# Research Project 2 - Differential Games Guidance with an Intercept Angle Constraint and Varying Speed Adversaries

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This research project proposes a linear quadratic differential games guidance law, which enables target interception while imposing a predetermined terminal intercept angle with varying missile and target speeds. Imposing the terminal intercept angle can be used to increase warhead lethally, to improve observability, and to intercept the target from less defended directions. The guidance law is derived for linear, arbitrary order missile and target dynamics, using differential games theory. Unlike previous solutions, which usually assume constant missile and target speeds, time dependent speed profiles of the adversaries are addressed, to cope with more realistic scenarios. The problem is solved analytically and specific closed-form results are provided for ideal missile and target dynamics and adversaries with constant axial accelerations. The performance of the proposed guidance law is investigated using a non-linear two-dimensional simulation and the results are compared to two state-of-the-art optimal control and differential-games-based guidance laws that can impose the intercept angle. It is shown that the proposed guidance law can intercept the target with small miss distances and intercept angle errors and that it has better performance than the compared state-of-the-art guidance laws, when the target is trying to evade and the missile's and target's speeds vary.