



AE 262 Jan 3:0

Guidance Theory and Applications

Instructor

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Email:

Department: Aerospace Engineering

Course Time:

Lecture venue:

Detailed Course Page:

Announcements

Brief description of the course

This is a graduate level introductory course on guidance theory and its applications to a wide variety of aerospace vehicles. From the very fundamentals of kinematics of motion, the course first introduces and analysis the relative engagement geometry for planar engagements. The concepts of collision course and collision triangle are introduced followed by detailed discussions on classical guidance law of Pure Pursuit and Deviated Pure Pursuit. Next part of the course deals with a thorough analysis of Proportional Navigation and its variants. The course also covers the topics of line-of-sight guidance and optimal control based guidance laws.

Prerequisites

None

Syllabus

Fundamentals of guidance; interception and avoidance; taxonomy of guidance laws, classical and empirical guidance laws; applied optimal control and optimal guidance laws; differential games and pursuit evasion problems. Recent advances in guidance theory. Collision detection and avoidance

strategies. Applications to guided missiles. Unmanned aerial vehicles and mobile robots.

Course outcomes

The students are expected to thoroughly grasp the following

1. Understanding of relative engagement geometry and central concepts in interception and avoidance.
2. Classical guidance theory: Its development and analysis.
3. Optimal control theory and its application to aerospace engineering.
4. Trajectory simulations using MATLAB
5. Recent advances in aerospace guidance and the research perspective.

Grading policy

Mid Term 25%

Assignments 25%

Term Project 25%

Final Exam 25%

Assignments

Assignments mostly involve MATLAB simulation exercises for the guidance laws and scenarios discussed in the class. Numerical and analytical problems are also a part of the assignments.

Resources

Zarchan, P., Tactical and Strategic Missile Guidance, AIAA Publications, 4th Edition, 2002.

G.M. Siouris, Missile Guidance and Control Systems, Springer Verlag, 2004.

N.A.Sneyhdor, Missile Guidance and Pursuit, Ellis Horwood Publishers, 1998.

Current Literature