NORTHERN ARIZONA UNIVERSITY

Department of Mathematics and Statistics

COLLOQUIUM
Tuesday, October 25th, 2015
4:00 – 5:00 pm, Adel Mathematics Bldg., Room 164
(refreshments at 3:45)

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NAU

Predictive Communications for UAV Systems

Abstract: High speed fixed-wing UAVs form a rapidly changing dynamic network configurations, therefore utilizing classical communication algorithms which are primarily designed for low-speed network users is highly inefficient. In this project, we propose to use predictive communications, where the core idea is two-fold: i) using a framework to predict network configuration based on UAV motion trajectories; and ii) incorporating the results of this predictive framework in different communication algorithms. We consider, fixed wing UAVs, where the motion trajectories are modeled as Gaussian Markov Motion Model (GMMM) based on popular Dubin's curve with noisy observations. We study a scenario where each UAV with a limited number of measurement resources monitors the surrounding UAVs through noisy channels. We propose a measurement policy based on Kalman filtering with intermittent observations in order to optimally assign the measurement resources among the UAVs during a measurement cycle.

As an implementation example, we illustrate the utility of the proposed predictive modeling by developing a predictive routing algorithm based on the celebrate Dijkstra's shortest path algorithm. The core idea is accounting for the time-varying pairwise node distances in finding the optimal path by considering the anticipated node locations when they are met by data packets. This approach significantly outperforms the conventional method of considering static network configurations.

Algebra Combinatorics Geometry and Topology (ACGT) Seminar meets every Tuesday, 12:45 – 1:45 pm, AMB 164.

Applied Math Seminar (AMS) meets every Thursday, 12:45 – 1:45 pm, AMB 164, as announced. Etude Oneel-Judy will discuss "Modeling the Non-Euclidean Geometry of Flat Minkowski Space Using Projective Euclidean Surfaces." This project explores the conceptual and mathematical development of a new representation of flat Minkowski space that visually encodes the geometric properties of flat spacetime. Further work and potential applications of this model will be discussed.

Friday Afternoon Undergraduate Mathematics Seminar (FAMUS) meets Fridays, 3pm, AMB 164.