad plus zones for which the galactic concentrations are 6·113 and 10·274 and larger than that for the Hyderabad minus zones for which the galactic concentration is 4·912 (Goyal 1964*a*). But it is appreciably larger than the galactic concentration from all stars in the

Observed distribution of stars according to d, m, Δm and β

$\frac{\Delta m}{m}$	< 0·3	0·3–0·6	0·6–0·9	0·9–1·2	1·2–1·5	1·5–1·8	1·8–2·1	2·1–2·4	< 2·4	T
				TABLE X						
				$5'' < d \leqslant 10''$; $\beta > 40°$						
< 9·0	0	0	0	0	0	0	0	0	0	0
9·0–10·0	0	2	1	0	0	0	0	1	0	4
10·0–11·0	0	4	3	1	0	0	0	1	0	9
11·0–12·0	0	2	1	0	0	1	0	0	0	4
12·0–13·0	1	6	0	0	0	0	0	0	0	7
				TABLE XI						
				$10'' < d \leqslant 15''$; $0° < \beta \leqslant 20°$						
< 9·0	0	1	0	0	0	0	0	0	3	4
9·0–10·0	2	0	1	2	0	0	0	0	5	10
10·0–11·0	4	0	0	1	0	2	1	5	2	15
11·0–12·0	7	4	3	6	7	3	0	0	0	30
12·0–13·0	23	16	3	0	0	0	0	0	0	42
				TABLE XII						
				$10'' < d \leqslant 15''$; $20° < \beta \leqslant 40°$						
< 9·0	1	0	0	0	2	0	0	0	3	6
9·0–10·0	1	1	1	0	0	0	0	0	2	5
10·0–11·0	3	2	0	1	0	0	3	3	2	14
11·0–12·0	2	8	1	5	2	2	1	0	0	21
12·0–13·0	7	9	0	0	0	0	0	0	0	16
				TABLE XIII						
				$10'' < d \leqslant 15''$; $\beta > 40°$						
> 9·0	0	0	0	0	0	0	0	0	0	0
9·0–10·0	0	1	0	0	0	0	0	0	0	1
10·0–11·0	0	1	1	0	0	0	1	0	0	3
11·0–12·0	0	1	2	0	1	0	0	1	0	5
12·0–13·0	3	3	0	0	0	0	0	0	0	6

Oxford zones $+32°$ and $+33°$ (Goyal 1961-62). Consequently, in these zones also the galactic concentration of doubles is larger than the galactic concentration of stars in general. Further, quite a few stars with magnitudes $< 11{\cdot}0$ might turn out to be true binaries in $5'' < d \leqslant 10''$ when $\Delta m \leqslant 1{\cdot}00$ in $10'' < d \leqslant 15''$ when $\Delta m \leqslant 0{\cdot}6$ and almost all stars in $0'' < d \leqslant 5''$.

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