THE USE OF NON OSCULATING ELEMENTS IN THE THREE BODY PROBLEM

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We are developing a special method to solve the three body problem. A set of non osculating elements is used with that purpose.

Two cases are to be considered:

a) The problem in the plane.

b) The general problem in the space.

We have chosen in the first case the eccentric anomaly, the longitude of the perihelium, the semi-major axis and the eccentricity as dependent variables. The time is the independent one.

The differential equation for the eccentric anomaly, corresponds to a special case already studied by Poincaré. This author found out a theorem by which it is possible to determine the behaviour of the solutions of the equations:

$$\frac{d^2x}{dt^2} - \alpha x = \mu\,(x, t, \mu)$$

α is any constant and μ is a parameter.

Gyldèn has put the solution of that equation in terms of pure periodic series. Poincaré has shown that, in the restricted problem, the series converge absolutely and uniformely for every value of the time t, if $\alpha > 0$.

The constant α is negative in all the methods developed up to present time. In our method α has a different value for every value of the time <u>t</u> and depends on the values of undisturbed quantities . In this way we are able to apply Poincaré's theorem for every value of the time t, with different values of the constant α.

The constant α is positive in the interval

$$90° < E < 270° \qquad (E = \text{eccentric anomaly})$$

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It can be easily shown that a new equation may be built up in order to get absolute and uniform solutions in the interval $70^\circ < E < 90^\circ$.

We got simple representations for the solutions of the remaining variables, in terms of series of Bessel's functions.

In the general case we kept the above mentioned set of dependent variables, except the longitude of the perihelium. We used the directional cosines P and Q as additional dependent variables.

The trouble is only apparent, because it is possible to express the variations of the P's and Q's in terms of the variations of the remaining dependent variables and of six absolute constants.