INSTITUTE OF TECHNOLOGY, NIRMA UNIVERSITY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

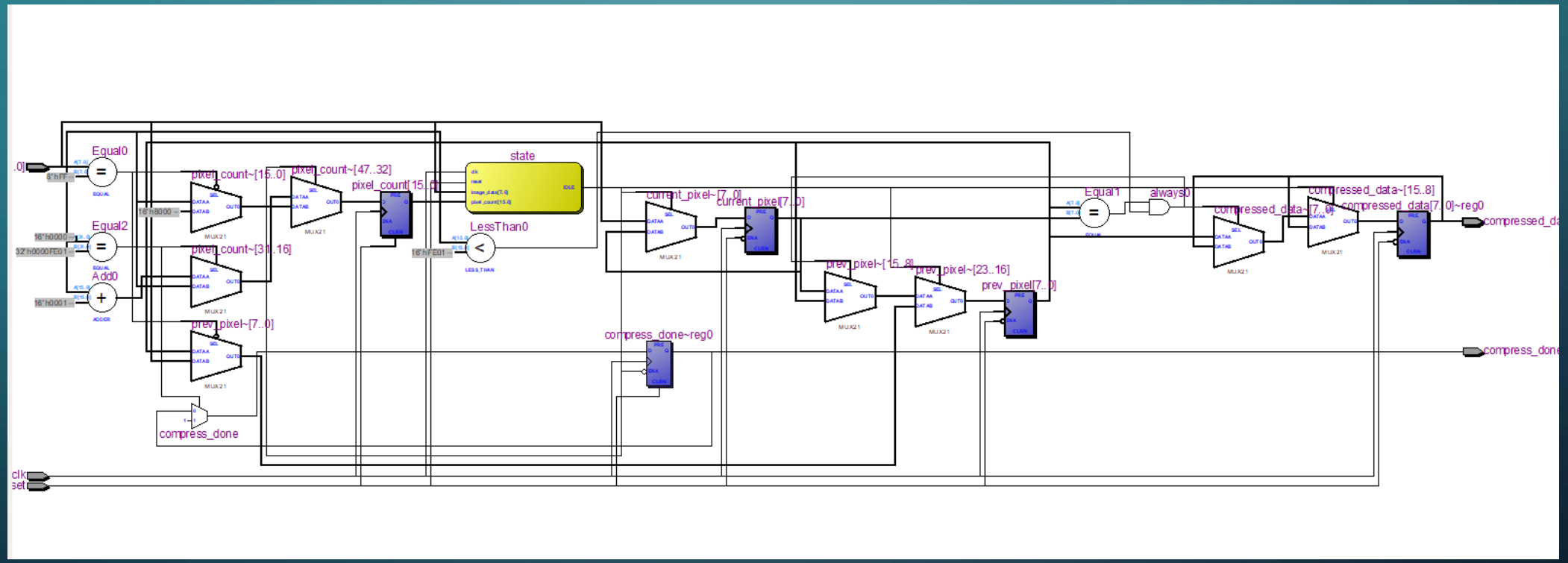
FPGA BASED SYSTEM DESIGN

BASIC IMAGE COMPRESSION

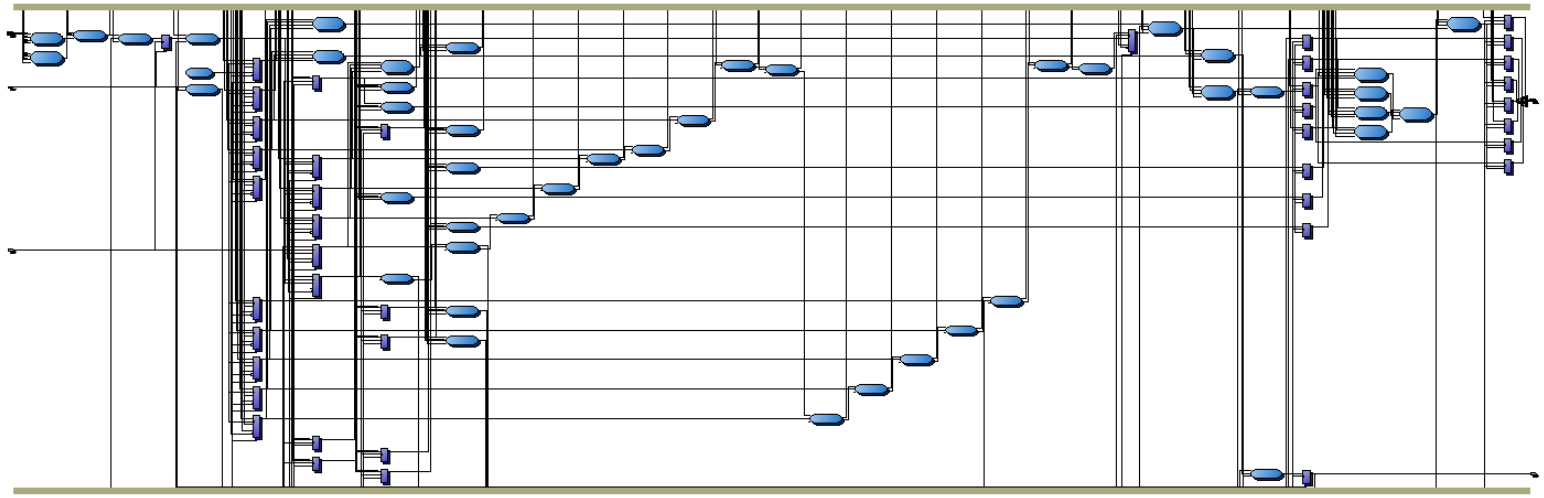
ABSTRACT

- An picture can be made smaller without sacrificing quality by using an image compression technique. This is accomplished by eliminating the image's spectral and spatial redundancy. Reducing the amount of bits needed to represent the image while maintaining the highest level of visual clarity and resolution in the reconstructed image is the aim.
- Lossy and lossless picture compression are the two primary varieties. An image with lossy compression has a smaller file size but a lower quality since part of the image data is lost. Since lossless compression does not eliminate any data, the file size is bigger but the image quality remains unchanged.

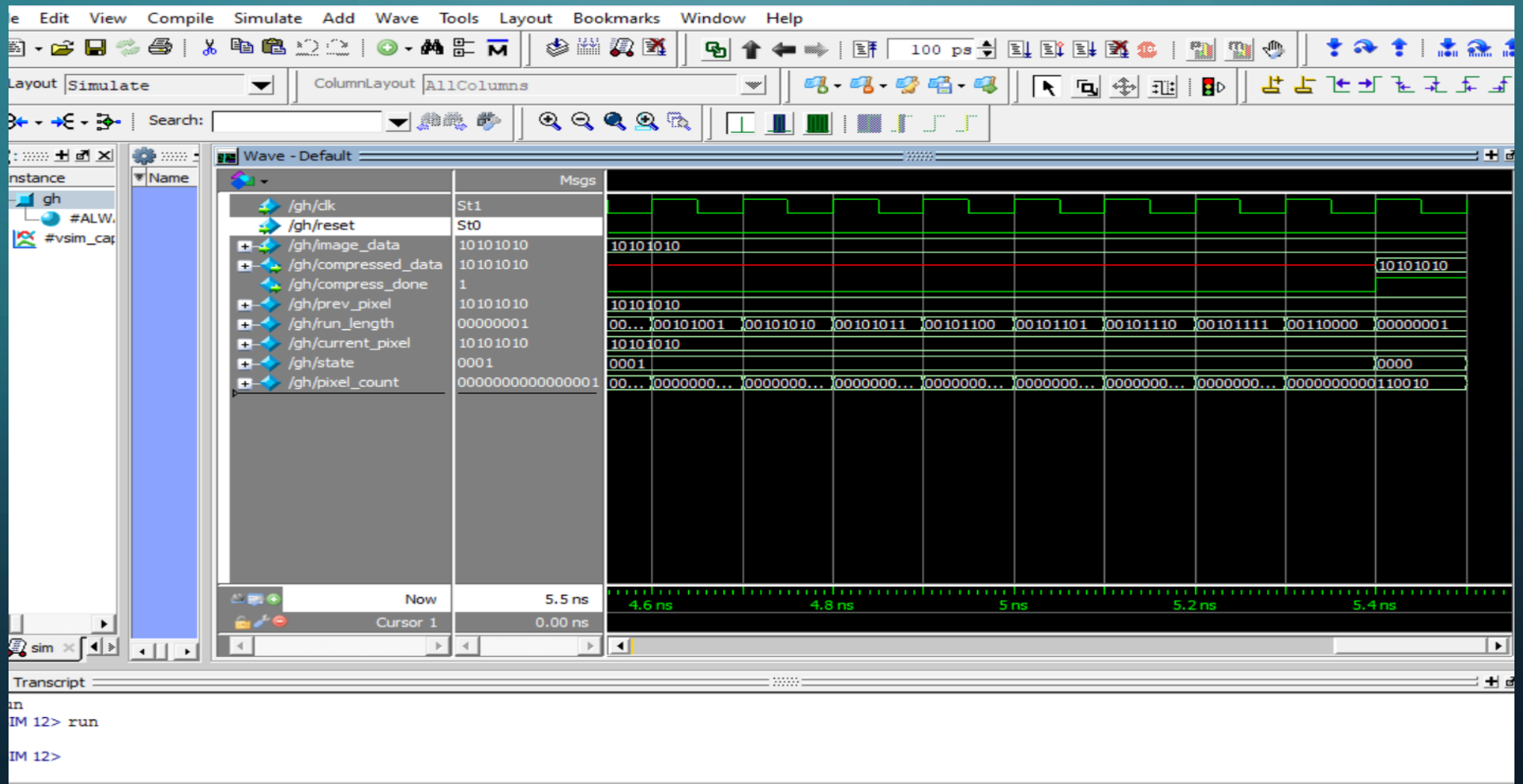
RTL


Equal0
Equal2
Add0
pixel_count~[15..0]
pixel_count~[47..32]
pixel_count~[31..16]
prev_pixel~[7..0]
compress_done
state
LessThan0
current_pixel~[7..0]
current_pixel[7..0]
compress_done~reg0
prev_pixel~[15..8]
prev_pixel~[23..16]
prev_pixel[7..0]
Equal1
always0
compressed_data~[15..8]
compressed_data~[7..0]
compressed_data[7..0]~reg0
clk
set

TTL



SIMULATION


Edit View Compile Simulate Add Wave Tools Layout Bookmarks Window Help
100 ps
Layout Simulate
ColumnLayout AllColumns
Search:
Wave - Default
Msgs
/gh/clk St1
/gh/reset St0
/gh/image_data 10101010
/gh/compressed_data 10101010
/gh/compress_done 1
/gh/prev_pixel 10101010
/gh/run_length 00000001
/gh/current_pixel 10101010
/gh/state 0001
/gh/pixel_count 0000000000000001
Now 5.5 ns
Cursor 1 0.00 ns
4.6 ns
4.8 ns
5 ns
5.2 ns
5.4 ns
Transcript
IM 12> run
IM 12>

FINAL RESULT

- In conclusion, measuring the number of neighboring pixels that have the same gray level value is how Run-Length Encoding (RLE), an efficient lossless picture compression technique, operates. When compressing grayscale photos, RLE can also be used to encode each run of pixels with the same intensity as a pair (run length, pixel value). The pixel value can take up to multiple bits, depending on the amount of Gray levels, whereas the run length typically takes up one byte, allowing for runs of up to 255 pixels. RLE can greatly reduce the size of image files, particularly when dealing with grayscale or big areas of similar color. RLE, however, might not work well for pictures with intricate textures or patterns, and it occasionally produces larger files.
- 1- Run length encoding algorithm is a method of compressing images depend on the number of adjacent pixels value in the image.
- 2- RLE algorithm is failing mostly when using it for compressing color images, because we need new field to store the number of repeated adjacent pixels.
- 3- Run length encoding algorithm is an efficient compression method with images have less various between values of adjacent pixels, but fail with images have high difference between adjacent pixels value.
- 4- When increasing the values of threshold in the proposed enhanced RLE algorithm this will yield increasing the compression ratio, and vice versa.
- 5- Controlling the compression ratio depends on the value of the threshold, which depends on the type of domain that image used it .