

POINCARÉ MAPS AND DYNAMICS IN RESTRICTED PLANAR  $(n + 1)$ -  
BODIES PROBLEMS.

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We perform the analysis of the  $n$ -center and the  $(n + 1)$ -body problems. They consist in the study of the motion of a infinitesimal particle subject to the attraction of  $n$  particles with equal mass, which are fixed or subject to their mutual attraction and are on the vertices of a regular polygonal. We reduce the dimension of the problem from 4 to 2 by using the energy relation and its associated Hill region, and the symmetries of the problem. The motion is studied by a careful election of transversal sections and a family of Poincaré maps in subsets of  $R^2$ . The main difficulty is the existence of orbits of collision or near collision with one of the primaries. Due to the special features of the problem we can deal with them using regularization techniques similar to Birkhoff's. The method applied involves several symplectic changes of coordinates to put our problem in a workable form. We present several simulations and study numerically the motion of the secondary.