

Receive Beamformer (RXBF)

Medical Imaging DSP Applications Team

1 Description

The purpose of the receive beamformer unit is to provide the software modules necessary to perform receive beamforming on a DSP. In receive mode, the beamformer produces a signal that represents the echo characteristics of the tissue along a given scanline for a time duration that corresponds to the desired depth of imaging. Since multiple transducer elements are needed and they are not collocated with one another, their spatial position with respect to the scanline must be well understood so that the elements are triggered appropriately in transmit mode and the echo signals are properly processed in receive mode. A common beamformer implementation in the receiver is to delay and sum the signals from the transducer elements in such a way as to produce a signal that has been focused at each sample point along the given scanline [1] [2].

Project collateral discussed in this document can be downloaded from the following URL:
<http://www-s.ti.com/sc/techlit/sprs620.zip>.

2 Kernel Complexity (C64x+™ CPU cycles, based on CPU cycle accurate Simulator)

- Data Summing, `rxBf_sumData()`: 79,134 (B=1;K=8;M=64;N=128;P=10) 152,862 (B=1;K=8;M=128;N=128;P=10)
- Data Filtering, `rxBf_filterData()`: 7,682 (B=1;K=8;M=64;N=128;P=10) 7,682 (B=1;K=8;M=128;N=128;P=10)
- Data Combining, `rxBf_combineData()`: 861 (B=1;K=8;M=64;N=128;P=10) 861 (B=1;K=8;M=128;N=128;P=10)
- Memory Zeroing: 1,746 (B=1;K=8;M=64;N=128;P=10) 1,746 (B=1;K=8;M=128;N=128;P=10)

where

B is the number of scanlines

K is the number of interpolation filter coefficients

M is the number of receive data channels

N is the number of output samples per iteration of the beamformer

P is the number of interpolation filters

3 Memory

Memory	Size in Bytes
Persistent	$\sim 10 * M * N + 10 * P + 6 * K * P + 124$
Program	<code>rxBf_common(4000)</code> , <code>rxBf</code> (2816)

4 References

1. Thomenius, Kai E., *Evolution of Ultrasound Beamformers*, Proceedings From the 1996 IEEE Ultrasonics Symposium, Vol. 2, November 3-6, 1996, pp.1615-1622.
2. Walker, J.T. and J.D. Meindl, *A Digitally Controlled CCD Dynamically Focused Phased Array*, Proceedings of the 1975 Ultrasonics Symposium, pp. 80-83.

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