



# Methods Of Orbit Determination

**Oliver Montenbruck, Eberhard Gill**

## **Methods Of Orbit Determination:**

**Methods of Orbit Determination** Pedro Ramon Escobal,1976      **Methods of orbit determination** Pedro R. Escobal,1985      **Satellite Orbits** Oliver Montenbruck,Eberhard Gill,2012-12-06 Satellite Orbits Models Methods and Applications has been written as a comprehensive textbook that guides the reader through the theory and practice of satellite orbit prediction and determination Starting from the basic principles of orbital mechanics it covers elaborate force models as well as precise methods of satellite tracking and their mathematical treatment A multitude of numerical algorithms used in present day satellite trajectory computation is described in detail with proper focus on numerical integration and parameter estimation The wide range of levels provided renders the book suitable for an advanced undergraduate or graduate course on spaceflight mechanics up to a professional reference in navigation geodesy and space science Furthermore we hope that it is considered useful by the increasing number of satellite engineers and operators trying to obtain a deeper understanding of flight dynamics The idea for this book emerged when we realized that documentation on the methods models and tools of orbit determination was either spread over numerous technical and scientific publications or hidden in software descriptions that are not in general accessible to a wider community Having worked for many years in the field of spaceflight dynamics and satellite operations we tried to keep in close touch with questions and problems that arise during daily work and to stress the practical aspects of orbit determination Nevertheless our interest in the underlying physics motivated us to present topics from first principles and make the book much more than just a cookbook on spacecraft trajectory computation      *Methods of Orbit Determination for the Microcomputer* Dan L. Boulet,1991

## **A Development and Comparison of Two Methods of Orbit Determination** Harry Louis Hughes,1967

**Manual Onboard Methods of Orbit Determination** Peter Bielkowicz,Roger C. Horrigan,Richard C. Walsh,American Institute of Aeronautics and Astronautics,1970      *Non-linear Orbit Determination Methods* Ali Hasan Nayfeh,1968

**Orbit's Determination Methods for Low-Earth-orbit Satellites** Olivier L'Hermitte,1997      *Methods for Initial Relative Orbit Determination Using Angles-only Observations* Ethan M. Pratt,Old Dominion University. Department of Mechanical and Aerospace Engineering,2014      **Theory of Orbit Determination** John David Anderson (Jr.),Jet Propulsion Laboratory (U.S.),United States. National Aeronautics and Space Administration,1963      *On Gauss's Method of Orbit Determination* Laurence G. Taff,MASSACHUSETTS INST OF TECH LEXINGTON LINCOLN LAB.,1979 This report presents a statistical version of the Gaussian initial orbit technique It neglects neither the angular velocity nor the radial velocity terms in the f and g series More importantly it provides a rigorous analytically simple result for the radius of convergence of the f and g series The radius of convergence can be extremely small at periastron approaching zero as the eccentricity of the orbit approaches unity The leading term is given by  $\sqrt{2(1-e^2)}$  to the  $3/2$  power  $P/3\pi$  as  $e$  approaches 1 where  $P$  is the orbital period This implies that initial orbit determination by any procedure which uses the f and g series is a process fraught with

the possibility of unknown errors      **A Numerical Evaluation of Preliminary Orbit Determination Methods** William F. Huseonica,1969      A general method of orbit determination by M. Schneider M. Schneider,1968      *A Numerical*

*Evaluation of Preliminary Orbit Determination Methods* William F. Huseonica,1970 This Technical Note presents a general FORTRAN Code and computer program flowcharts for twelve different Preliminary Orbit Determination Methods PODM A number of solutions were obtained from each PODM using input data from a predetermined reference orbit A comparison of these PODMs in their ability to converge error propagation computation time and total computer core requirements is presented

*Application of Initial Orbit Determination Methods to Telescope Observations* Carson Hunsberger,2022 Space Domain Awareness is aimed at providing timely and accurate information of the space environment This was originally done by maintaining a catalog of space objects states position and velocity With the ever increasing population of man made space debris in orbit explosions collisions and potential impacts of near Earth objects it has become imperative to modify the traditional approach to a more predictive tactical and exact rendition Hence a precise orbit propagation model coupled with state of the art orbit determination techniques need to be developed which warrants a better understanding of the perturbations in the near Earth space Additionally the sensors used to track these objects in space have to be tasked appropriately to observe and catalog these Resident Space Objects RSO This work outlines the intricacies of using inertial measurements from an observation site on the surface of the Earth Optical measurements from the Falcon Telescope Network nodes at Penn State and Colorado managed by USAFA is utilized to schedule observations of objects in the geosynchronous belt An orbit determination algorithm is implemented to obtain the osculating orbital elements of the observed RSO Further a rudimentary sensor tasking strategy is developed by modeling the dynamics equations in a topocentric frame thereby allowing for fast generation of a tasking surface Its utility is demonstrated through simulations showing detections of over 200 RSOs from the geosynchronous satellite catalog

**A Computerized Survey of a Selected Subset of Initial Orbit Determination Methods** Durand Ennis Cleveland,1972      Preliminary orbit determination for

orbital rendezvous using Gauss' method Bryan E. Bingham,2007      **Filtering theory methods and applications to the**

**orbit determination problem for near-earth satellites** Kenneth Alan Myers,1974      **A Comprehensive Comparison**

**Between Angles-only Initial Orbit Determination Techniques** Andrew Vernon Schaeperkoetter,2012 During the last two centuries many methods have been proposed to solve the angles only initial orbit determination problem As this problem continues to be relevant as an initial estimate is needed before high accuracy orbit determination is accomplished it is important to perform direct comparisons among the popular methods with the aim of determining which methods are the most suitable accuracy robustness for the most important orbit determination scenarios The methods tested in this analysis were the Laplace method the Gauss method using the Gibbs and Herrick Gibbs methods to supplement the Double R method and the Gooding method These were tested on a variety of scenarios and popular orbits A number of methods for quantifying

the error have been proposed previously Unfortunately many of these methods can overwhelm the analyst with data A new method is used here that has been shown in previous research by the author The orbit error is here quantified by two new general orbit error parameters identifying the capability to capture the orbit shape and the orbit orientation The study concludes that for nearly all but a few cases the Gooding method best estimates the orbit except in the case for the polar orbit for which it depends on the observation interval whether one uses the Gooding method or the Double R method All the methods were found to be robust with respect to noise and the initial guess if required by the method All the methods other than the Laplace method suffered no adverse effects when additional observation sites were used and when the observation intervals were unequal Lastly for the case when the observer is in space it was found that typically the Gooding method performed the best if a good estimate is known for the range otherwise the Laplace method is generally best *Algorithms for Satellite Orbital Dynamics* Lin Liu,2023-06-20 This book highlights the fundamental physics of orbit theory dynamical models methods of orbit determination design measurement adjustment and complete calculations for the position tracking and prediction of satellites and deep spacecraft It emphasizes specific methods related mathematical calculations and worked examples and exercises Therefore technicians and engineers in the aerospace industry can directly apply them to their practical work Dedicated to undergraduate students and graduate students researchers and professionals in astronomy physics space science and related aerospace industries the book is an integrated work based on the accumulated knowledge in satellite orbit dynamics and the author s more than five decades of personal research and teaching experience in astronomy and aerospace dynamics

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