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## ON THE DETERMINATION OF A CIRCULAR ASTEROID ORBIT WITH THE USE OF ITS SINGLE CCD-OBSERVATION (ALPHA, DELTA, ALPHA-DOT, DELTA-DOT, UT)

O. P. BYKOV<sup>1</sup> and V. V. KOMAROV<sup>2</sup>

<sup>1</sup> Pulkovo Observatory <sup>2</sup> St.-Petersburg University

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KEY WORDS Asteroids, orbits, CCD-observations

As is known, modern positional CCD-observation of a celestial body moving against the background of stars gives the coordinates (alpha, delta) and its first derivatives (alpha-dot, delta-dot) for a given moment UT. The accuracy of such CCDobservations is sufficient for the determination of a reliable circular orbit of the observed celestial body or its initial elliptical orbit on the assumption that the observation corresponds to the body's perihelion point. For these orbit determinations we put into practice the Method of Apparent Motion Parameters developed at Pulkovo Observatory by Dr. A. A. Kiselev and Dr. O. P. Bykov in 1973-80. This new method may be considered as an extension of Laplace's idea in the problem of initial orbit determination from positional observations. The Laplace and APM-method algorithms were published in (Bykov, 1989).

Due to the courtesy of Dr. D. Rabinowitz (USA) and Dr. E. Yagudina (Russia) we obtained a good opportunity to apply the results of American CCD-observations of asteroids made in May 1991 on the Spacewatch Telescope of the Steward Observatory on Kitt Peak. These CCD-observations consisted of positions and rates of their change for 926 asteroids referred to a fixed moment UT. We calculated the elements of initial orbits practically for each of these objects by AMP-method using alpha, delta, alpha-dot, delta-dot and UT only. Such information is likely to be the first used for orbit determination in astronomy.

Some results of our calculations for Numbered Minor Planets are presented in Table 1. In the first line, the number of the Minor Planet, its theoretical quantitative of the topocentric angular rates and its real orbital elements are given. In the second line, there are the same data resulting from CCD-observations and our AMPcalculations of a circular orbit.

		Ġ	Orbital elements					1991,
	(deg. per day)		a	e	$\Omega$ i (in degrees)		$M + \omega$	May, UT
MP 4060	-0.116	0.050	5.25	0.16	167.6	16.16	28	5.25
CCD 67	114	.054	5.34	0.00	174	17.9	42	
MP 2290	-0.208	0.077	2.59	0.24	155.6	11.52	44	5.26
CCD 73	228	.081	2.40	0.00	146	9.2	73	
MP 3026	-0.186	0.102	3.03	0.03	215.6	9.64	10	12.25
CCD 299	179	.106	3.02	0.00	217	10.2	9	
MP 1154	-0.190	0.035	3.39	0.07	82.6	4.55	148	13.28
CCD 345	210	.040	2.86	0.00	84	4.2	144	
MP 3689	-0.204	0.087	2.88	0.08	201.9	9.34	44	14.40
CCD 518	198	.091	2.82	0.00	202	9.0	36	14.40
CCD 533	201	.086	2.79	0.00	198	8.1	40	14.41
MP 518	-0.223	0.113	2.53	0.22	203.8	6.74	46	15.20
CCD 578	218	.113	2.37	0.00	205	6.7	22	
MP 1910	-0.168	0.089	3.05	0.05	200.7	10.33	18	18.32
CCD 862	167	.095	3.15	0.00	205	12.5	21	

Table 1

As follows from the table, our results are very close to real orbits, especially in the case of a real circular motion of the Minor Planet.

We believe that the AMP-method orbits may be used for identifications of observed celestial objects (Bykov and Komarov). These orbital computations can be produced in real time during CCD-observation of Near Earth Objects, for example Artificial Earth Satellites or Asteroids crossing the Earth orbit.

We present orbital elements derived for 15 asteroids from single CCD-observations.

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