Detailed Road map Modifications

PS side = A.x

PL side = B.X

PS & PL mod's to Lab #0 in order to complete Lab #1!

A.1 modify common.h.

	BEGIN	After	
MAX_HISTO_VALS	2048	1024	
DIST_RANGE	2048	1024	
LV_BOUND	256	128	(.0625)*(2048)
HV_BOUND	3840	1920	(.9375)*(2048)

end of changes @ common.h

A.2 modify histo.c

no change @ void ComputeHisto()

no change @ int ReadData()

no change @ void LoadUnload BRAM()

{-- 'export to' stays the same, but 'import from' will be ½ size of previous program version...}

Yes change @ int (main)

- ++ ~ Line 274
  - add new array data_diffs_arr_in (should be ½ of old size)
  - (only for internal 'c' use, for controller purposes still export the raw 4096 data set)
- ++ ~ Line 275
  - Differencing process done on data_arr_in
    - < Insert Array math here >
- Change ComputeHisto call @ L:284

Before

call (..., ..., data_arr_in, ..., ...)

After

(..., ..., data_difs_arr_in, ..., ...)

end of changes @ Histo.c

end of PS changes

Changes to PS side = A.X
Changes to PL side = B.X

Hardware changes
Algorithm: Difference the upper/lower PN values. DO Histo on these

B.1 Create Registers...

B.11 Set up registers for values to be diff'd
Setup registers for outcome of diff'

B.12 set up BRAM space to stack results in DataTypes_pkg...

Add PN_DIFFS_BRAM_SIZE_NB
- BRAM_BASE
- UPPER_LIMIT

B.13 set datatype constants, new Diff's value must accomodate larger intergers i.e. -UPPER value - (+LOWER value) = Very large (-) value
so. instead of 12 bit INT + 4 bit precis
use 13 bit INT + 3 bit precision.

Constant PN_DIFFS_INTEGER_NB := 13;
- _PRECISION_NB := 3;
- _SIZE_NB := _INTEGER + _PRECISN = 16

PN_DIFFS_LARGEST_POS_VAL =

largest Pos value =
0011111111111111.111 = 2047.875

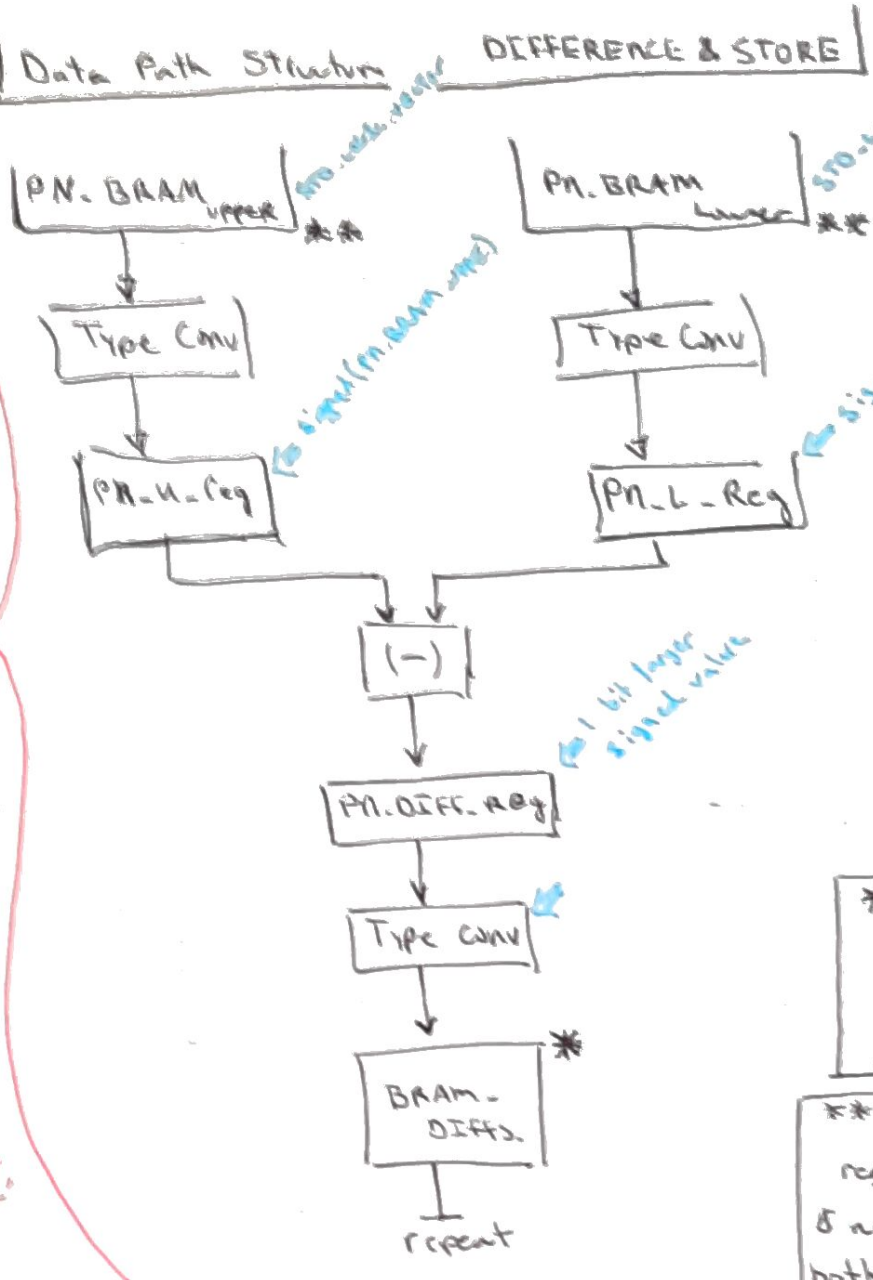
largest Pos Binary value =
0011111111111111 = 16383

largest neg
1100000000000.001 = -2047.875

largest neg val. Binary
= -16383

B.2 Data Path Structure — DIFFERENCE & STORE

Initializing & unloading memory



- Shim into either Controller.VHD or UM_ULAM.VHD
  - AFTER importing 'c' data into BRAM &&
  - BEFORE exporting hardware HISTO results back to 'c'

* Need registers for current PN_DIFF address and next PN_DIFF address

** likewise, need registers for current & next addresses for both PN_BRAM_UPPER & PN_BRAM_LOWER

B.3 Histogram

REDIRECT HISTO.VHD to SMALLER PN_DIFFS VALUES @ NEW MEMORY LOCATION

B.31

modify any constants re: max values, max data pts.

- DataTypes.HISTO_BRAM_SIZE_NB : _____
- DataTypes.HISTO_BRAM_BASE : _____
- DataTypes.HISTO_BRAM_UPPER_LIMIT: _____
- DataTypes.HISTO_MAX_RANGE_MB: _____
- DataTypes.HISTO_MAX_RANGE : _____

B.31 continued

Once constants changed & new base_address checked,
HISTO.VHD should run as before
should be no structure / stat machine
Changes to HISTO.VHD

B.4 Export new smaller Hardware Histo results from HISTO storage back to 'C'.

Results will be found at same HISTO BASE ADDR
BUT ½ as many values, as before
AND individual values may be 2x as large, as before.

New HISTO Results should be 1024 maximum possible values ranging from

$-2047.875 \leq x \leq +2047.875$

(1 bit less on precision,
1 bit more on integer)

Export via LM_ULM should all work the same so long as new offset to HISTO_BASE_ADDR is correctly changed.

Since HISTO_BRAM_UPPER_LIMIT is a CONSTANT defined in dataTypes_pkg, & changed in previous step B.31, controller.vhd & LM_ulm.vhd should need no changes for the EXPORT process.

DONE Rebuild / Recompile in Vivado & Vit.3 & Test