# MODIFICATION OF 'GAUSS' METHOD

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The method for determination of orbital elements of celestial bodies was developed by C.F.Gauss as early as at the beginning of the 19th century when the first asteroids were discovered. Up to the present time, this method has been successfully employed for preliminary orbit determination for both circumsolar and near-Earth orbital motion. However, the method presents some limitations in its usage. In particular, the orbital arc whose length is used for calculations should not be too long as in this case difficulties with soluti1on of some equations may emerge. On the other hand, the orbital arc should not be too short as in this case uncertainties associated with observational errors may occur.

These and other limitations of Gauss' method can be overcome by exploiting capabilities of modern computers. At a two-body approximation the orbital plane always intersects the centre of gravity. With this fact the orbital plane position can be independently determined using the method of exhaustive enumeration of all possible values of inclination and longitude of the ascending node. All orbital elements can be derived for each pair of elements i and Ω using Gauss' method for determination of orbital elements from two position vectors and instants of time. Based on these orbital elements, it is possible to define a celestial body's position for the current i and Ω. Using the differences between the observed and calculated in such a manner positions (O-C), it is possible to select the inclination and longitude of the ascending node which define the actual position of the orbital plane. It is evident that it is the minimum difference (O-C) that corresponds to the actual position of the orbital plane.

Thus, to ultimately determine the orbital plane using a modified Gauss' method, a priori information on the pattern of the celestial body's motion is required, particularly, whether its motion is direct or retrograde. This requirement is similar to that

one for the application of Gauss' method for determination of orbital elements from two position vectors and instants of time.

## TEMPORARY CAPTURE OF A SMALL BODY INTO A GEOCENTRIC ORBIT

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The radius of the Earth's activity sphere relative to the Sun exceeds 900,000 km. New asteroids whose orbits intersect this sphere have been discovered every year. It would appear reasonable that under certain conditions of an asteroid's approach to the Earth it can be captured into a geocentric orbit. Using the method for numerical simulation of test point masses in the gravitational fields of the Sun and major planets, we determined some orbital elements of the asteroids which are the most likely to be temporarily captured into geocentric orbits.

We came to the conclusion that semi-major axes of this orbits are take values close to 0.97 AU and 1.03 AU. Where in the heliocentric speed during rapprochement with the Earth should be near to 30.2 km/s and 29.2 km/s respectively.

We found that the most probable time of the existence of the asteroid in Earth orbit is 220 days. But if asteroid remains in Earth orbit for more 5 years s of such celestial bodies collides with the Earth.