

Provisional orbits for three visual binaries

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Abstract. — This paper presents new orbits for two visual double stars COU 247 (CCDM 00095+1907) and ADS 3672 (STT 95, CCDM 05055+1948) and a revised orbit for ADS 15182 (A 772, CCDM 21395+3009) computed by the Thiele–van den Bos method.*

Key words: binaries: visual — astrometry

1. Introduction

This paper presents orbits for three visual double stars. In each case, the method of Thiele–van den Bos was applied using three fundamental points and the double of the areal constant value. For the computation of the orbital elements, a programme made by O. Nys (1983) was employed. For all the three stars, the position angles have been corrected to the equinox of 2000.0. The dynamical parallax and masses were computed using Baize–Romani method (1946).

2. COU 247 (CCDM 00095+1907)

$\alpha_{2000} = 00^{\text{h}}09^{\text{m}}5$, $\delta_{2000} = +19^{\circ}07''$, m 8.0–9.3, Sp G3V

With an arc of 45° covered by the observations, this star does not show a well curved motion in its apparent orbit. However, surprisingly the graphs of $\theta(t)$ and $\rho(t)$ showed a good consistency with the Kepler’s third law.

The three fundamental points and the double of the areal constant value were:

t	θ_{2000}	ρ
1969.00	$32^{\circ}00$	$0''.535$
1976.00	21.00	0.585
1988.00	358.00	0.430
Areal constant		–0.008972

which yielded the following orbital elements:

$P(\text{yr})$	60.52	i	$113^{\circ}2$	A	$-0''.3090$
T	1956.60	Ω_{2000}	$33^{\circ}7$	F	$0''.2955$
a	$0''.50$	ω	$238^{\circ}5$	B	$-0''.0054$
e	0.46			G	$0''.3206$

Table 1. Dynamical Parallax, Masses, and Ephemerides of COU 247

t	θ_{2000}	ρ	$V_r(\text{km/s})$
	π $0''.028$		$\mathcal{M}_{\text{AB}} 1.56 \mathcal{M}_{\odot}$
			$\mathcal{M}_{\text{A}} 0.91 \mathcal{M}_{\odot}$
			$\mathcal{M}_{\text{B}} 0.65 \mathcal{M}_{\odot}$
1996.000	$322^{\circ}8$	$0''.281$	–0.96
1998.000	308.6	0.259	–1.89
2000.000	292.5	0.251	–2.90
2002.000	276.4	0.257	–4.01
2004.000	261.8	0.276	–5.24
2006.000	249.4	0.301	–6.58
2008.000	238.9	0.326	–8.05
2010.000	229.7	0.342	–9.56
2012.000	220.9	0.338	–10.87
2014.000	211.0	0.302	–11.24
2016.000	196.2	0.223	–9.30
1973.247	33.7	0.267	6.91 V_{rmax}
2011.111	213.7	0.267	–11.30 V_{rmin}

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*Tables of observations and the residuals are published electronically only at CDS

The dynamical parallax, the masses, and ephemerides are given in Table 1.

3. ADS 3672 (STT 95, CCDM 05055+1948)

$\alpha_{2000} = 05^{\text{h}}05^{\text{m}}5$, $\delta_{2000} = +19^{\circ}48''$, m 7.0–7.4, Sp A5m

The observations extended from 1843 till 1991 (about 150 years) and cover an arc of about 60° . Although the observations show a great dispersion, the relative motion of the components is well marked. The secondary has been moving away from the primary since the first observation.

Retaining the following three fundamental points and the double of the areal constant value:

t	θ_{2000}	ρ
1850.00	346 $^{\circ}$.60	0''560
1890.00	329.30	0.780
1990.00	302.50	0.940
Areal constant		−0.003545

and after additional empirical corrections $\Delta \Omega = +1^{\circ}$ and $\Delta T = -1$ yr brought to Ω and T , the final orbital elements obtained were:

P (yr)	760.34	i	100 $^{\circ}$.7	A	0''0985
T	1833.68	Ω_{2000}	6 $^{\circ}$.6	F	3''0111
a	3''03	ω	272 $^{\circ}$.9	B	0''5732
e	0.97			G	0''2654

It appeared difficult to obtain a much better orbit than this very eccentric one except if one accepts a higher value of eccentricity. Using thus the Thiele–van den Bos–Dommanget (TBD) method (Dommanget 1978, 1981), a hyperbolic orbit was obtained showing also a good representation of the observations.

The dynamical parallax, the masses, and the ephemerides are given in Table 2.

4. ADS 15182 (A 772, CCDM 21395+3009)

$\alpha_{2000} = 21^{\text{h}}39^{\text{m}}5$, $\delta_{2000} = +30^{\circ}09''$, m 9.2–9.6, Sp A5

A first orbit for this star has been computed by Baize (1981), but the recent observations show a great departure from the calculated values. Therefore, a new orbit has been determined. The observations cover an arc of 150° , showing a very well-curved motion.

There are strong discrepancies of some recent (1973.47, 1977.58, 1978.62, 1981.70, 1984.82) observations due to the small value in angular separation. Their large (O-C) do not agree with the other observations and their departure from their mean is unavoidable.

An orbit has been computed using the following three fundamental points and the double of the areal constant value:

Table 2. Dynamical Parallax, Masses, and Ephemerides of ADS 3672

π 0''028		$\mathcal{M}_{\text{AB}} 2.28 \mathcal{M}_{\odot}$	
		$\mathcal{M}_{\text{A}} 1.20 \mathcal{M}_{\odot}$	
		$\mathcal{M}_{\text{B}} 1.08 \mathcal{M}_{\odot}$	
t	θ_{2000}	ρ	V_{r} (km/s)
1996.000	301 $^{\circ}$.1	0''946	2.28
1998.000	300.7	0.948	2.25
2000.000	300.2	0.950	2.22
2002.000	299.8	0.952	2.19
2004.000	299.3	0.954	2.16
2006.000	298.9	0.956	2.14
2008.000	298.5	0.958	2.11
2010.000	298.1	0.960	2.08
2012.000	297.6	0.962	2.05
2014.000	297.2	0.964	2.03
2016.000	296.8	0.967	2.00
1900.676	6.6	0.097	17.67 V_{rmax}
1754.709	186.6	0.097	−15.95 V_{rmin}

t	θ_{2000}	ρ
1920.00	3 $^{\circ}$.10	0''288
1960.00	320.20	0.256
1990.00	252.00	0.129
Areal constant		−0.001481

The elements were:

P (yr)	133.81	i	149 $^{\circ}$.8	A	−0''1816
T	1998.57	Ω_{2000}	72 $^{\circ}$.8	F	0''0397
a	0''21	ω	262 $^{\circ}$.6	B	0''0276
e	0.58			G	0''2078

Table 3. Dynamical Parallax, Masses, and Ephemerides of ADS 15182

π 0''006		$\mathcal{M}_{\text{AB}} 3.18 \mathcal{M}_{\odot}$	
		$\mathcal{M}_{\text{A}} 1.67 \mathcal{M}_{\odot}$	
		$\mathcal{M}_{\text{B}} 1.51 \mathcal{M}_{\odot}$	
t	θ_{2000}	ρ	V_{r} (km/s)
1996.000	204 $^{\circ}$.8	0''086	−3.65
1998.000	178.7	0.077	−1.66
2000.000	150.8	0.078	0.56
2002.000	125.7	0.088	2.50
2004.000	106.8	0.103	3.79
2006.000	92.8	0.119	4.49
2008.000	82.2	0.134	4.81
2010.000	73.7	0.149	4.91
2012.000	66.7	0.163	4.87
2014.000	60.8	0.176	4.76
2016.000	55.6	0.187	4.60
2022.483	72.8	0.088	4.91 V_{rmax}
1980.240	252.8	0.088	−5.70 V_{rmin}

which yielded a dynamical parallax, masses and ephemerides given in Table 3.

From the ephemerides, it can be seen that the components are moving fast. During the next few years they will reach their minimum value in angular separation. It will thus be urgent to put this pair on programmes with the speckle techniques.

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References

- Baize P., 1981, A&AS 44, 199
- Baize P., Romani L., 1946, Ann. Astrophys. 9, 13
- Dommanget J., 1978, A&A 68, 315
- Dommanget J., 1981, A&A 94, 45
- Nys O., 1983, Comm. Obs. R. Bel. 128, 3