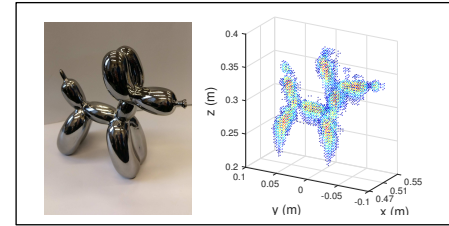**EEPxx Fall 2022 Radar Signals and Systems**

Instructor: Matt Reynolds

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Class Schedule: TBD

Objectives

This course will provide a hands-on introduction to radar system design with an emphasis on radar signal processing. We will focus on emerging commercial and industrial applications for radar, such as automotive radar, short-range radar sensing for UAVs, and radar imaging.

Students will construct a low-power radar system using a software defined radio (SDR) and conduct a series of hands-on experiments including data collection and MATLAB/Python signal processing to demonstrate such applications as person tracking, automotive adaptive cruise control, UAV identification and classification via micro-Doppler signatures, and synthetic aperture radar (SAR) imaging.

Prerequisites

Basic knowledge of electromagnetics (EE 361) and signal processing (EE 242). For the experimental work, students should have a working knowledge of MATLAB or Python. Example code will be provided in MATLAB but students are welcome to program in Python if they prefer. Students will need to provide a Windows 10 laptop capable of running either MATLAB or Python.

Course Materials

Class web site - lecture notes and journal papers

Reference Text: Fundamentals of Radar Signal Processing - Mark A. Richards

HW & Lab

Group lab time will be scheduled during the week for data collection. There will be 1 hardware-focused lab session+report where students will fabricate and test their own antennas for their SDR setups, followed by 6 take-home assignments to process and analyze their data.

Tentative Course Topics

1. Radar Cross-Section and the Radar Equation
2. Radar System Design - Transmitters, Receivers, and Antennas
3. Radar Signal Processing: The Doppler space
4. Radar Signal Processing: Range-Doppler maps
5. Radar Signal Processing: Array processing
6. Radar Signal Processing: Synthetic Aperture Radar (SAR) and Inverse SAR (ISAR)

Grading Policy

The final grade will be based on the lab report and the 6 take-home signal processing assignments. There will be no final exam.