High Performance Millimeter Wave Edge Imaging System Based on Zynq7000

Huan Huang
Chongqing University of Posts and Telecommunications, Chongqing City

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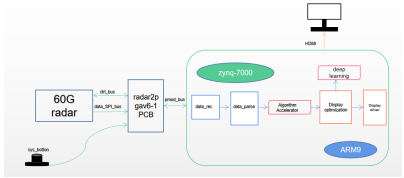
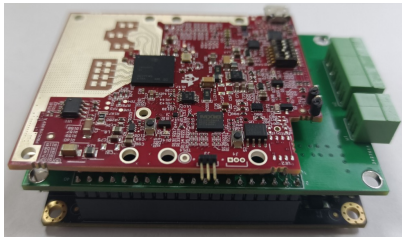
INTRODUCTION

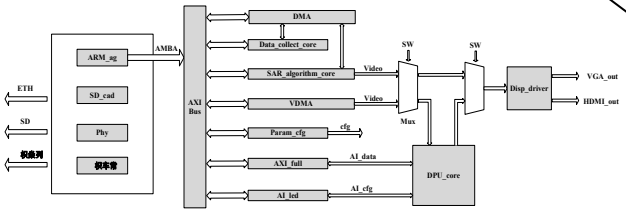
Using the advantages of **millimeter wave radar technology**, this project uses multiple input multiple output (MIMO) radar chip IWR6843 and Zynq7000 fully programmable FPGA SOC to form a millimeter wave edge acceleration processor **imaging system**, which can replace the single popular Ti millimeter wave sensor +DCA1000 system scheme in the industry of colleges and universities at home and abroad, and realize slide control, high-speed radar echo signal acquisition and analysis, and millimeter wave imaging and the cost is only about a quarter of the former. The millimeter wave band of the system works at **60-64Ghz**, and can be used in millimeter wave security inspec





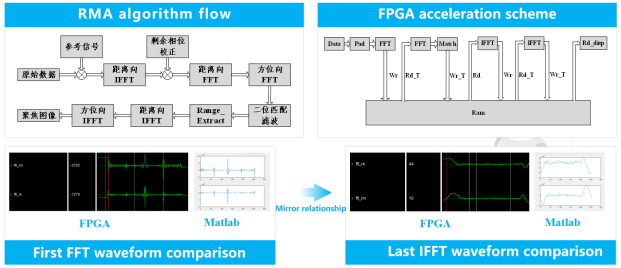
Overall design and physical picture of core processing module

Architecture and structure of imaging system



High-performance millimeter wave imaging system can support high-resolution observation, including a high-speed radar data acquisition module supporting **40MHz SPI** and MMW imaging module based on **RMA**.

FPGA Implementation of RMA Imaging Algorithm



Using the **Frequency domain data processing technology**, utilize FFT to convert the original radar signal into the frequency domain, then use matched filtering to eliminate noise, and perform inverse FFT on the data to change back to the time domain.**Efficient data transmission mechanism**, using 16bits fixed-point number for calculation and only one block of RAM for storage.

CREATIVE DESING

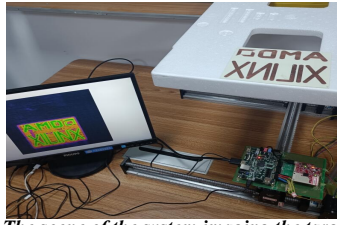
On board test by Z7-Lite

RESULT

The system performs an imaging test on the self-made resolution plate which is composed of several metal strips.The order of strips arrangement is 10mm, 7mm, 5mm, 4mm, 3mm.From the imaging results below, we can clearly see the separation of 3mm metal tones, **which basically reaches the theoretical limit resolution of 300mm synthetic aperture** in this work.

resolution plate

Imaging results



The scene of the system imaging the target board with AMD-Xilinx logo