

A Linear Tuning Control System for Laser Array based on Xilinx Zynq

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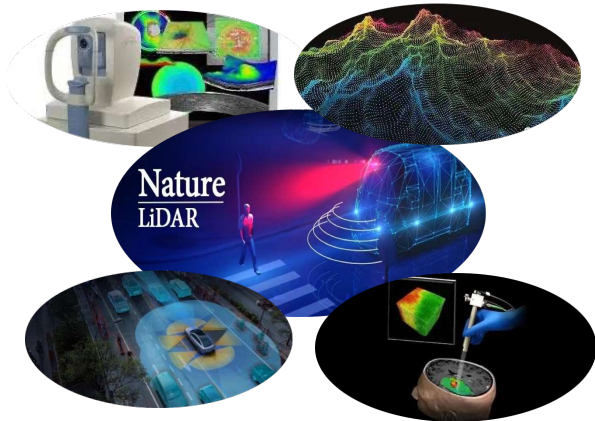
AMD
XILINX
OpenHW2022



On board test by PYNQ-Z1

INTRODUCTION

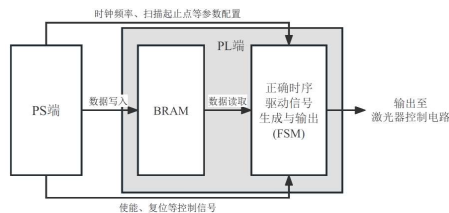
Tunable lasers refer to lasers with continually adjustable output wavelength. These lasers are widely used in laser radar (LIDAR), optical coherence tomography (OCT), fiber grating sensor and other areas. On most occasions, **high linearity of laser wavelength** is a necessity of high accuracy and resolution ratio, whereas laser light sources with strict linear tuning is difficult to obtain.



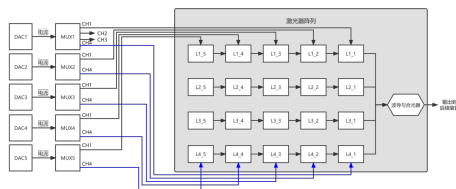
Nature LIDAR

Application of tunable lasers

Design architecture of the zynq system



Structure of the laser array and its control system



Data flow by the FSM method

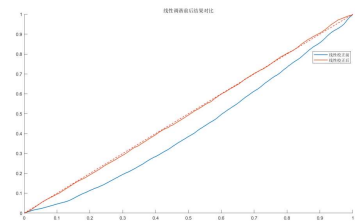


The system achieves driving a **4x5 tunable laser array** to output scanning laser signal. By processing output signal as feedback, the system instantaneously adjusts the drive current to acquire better linearity of lasers' output wavelength. We combine with the **high performance of FPGA and the advantages of MPU programmability**. By modifying **BRAM data**, any scanned waveform can be output to achieve data correction.

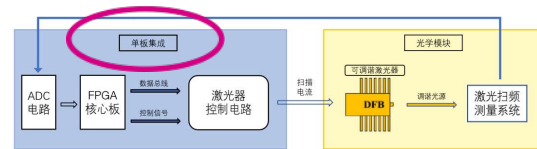
CREATIVE DESIGN

RESULT

The linear tuning control system shows great effect on the laser array. In the future, we try to integrate the function of **controlling, feedback and data processing** on only a FPGA board neither use PC to block the data flow.



Linear performance of laser array before and after correction



Integrated FPGA board of future design