Doppler Color Flow Estimator (1D)

Medical Imaging DSP Applications Team

1 Trademarks

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2 Description

The purpose of Doppler color flow estimator is to provide the necessary tools to estimate blood flow parameters like flow velocity, turbulence and power, using the decimated RF demodulated data. There are a large variety of techniques to achieve this basic goal and the underlying algorithms lend themselves to a large degree customization. Hence this package provides a set of necessary functions to build this application, but leaves it to the equipment developer to tie up suitable building blocks, add additional modules, if necessary, and build up the application. This set includes functions to compute the complex autocorrelation and 1D power estimates from the ensembles of input data. It also includes functions to use these complex autocorrelation and power results to compute the flow velocity (1D) and flow turbulence (1D) as explained in [1].

Project collateral discussed in this document can be downloaded from the following URL: http://www.ti.com/lit/zip/sprs622.

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

- Flow Power and complex correlation: 1.5 D * N + 7.5 * D + 82
- Flow Velocity computation: 4.5 D + 114
- Flow Turbulence computation: 5.5 D + 202

where

D = Number of samples per scan-line
N = Number of ensembles

4 Cycles on TMS320C6455 EVM

The performance is given for several example cases on the C6455 EVM in cycles. The test bench for Color Flow (1D) can be used to find cycles of interest for any other valid configuration.

D	N	Test Case	Correlation	Velocity	Turbulence	Total
256	16	1	8272	1266	1628	11166
256	32	19	14416	1266	1628	17310
33	5	21	550	209	292	1051
64	16	21	2087	344	457	2888

5 Memory

Memory	Size in Bytes
Data	• 600 persistent • 2*D temporary
Program	~1KB (dpucolor1d) + ~1KB(atan2+cplxMag)

6 References

1. Kasai, C., Namekawa, K., Koyano, A., and Omoto, R., *Real-Time Two Dimensional Blood Flow Imaging Using an Autocorrelation Technique*", IEEE Trans. Sonics Ultrasonics, vol. SU-32, pp. 458-464, 1985.
2. Shima, J.M., *FM Demodulation Using Digital Radio and Digital Signal Processing*", MS Thesis, University of Florida, 1995.
3. Lyons, R.G., *Understanding Digital Signal Processing*, Pearson Education, Nov. 1996.

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