The Linear Stability on 1+2j-Body Problem

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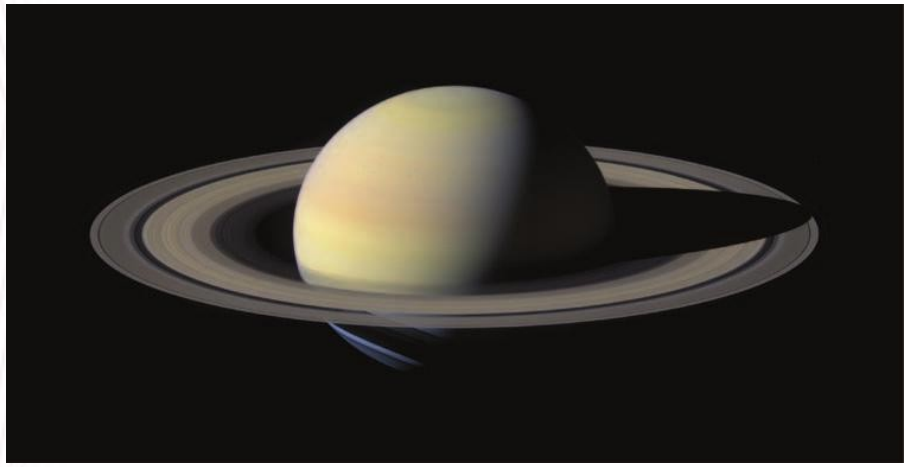
Background

- J. C. Maxwell, On the stability of the motion of Saturn's moons, 1859
- H. Salo, C.F. Yoder. The dynamics of coorbital satellite systems. 1988
- G.R. Hall. Central configurations in the planar 1+n body problem(preprint).
- R. Moeckel. Linear stability of relative equilibria with a dominant mass. 1994
- … …

Maxwell's Model

- Not uniformly solid
- Not continously liquid
- very small disconnected masses



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- For one ring:
  mass(ring)<= 2.298 *mass(Saturn)/n^{2}
- Average density of such a ring is smaller 1/300*density(Planet)
- Refer to : A.F.Cook, F.A.Franklin. Rediscussion of Maxwell's Adams Prize essay on the stability of Saturn's rings, 1964

Salo,Yoder, 1988

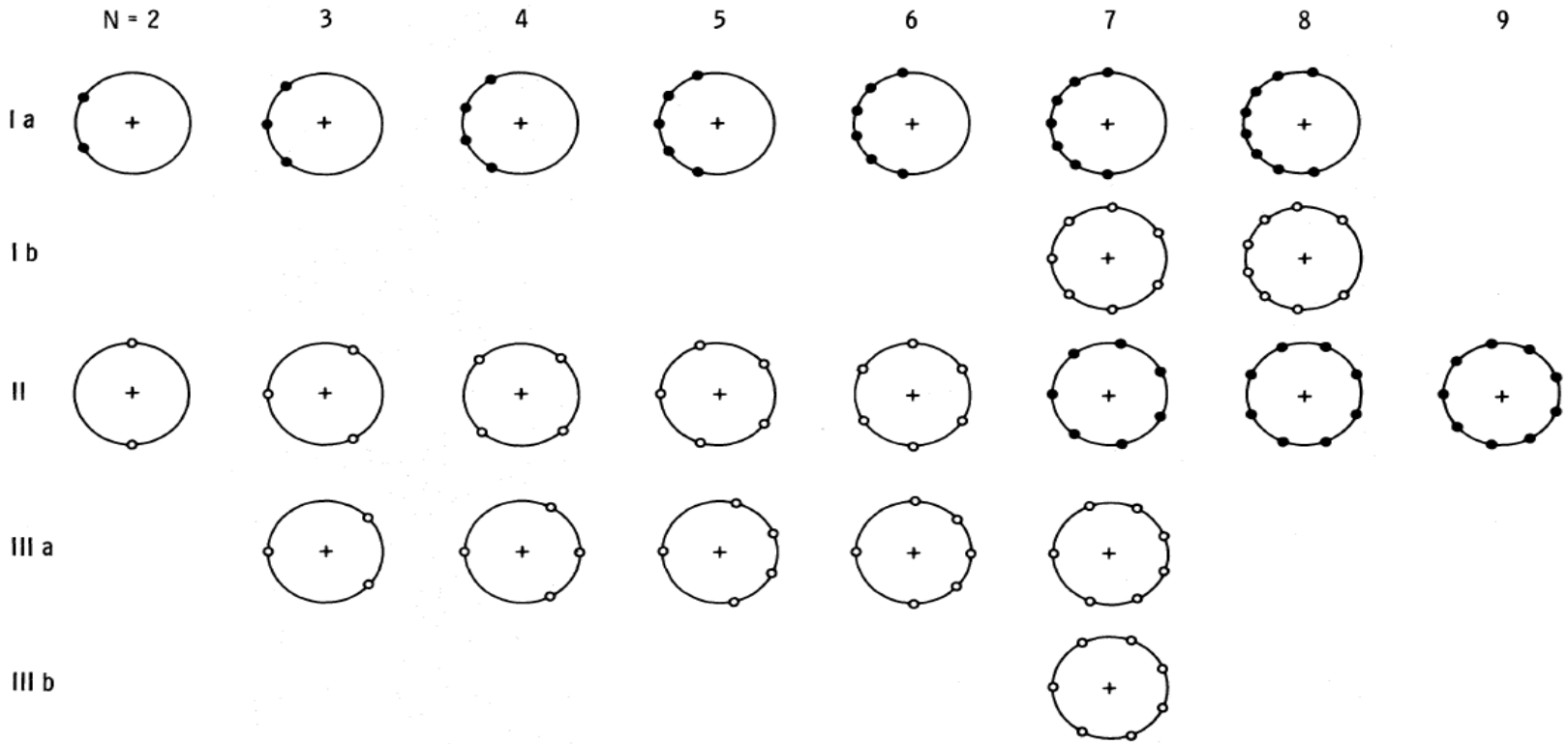

Fig. 2. Different stationary configurations for $N = 2$ to 9 identical satellites. Filled circles denote stable configuration

Hall's questions

- (1) We have found necessary conditions for 1+n body central configurations, what about the sufficient conditions?
- (2) Which configurations in which there are two zero masses with the same position are 1+n-body central configurations and is this equivalent to studying the problem of 1 large and n small but possibly unequal masses?

- (3) How large need n be before there is only one 1+n body central configuration without collisions?
- (4) Is there an usable numerical method for finding all the 1+n body central configurations even when n is reasonably very small?

The linear stability of 1+2j-body problem

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Or

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Questions

- Current research topic:

  There are one central dominant mass and two kinds of non-zero small masses, where the small masses are distributed on the vertices of two concentric regular poly-gons.

  Aim: The relationship between stability and the three masses, in addition, even with their positions.

- 1. For different small masses in 1+n-body problem, in which case will the total mass of the small masses be the largest?
- 2. Considering the elliptical motions of the small masses in the 1+n-body problem, how to find out the number of central configurations and their stabilities?
- 3. How to study the coorbital motions in three dimensional space for the 1+n-body problem?

Thank you!

Merci !