CS4481b Assignment #3

DATA INTERPRETATION

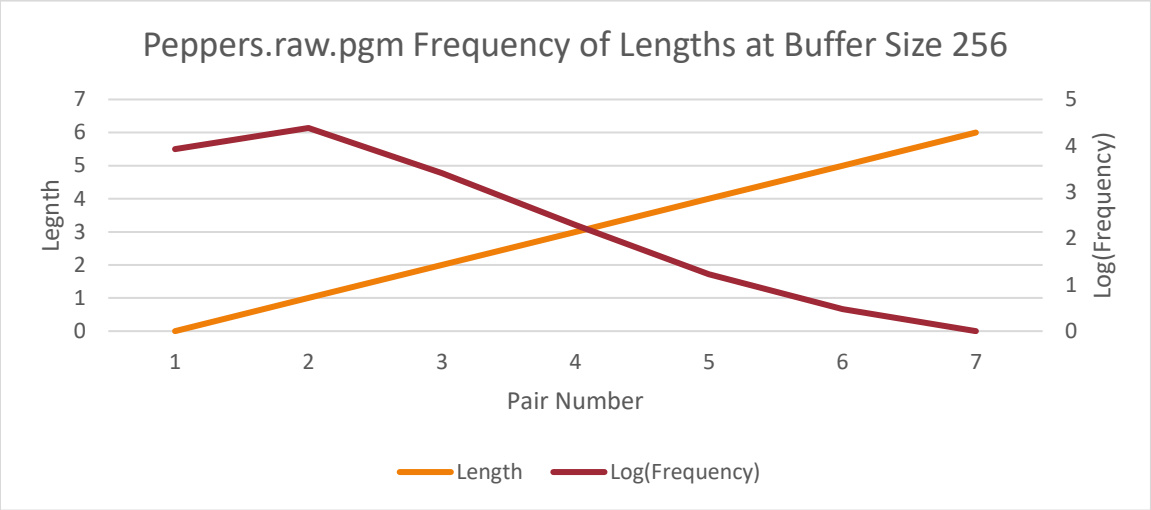
Image Name	Peppers.raw .pgm	Peppers.raw .pgm	Peppers.raw .pgm	Goldhill.raw .pgm	Goldhill.raw .pgm	Goldhill.raw .pgm
Buffer Size	5120	1024	256	5120	1024	256
Average Offset	1039.81	240.4	73.43	1046.21	213.92	45.18
Average Length	1.57	1.21	0.85	1.64	1.26	0.82
Offset Standard Deviation	1301.28	258.81	90.39	1313.54	242.57	65.88
Length Standard Deviation	0.65	0.56	0.56	0.92	0.8	0.64
Time To Encode (µs)	427515	106438	35017	1682477	166746	56770
Time To Decode (µs)	10520	10887	10912	16162	16475	16482

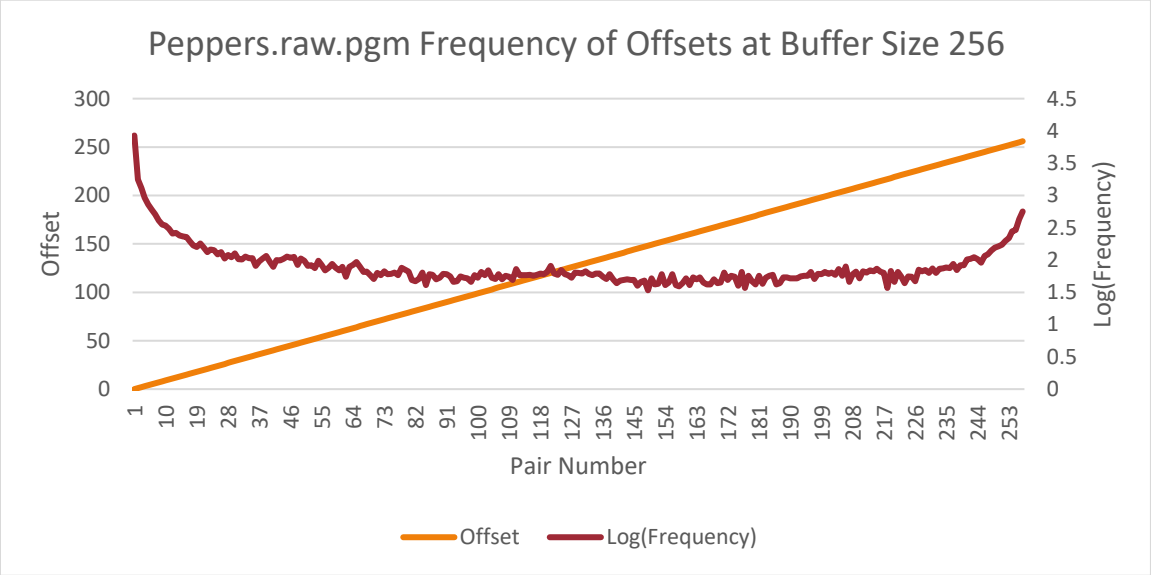
Above is the recorded data from the six required test cases.

In the graphs pertaining to the frequency of offsets being used, there are noticeable spikes every so often in the frequency. Upon further inspection, these spikes in frequency occur approximately where the *offset % image_width = 0,* that is, every time the offset is approximately a multiple of the image width, or the offset is 0. These spikes in frequency are due to how the encoder encodes the image in the input stream left to right, top to bottom, so similarly to how a pixel at offset 1 is one pixel away from the next pixel, a pixel at offset *image_width* would be right above the next pixel in the original image. Pixels that are nearby tend to be similar (or the same) colour, and that's why these offsets are more likely to be used.

I think both images would benefit from a search buffer size of 1024 in the encoder, because the buffer would be large enough to reuse nearby pixels, not only the pixels beside the next pixel, but above the next pixel. I think in the image peppers.raw.pgm, a search buffer size of 256 would suffice since the image width is 256, however 1024 would provide more nearby pixels to work with. It is much more important that goldhill.raw.pgm gets a buffer size of 1024 due to the image width being 360, with a buffer of 256 it is not sufficient to get all nearby pixels.

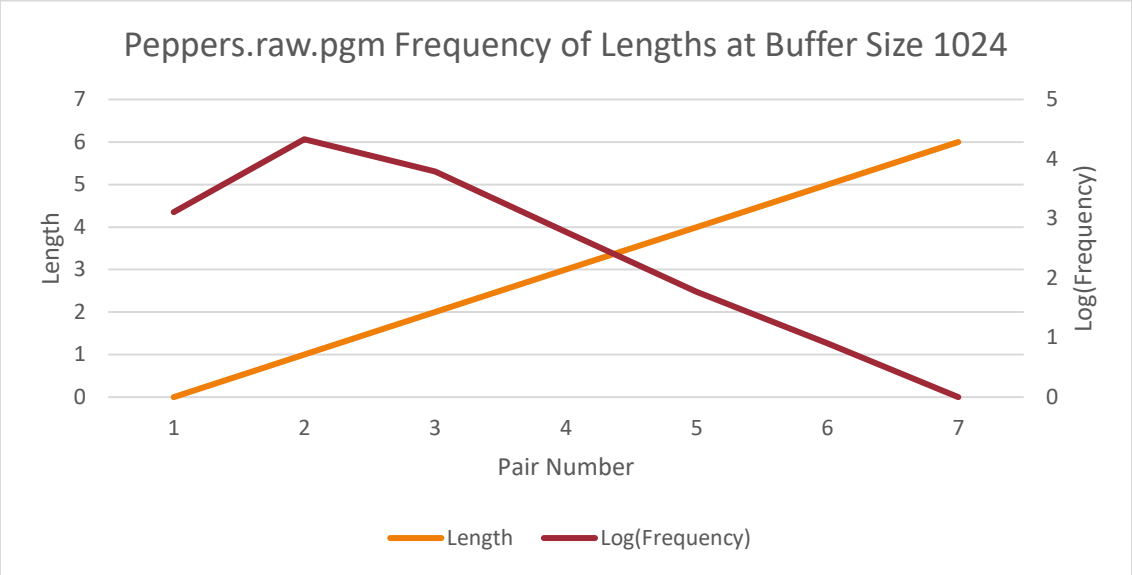
PEPPERS.RAW.PGM SEARCHING_BUFFER_SIZE = 256

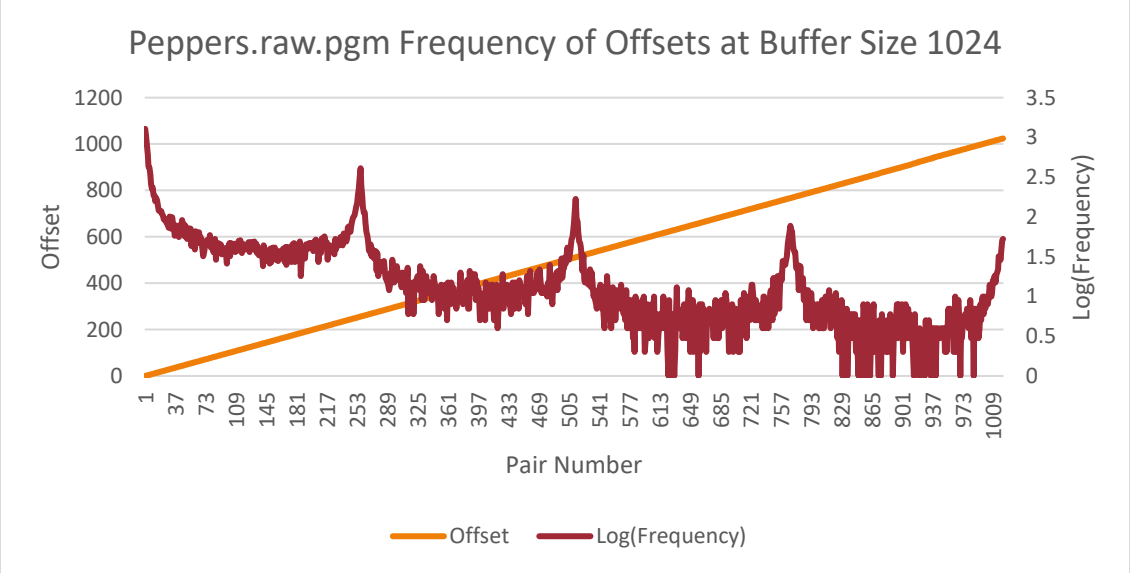




Using buffer size 256 in the image peppers.raw.pgm, shorter length matches are used more frequently, also, you can notice since the width of the image is 256, the encoder prefers to match nearby pixels that are offset 1 or close to 256.

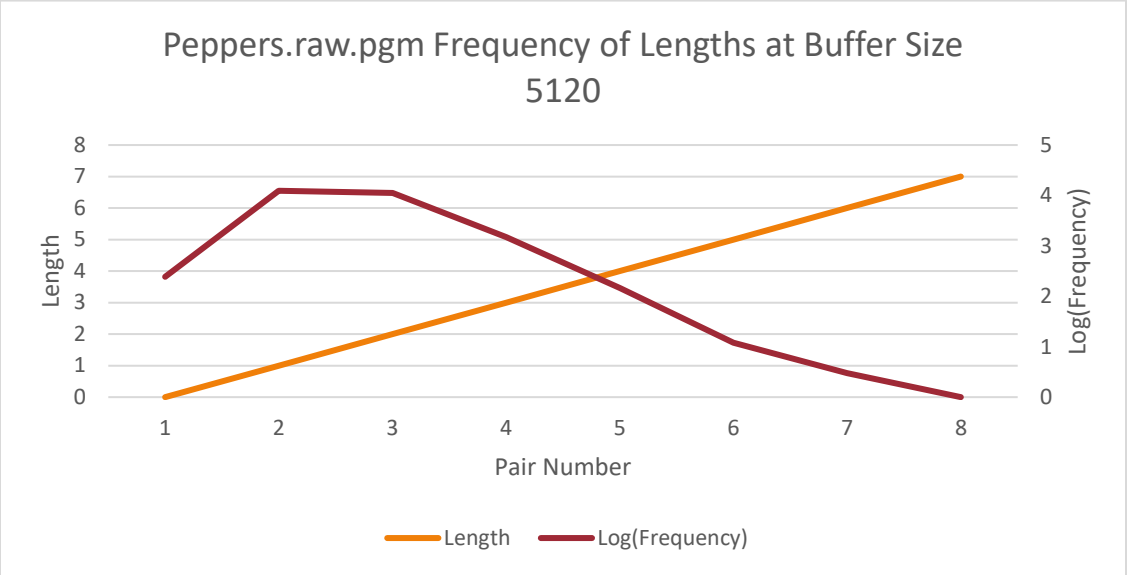
PEPPERS.RAW.PGM SEARCHING_BUFFER_SIZE = 1024

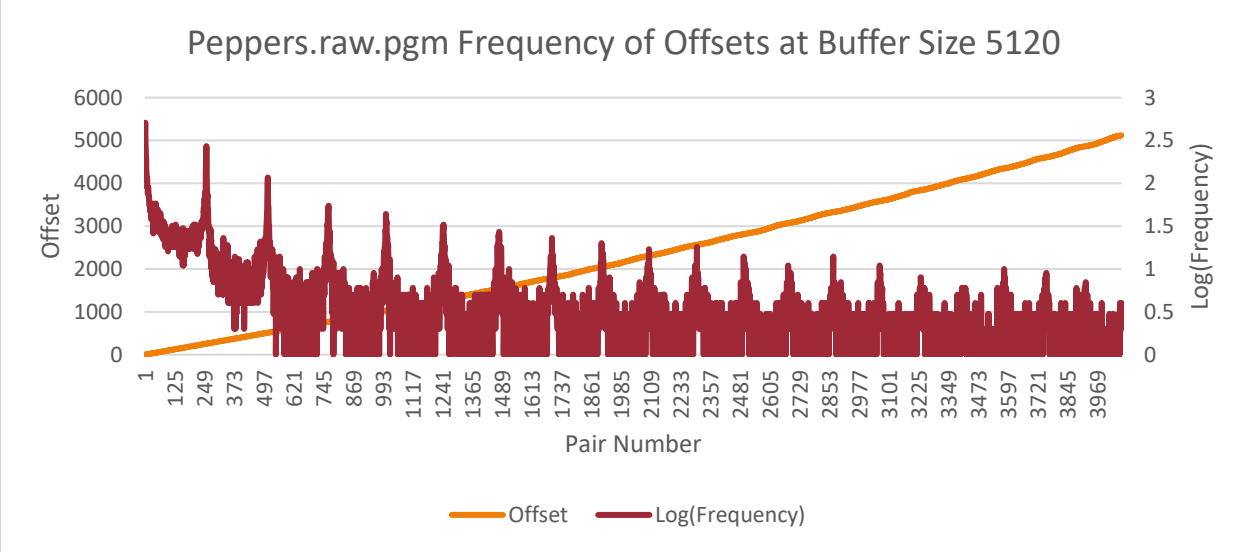




Using buffer size 1024 in the image peppers.raw.pgm, the length of the matches are still relatively short, and the offset graph shows spikes/impulses approximately every *image_width* pixels.

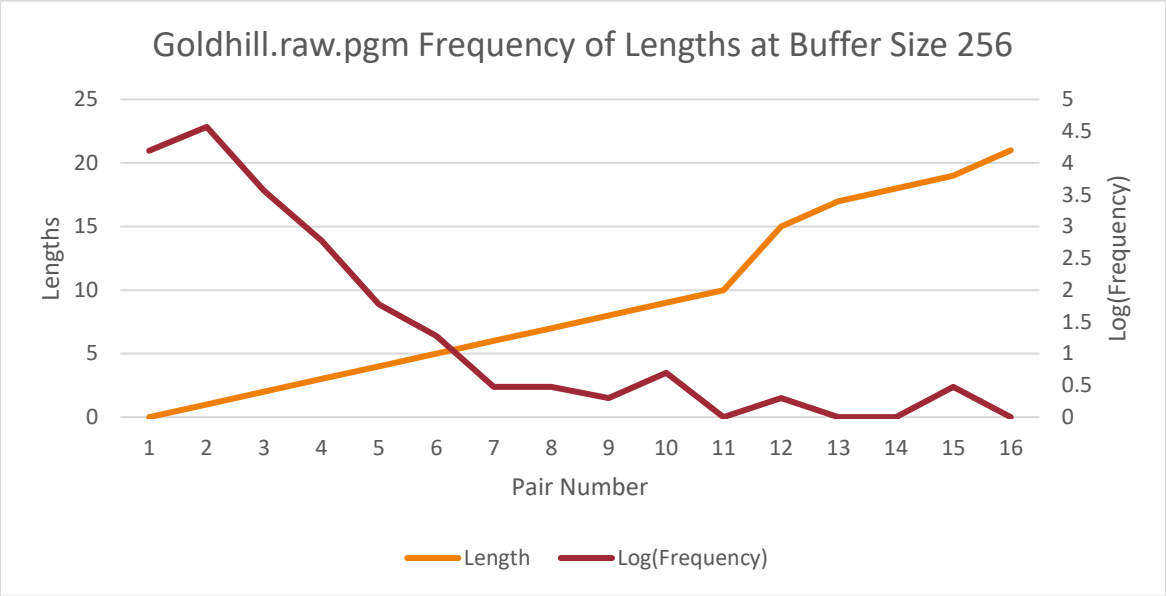
PEPPERS.RAW.PGM SEARCHING_BUFFER_SIZE = 5120

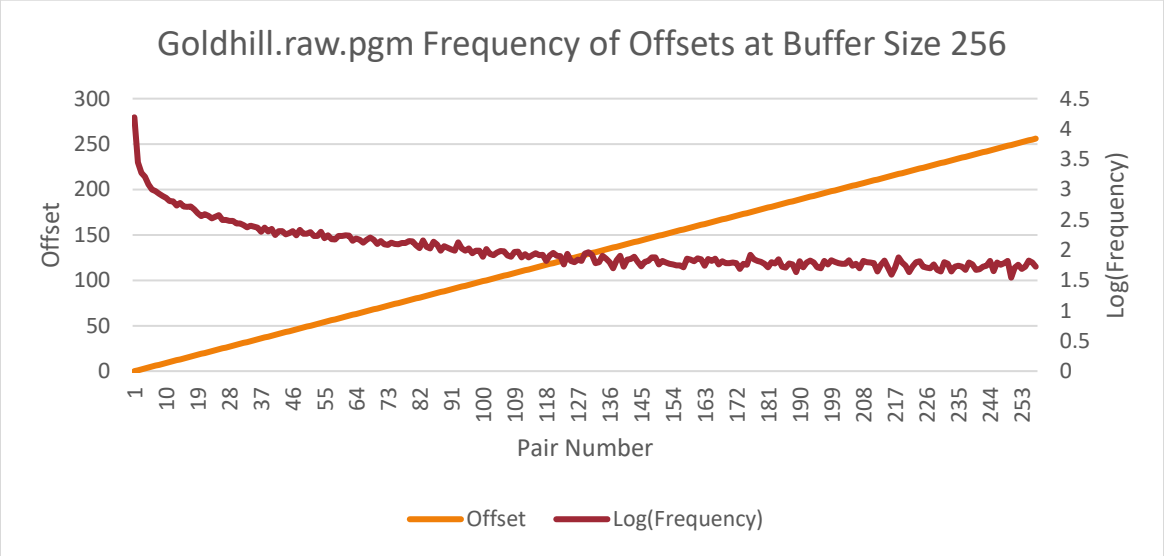




Using buffer size 5120 in the image peppers.raw.pgm, the length of the matches are still relatively short, and the offset graph shows spikes/impulses approximately every *image_width* pixels.

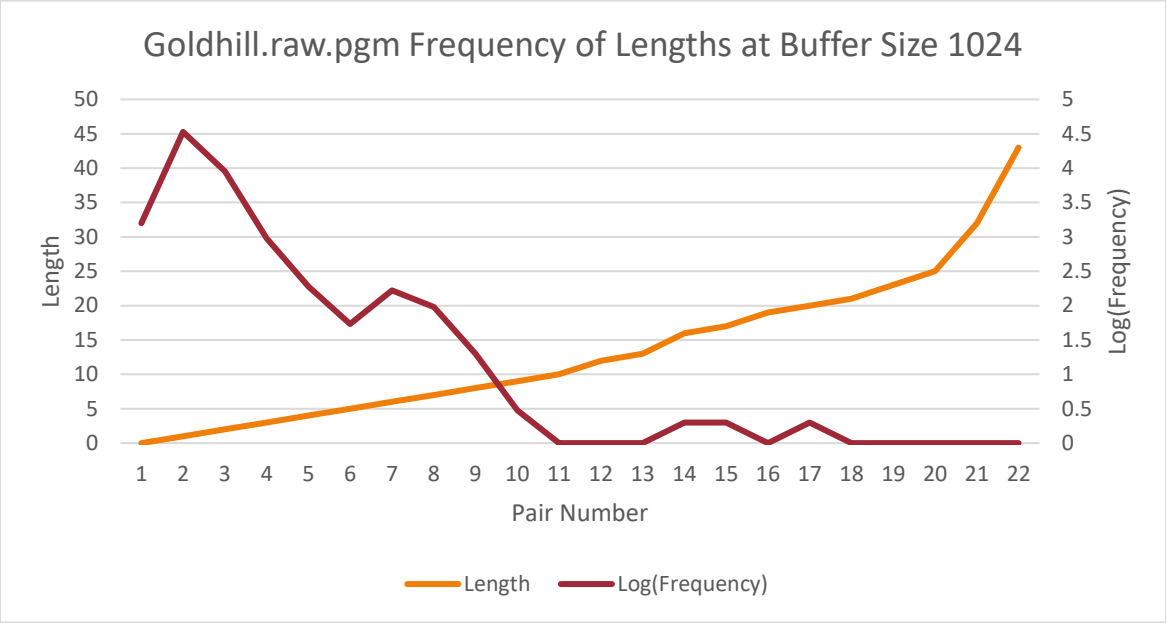
GOLDHILL.RAW.PGM SEARCHING_BUFFER_SIZE = 256

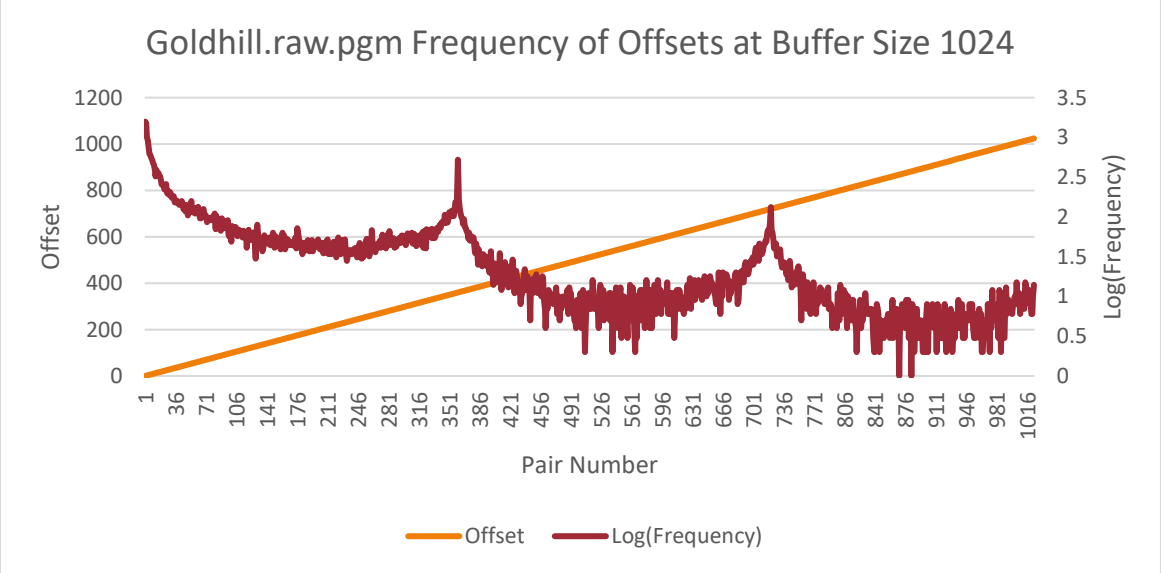




Using a buffer size of 256 in the image goldhill.raw.pgm, shorter match lengths are used more often. It can be noted in the offsets graph that a buffer size of 256 is insufficient for this image due to its width being 360. The insufficient buffer size makes the encoder unable to match all nearby pixels.

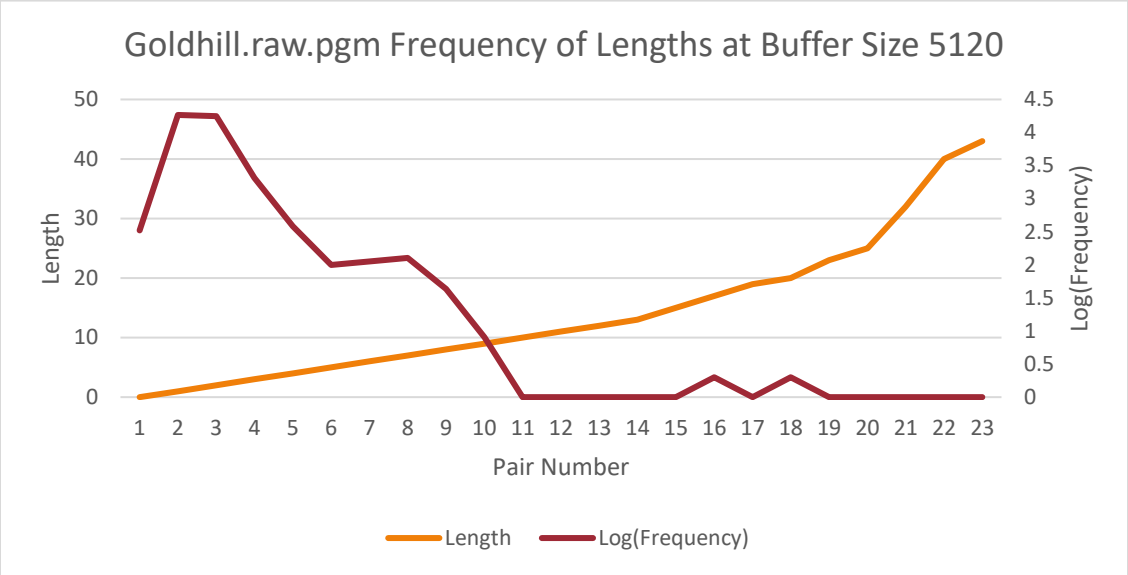
GOLDHILL.RAW.PGM SEARCHING_BUFFER_SIZE = 1024

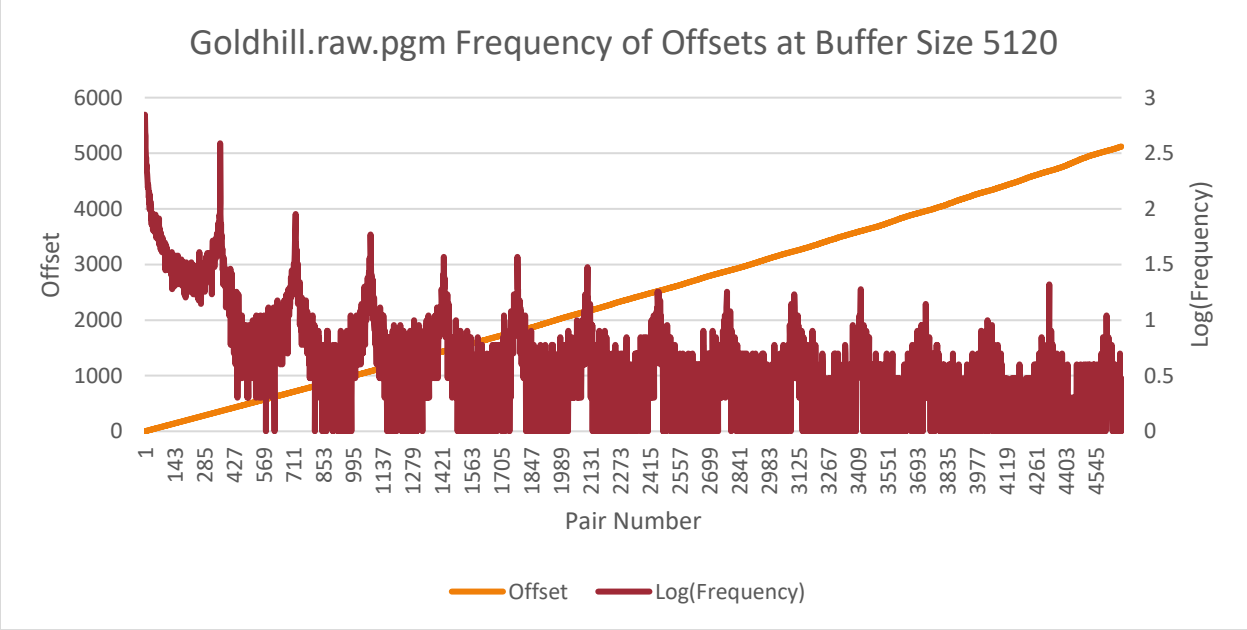




Using a buffer size of 1024 in the image goldhill.raw.pgm, the encoder still mostly uses shorter match lengths, but longer match lengths than when the buffer size was 256 due to a wider selection. Since the buffer size is now larger than the width of the image, the spikes/impulses in frequency begin to appear because the encoder is able to match nearby pixels in the image that are further back in the search buffer.

GOLDHILL.RAW.PGM SEARCHING_BUFFER_SIZE = 5120





Using a buffer size of 5120 in the image goldhill.raw.pgm is very similar to the search buffer size of 1024. Similar match lengths are found and the encoder is able to match all nearby pixels.