A PARAMETERIZED SIMULATION OF DOPPLER LIDAR

by

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CONTENTS

CHAPTER 1

LadarSIM

LadarSIM is a robust parameterized tool for simulating lidar systems, which has been developed at Utah State University's Center for Advanced Imaging Ladar (CAIL) since 2003 [4, 5]. LadarSIM was originally developed to simulated pulsed time-of-flight lidar systems and has the flexibility to simulate a wide range of these systems by simulating parameterized lidar transceiver, focal plane arrays, and pointing/scanning systems, as well as the interaction of the lidar with a simulated 3D scene.

CHAPTER 2

Frequency Modulated Continuous Wave Detection

2.1 FMCW Basics

Frequency Modulated Continuous Wave (FMCW) detection refers to a radar/lidar system in which a continuous wave of known frequency is modulated in amplitude, transmitted, and the reflected signal is detected. A continuous wave radar in which a single microwave oscillator serves as both the transmitter and local oscillator (LO) is, generally speaking, a homodyne radar. Frequency modulated continuous waveform (FMCW) radar systems often leverage a homodyne architecture.

A continuous wave radar in which a single microwave oscillator serves as both the transmitter and local oscillator (LO) is, generally speaking, a homodyne radar. Frequency modulated continuous waveform (FMCW) radar systems often leverage a homodyne architecture. In FMCW homodyne radar the continuous wave signal is modulated to create a linear chirp which is transmitted via antenna toward a target. The return echo signal, which is delayed in time, is mixed with the LO signal. The result is a signal which is comprised of a linearly increasing chirp signal, which is actively filtered out, and the beat frequency which is used for detection [6].

2.2 Simplified Homodyne Detection

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