**The Saari's conjecture in celestial mechanics**

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In 1970, D. Saari conjectured that the only solutions of the Newtonian $n$–body problem that have constant moment of inertia $I$ are the relative equilibria, that is motions where the particles move like a rigid body. In the case $n = 3$, there exists a computer assisted proof of this conjecture given by R. Moeckel in 2003. The extended Saari's conjecture establishes that if along an orbit of the $n$–body problem $IU^2$ is constant, then the orbit is a homographic solution, that is a solution where the configuration of the bodies is similar to itself when $t$ varies; here $U$ is the potential energy. In this talk, we give an analytical proof of this last conjecture for the collinear case. For $n = 3$ we also prove the extended conjecture for a huge set of initial data. Since $I$ constant implies $IU^2$ is also constant, the above results hold for the original Saari's conjecture.