

# Short arc CCD observations of celestial bodies: new approach

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A domination of CCD technique in modern Astrometry leads to inspection of a role and meaning of crowded celestial body positions obtained by a single small telescope during one night's hours and consequently distributed along supershort topocentric arc. Now positional CCD observations allows us to get asteroid coordinate sets with any time density and processes them in interactive mode. Such observational data consists an important information as to space motion of observed asteroid, namely the Parameters of its Apparent Motion (AMP), i.e. its topocentric angular velocity  $\mu$  and acceleration  $\dot{\mu}$ , positional angle  $\psi$  and curvature  $C$  of its trajectory. These values are calculated with statistical treatment of the CCD positions by means of time polynom approximation for each  $\alpha, \delta$  coordinate set. The AMPs were taken into consideration by Pulkovo astronomers with the beginning of the first Artificial Earth Satellite photographic observations. In Pulkovo observatory the new Apparent Motion Parameters Method was developed by Dr. A.Kiselev and his colleagues to determine initial elliptical orbit of observed celestial body on the base of parametr (  $\alpha, \delta, \mu, \dot{\mu}, \psi$  and  $C$  ). Our AMP-method that is a further developing of the classic Laplacian orbit determination method was successively applied for an investigation of the AES, Space Debris, small Solar System bodies and Double Stars.

The epoch of supremacy of CCD technique, the composition of the rich and accurate star catalogues and Pulkovo investigations of the super short arc information allows us to elaborate the new approach to the solution of the problem of observations of any celestial body moving on the background of stars. It is a fast analysis of CCD observations of moving object, its preliminary orbit determination and object's identification with orbital catalogues or, if an object is not known, further CCD observations with the use of ephemerides calculated by means of the Pulkovo AMP-method in an interactive mode.

The algorithms and software were developed in Pulkovo observatory for the fast analysis of any CCD frame where the moving celestial objects could be detected. Due to this approach we can get also new information for Celestial Mechanics as "by product" of dominating astrophysical CCD observations.