

F15FOLDS

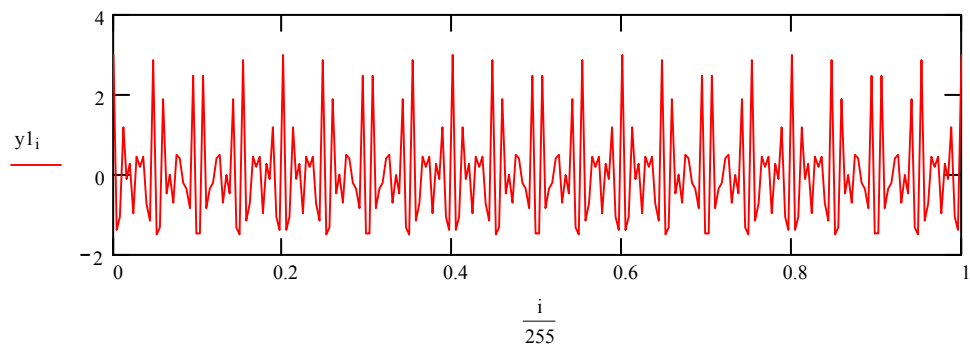
Folding of the spectrum.

For the sampling interval $1/255$, highest frequency is 128, the frequencies are at 65, 85, 105, all below 127.

a. Sample interval $i/255$

$i := 0..255$

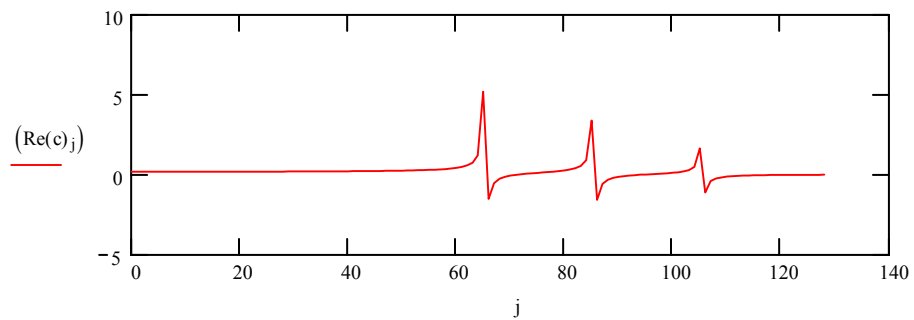
$$y1_i := \cos\left(2 \cdot \pi \cdot 65 \cdot \frac{i}{255}\right) + \cos\left(2 \cdot \pi \cdot 85 \cdot \frac{i}{255}\right) + \cos\left(2 \cdot \pi \cdot 105 \cdot \frac{i}{255}\right)$$



$c := \text{fft}(y1)$

$N := \text{last}(c) \quad N = 128$

$j := 0..128$

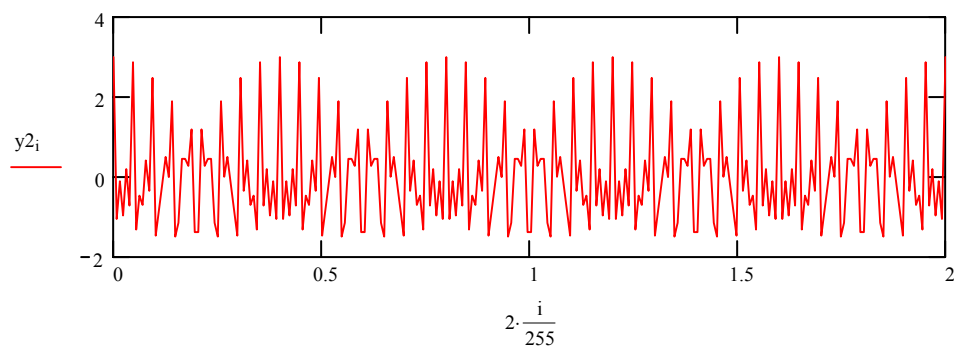


Frequency peaks are at 65, 85, 105

b. Sample interval $2i/255$

For the sampling interval $2/255$, highest frequency is 64, the original frequencies are at 65, 85, 105, all larger than 64 and appear folded.

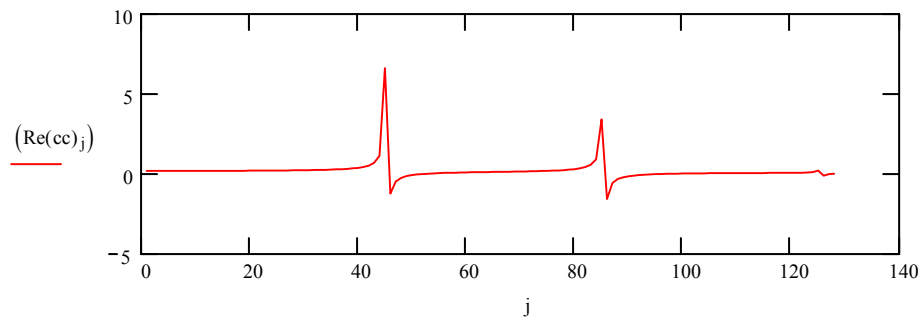
$$y2_i := \cos\left(2 \cdot \pi \cdot 65 \cdot \frac{2 \cdot i}{255}\right) + \cos\left(2 \cdot \pi \cdot 85 \cdot \frac{2 \cdot i}{255}\right) + \cos\left(2 \cdot \pi \cdot 105 \cdot \frac{2 \cdot i}{255}\right)$$



$cc := \text{fft}(y2)$

$N = 128$:c)

$j := 1..128$

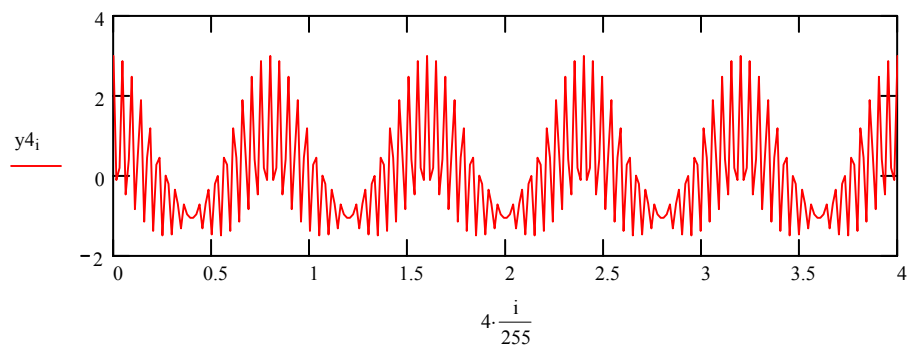


Frequency peaks appear 65 at--> 125
85 at--> 85
105 at--> 45

c. Sample interval $4i/255$

For the sampling interval $4/255$, highest frequency 32, the frequencies are higher than 1 times 32 and 2 times 32.

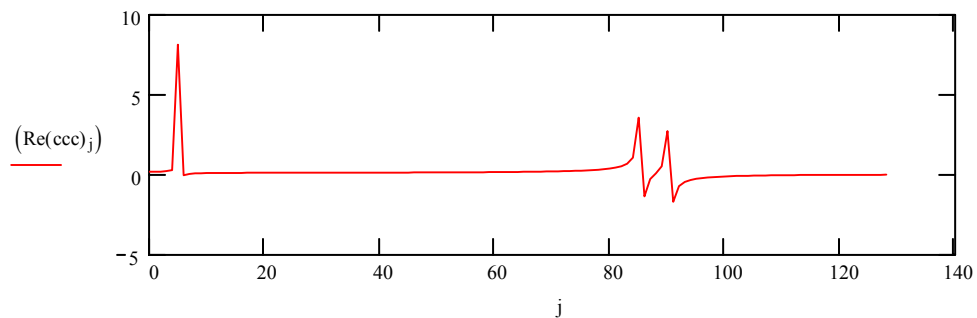
$$y4_i := \cos\left(2 \cdot \pi \cdot 65 \cdot \frac{4 \cdot i}{255}\right) + \cos\left(2 \cdot \pi \cdot 85 \cdot \frac{4 \cdot i}{255}\right) + \cos\left(2 \cdot \pi \cdot 105 \cdot \frac{4 \cdot i}{255}\right)$$



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ccc := fft(y4)
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N := last(cc N = 128
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j := 0..128
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Frequency peaks appear 65 at --> 5
85 at--> 85
105 at--> 90