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Rail Synthetic Aperture Radar (SAR) Demonstration System

1 Background

Applied Radar, Inc. currently employs several antenna and radar test/demonstration platforms including an anechoic chamber, near-field system, roof top radar demonstration system (RDS), and a mobile radar demonstration system (MRDS). To enhance its RF demonstration capabilities, Applied Radar has acquired the necessary hardware to implement a Rail SAR Demonstration System (RSDS) on the roof of its office building. As part of the RSDS program, Applied Radar is looking to complete design and development of the Rail SAR Demonstration System and demonstrate its capabilities by analyzing SAR data taken from the rooftop.

2 Project Goals

The overall goal of this project is to complete the design and integration of a Rail SAR Demonstration System. A major task will involve writing control software for the digital servo drive, which provides motion control signals to the servo motor. In addition to controlling the servo motor, and thus motion of the 30-foot belt driven actuator, the servo drive will need to account for feedback signals from two encoders and three proximity limit switches. Additional tasks will include designing the antenna mount and its mechanical interface with the rail carrier, implementation of existing RF hardware, writing a GUI interface, and synchronizing radar timing data with positional and speed data from the servo drive. The end result will be a rooftop mounted RSDS that is fully controllable from inside the laboratory.

3 Required Skills

This project encompasses many skill sets, including mechanical, electrical, and computer engineering. All team members will be responsible for writing the motion control software for the servo drive, which communicates using the CAN-bus standard. The electrical engineer(s) will be primarily responsible for RF system integration, synchronization between the radar system and the rail system, control and data bus wiring, and calibration. The computer engineer will be primarily responsible for creating a robust control GUI, collecting and storing speed and positional data, and performing analysis of SAR data. The control software must be written in Qt Creator. Any processing algorithms will be written using Matlab.

Applied Radar has a team of digital and RF design engineers and a mechanical engineer available to assist the Capstone team throughout the project. The Capstone team will be able to leverage any previously completed design work on the Rail SAR system as well SAR processing algorithms developed by the 2010-2011 MRDS Capstone team.