ELECTRICAL ENGINEER

DELAY-BASED COMMUNICATION IN PACKET SWITCHED NETWORKS
Daniel B. Copeland-Lieutenant, United States Navy
B.S., The University of Texas at Austin, 1995
Master of Science in Electrical Engineering-September 2002
Electrical Engineer-September 2002
Advisor: John McEachen, Department of Electrical and Computer Engineering
Co-Advisor: R. Clark Robertson, Department of Electrical and Computer Engineering
Co-Advisor: Herschel H. Loomis, Jr., Department of Electrical and Computer Engineering

While a great deal of research has been done on traditional amplitude and frequency-based communication, much less research has been done on delay-based communications. This thesis explores using Packet Position Modulation (PkPM), a delay-based communication method in a packet switched network. Error mitigation in various timing channels is examined to determine the feasibility of PkPM in different networks. Synchronization issues that arise when packets are lost in the network are also explored. Java code was written to implement PkPM to allow flexibility in the testing methods. OPNET simulations are used to test PkPM in different network sizes with different traffic loads. Comparisons are also made to previously proposed methods for error mitigation in delay-based communications. Simulations show that the PkPM method proposed here gives reasonable throughputs with low error rates in a variety of networks.

KEYWORDS: Delay-Based Communication, Packet Position Modulation, Packet Switching, Timing Channels

PERFORMANCE ANALYSIS OF A DIGITAL IMAGE SYNTHESIZER AS A COUNTER-MEASURE AGAINST INVERSE SYNTHETIC APERTURE RADAR
Fernando LeDantec-Lieutenant, Navy of Chile
B.S.S.E., United States Naval Academy, 1992
B.S.E.E., Naval Polytechnic Academy-Chile, 1995
Master of Science in Electrical Engineering-September 2002
Electrical Engineer-September 2002
Chairman of Committee: Phillip Pace, Department of Electrical and Computer Engineering
Committee Member: Douglas J. Fouts, Department of Electrical and Computer Engineering
Committee Member: David C. Jenn, Department of Electrical and Computer Engineering

This thesis is concerned with the development of a model to analyze a Digital Image Synthesizer (DIS) integrated circuit designed to create false target images to deceive Inverse Synthetic Aperture Radar (ISAR). The DIS is able to recreate the scattering effect of a moving target by using appropriate phase and gain modulations on an intercepted ISAR chirp signal before retransmitting it with the proper time delay. The DIS signal processing and the ISAR compression of the modulated return are modeled to examine the range-Doppler profile of a synthesized false target image. The image is representative of the image that would appear on an ISAR display. ISAR image quality is used to evaluate different DIS architectures and bit formats. Evaluation of the image quality is based on the deviation from an infinite resolution false target image. The results obtained from evaluating different DIS architectures indicate that the design is tolerant of significant quantization errors. The model is used to validate the architecture of the integrated circuit being fabricated. Finally, various different ISAR integration times and pulse repetition frequencies are used to confirm the integrity of the model.

KEYWORDS: Digital Image Synthesizer, DIS, Inverse Synthetic Aperture Radar, ISAR, Synthetic Aperture Radar, SAR, False Target