Mathematical Modeling and Consulting

Sponsor

Sponsor Name

Final Report

Insurance Redlining

Team Members

John Doe (Project Manager), Home Department
john.doe@jhu.edu

Jane Doe (Report Coordinator), Home Department

Academic Mentor

Dr. N. .H. Lee, Applied Mathematics and Statistics
nhlee@jhu.edu

Consultant

Jason Bourne

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Abstract

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Lemmas

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Glossary

Ascending node. The point where the satellite crosses through the equatorial plane in a northerly direction.

Earth-centered inertial frame. A frame of reference whose origin is the center of the earth and which does not rotate with respect to inertial space.

Earth-centered rotating frame. A frame of reference whose origin is the center of the earth but which rotates with the earth.

Footprint. The intersection of a visibility cone with the surface of the earth.

Great circle of arc. The shortest path between two points on the surface of the earth.

Groundtrack.The location of the center of a visibility cone footprint on the surface of the earth.

Inclination. The angle between the normal to the orbit plane and the normal to the equatorial plane.

LEO. An orbit with an altitude approximately below 2,000 km.

Molniya orbit. A highly elliptical orbit with an orbital period of half a day.

Projection distance. The distance between the center of the visibility cone footprint and a point of interest projected onto the plane orthogonal to the vector defining the visibility cone center and tangent to the earth surface.

Right ascension of the ascending node. The angle between the unit vector $\boldsymbol{X}$ and the point where the satellite crosses the ascending node, measured counterclockwise when viewed from the north side of the equatorial plane.

Appendix C

Abbreviations

ECI. Earth-centered inertial frame

ECR. Earth-centered rotating frame

LEO. Low Earth Orbit

RAAN. Right ascension of the ascending node

Selected Bibliography Including Cited Works

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Because an online reference may be changed at any time, it is conventional to tie the reference to the date when the resource was accessed.

[2] Roger R. Bate, Donald D. Mueller, and Jeremy E. While. *Fundamentals of Astrodynamics.* Dover, 1971.

A standard textbook on astrodynamics. It provided a reference for orbital mechanics and satellite propagation.

[3] Ingrid Carlbom and Joseph Paciorek. Planar Geometric Projections and Viewing Transformations. *Computing Surveys*, 1978.

Gives a thorough background to projective geometry and vertical perspective projection. This includes details about calculating projections using homogeneous coordinates and projection matrices.

[4] Gelfand and Fomin. *Calculus of Variations.* Prentice-Hall, 1963.

Discusses the essential principle of variational method for optimal path problems.

[5] George Grätzer. *More Math Into LaTeX.* Birkhäuser, Boston, MA, fourth edition, 2007.

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[7] David A. Vallado. *Fundamentals of Astrodynamics and Applications.* Space Technology, 2007.

A professional astrodynamics reference. It emphasizes the practical use of astrodynamics in space missions.

[8] Emo Welzl. Smallest Enclosing Disks (Balls and Ellipsoids). *New Results and New Trends in Computer Science*, 1991.

Outlines a smallest circle algorithm that runs in linear time using recursion.