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Variables

```
N = 128;    %Sample size
saw_step = 4096/128;    %Step size for sawtooth wave
a = 1:128;  % buffer to hold lookup table values
saw_wave = ones(1,128);
i = 0;
x = 0;
res    = 12;
offset = 0;
t = 0:((2*pi/(N-1))):(2*pi);    % time for sine wave
```

Sawtooth Wave

```
for c = a
    saw_wave(c) = c*saw_step;   % 0 to 4095
end
saw_wave(128) = 4095;   % last value 4095
% plot(a, saw_wave);
% disp(saw_wave);
% output to C code
fprintf("uint32_t Saw_LUT[NS] = {\n");
fprintf("\t");
for d = a
    if (x == 127)
        fprintf("%d", saw_wave(d));
    else
        fprintf("%d, ", saw_wave(d));
    end
    i = i + 1;
    x = x + 1;
    if (i == 16)
        i = 0;
        fprintf("\n\t");
    end
end
fprintf("};\n");
```

```
uint32_t Saw_LUT[NS] = {
 32, 64, 96, 128, 160, 192, 224, 256, 288, 320, 352, 384, 416, 448,
 480, 512,
```

```
 544, 576, 608, 640, 672, 704, 736, 768, 800, 832, 864, 896, 928, 960,
 992, 1024,
 1056, 1088, 1120, 1152, 1184, 1216, 1248, 1280, 1312, 1344, 1376,
 1408, 1440, 1472, 1504, 1536,
 1568, 1600, 1632, 1664, 1696, 1728, 1760, 1792, 1824, 1856, 1888,
 1920, 1952, 1984, 2016, 2048,
 2080, 2112, 2144, 2176, 2208, 2240, 2272, 2304, 2336, 2368, 2400,
 2432, 2464, 2496, 2528, 2560,
 2592, 2624, 2656, 2688, 2720, 2752, 2784, 2816, 2848, 2880, 2912,
 2944, 2976, 3008, 3040, 3072,
 3104, 3136, 3168, 3200, 3232, 3264, 3296, 3328, 3360, 3392, 3424,
 3456, 3488, 3520, 3552, 3584,
 3616, 3648, 3680, 3712, 3744, 3776, 3808, 3840, 3872, 3904, 3936,
 3968, 4000, 4032, 4064, 4095
 };
```

Sine Wave

```
sine_wave = sin(t); %create sine wave values
sine_wave = sine_wave + 1;
sine_wave = sine_wave*((2^res-1)-2*offset)/(2+offset);
sine_wave = round(sine_wave);
% Output to C code
fprintf("uint32_t Sine_LUT[NS] = {\n");
fprintf("\t");
for d = a
    if (x == 127)
        fprintf("%d", sine_wave(d));
    else
        fprintf("%d, ", sine_wave(d));
    end
    i = i + 1;
    x = x + 1;
    if (i == 16)
        i = 0;
        fprintf("\n\t");
    end
end
fprintf("};\n");
```

```
uint32_t Sine_LUT[NS] = {
 2048, 2149, 2250, 2350, 2450, 2549, 2646, 2742, 2837, 2929, 3020,
 3108, 3193, 3275, 3355, 3431,
 3504, 3574, 3639, 3701, 3759, 3812, 3861, 3906, 3946, 3982, 4013,
 4039, 4060, 4076, 4087, 4094,
 4095, 4091, 4082, 4069, 4050, 4026, 3998, 3965, 3927, 3884, 3837,
 3786, 3730, 3671, 3607, 3539,
 3468, 3394, 3316, 3235, 3151, 3064, 2975, 2883, 2790, 2695, 2598,
 2500, 2400, 2300, 2199, 2098,
 1997, 1896, 1795, 1695, 1595, 1497, 1400, 1305, 1212, 1120, 1031,
 944, 860, 779, 701, 627,
 556, 488, 424, 365, 309, 258, 211, 168, 130, 97, 69, 45, 26, 13, 4,
 0,
```

```
 1, 8, 19, 35, 56, 82, 113, 149, 189, 234, 283, 336, 394, 456, 521,
 591,
 664, 740, 820, 902, 987, 1075, 1166, 1258, 1353, 1449, 1546, 1645,
 1745, 1845, 1946, 2047,
 };
```

Square Wave

```
square_wave = 1:128;
for c = a
    if(c < 65)
        square_wave(c) = 4095;  % either 4095 or 0
    else
        square_wave(c) = 0;
    end
end
% Output to C code
fprintf("uint32_t Square_LUT[NS] = {\n");
fprintf("\t");
for d = a
    if (x == 127)
        fprintf("%d", square_wave(d));
    else
        fprintf("%d, ", square_wave(d));
    end
    i = i + 1;
    x = x + 1;
    if (i == 16)
        i = 0;
        fprintf("\n\t");
    end
end
fprintf("};\n");
```

```
uint32_t Square_LUT[NS] = {
 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095,
 4095, 4095, 4095, 4095, 4095,
 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095,
 4095, 4095, 4095, 4095, 4095,
 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095,
 4095, 4095, 4095, 4095, 4095,
 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095, 4095,
 4095, 4095, 4095, 4095, 4095,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 };
```

Triangle Wave

```
triangle_wave = 1:128;
for c = a
```

```
    if (c < 65)
        triangle_wave(c) = (c)*64 - 1;  % increasing to 4095
    else
        triangle_wave(c) = (128-c)*64;  % decreasing to 0
    end
end
% Output to C code
fprintf("uint32_t Triangle_LUT[NS] = {\n");
fprintf("\t");
for d = a
    if (x == 127)
        fprintf("%d", triangle_wave(d));
    else
        fprintf("%d, ", triangle_wave(d));
    end
    i = i + 1;
    x = x + 1;
    if (i == 16)
        i = 0;
        fprintf("\n\t");
    end
end
fprintf("};\n");
```

```
uint32_t Triangle_LUT[NS] = {
 63, 127, 191, 255, 319, 383, 447, 511, 575, 639, 703, 767, 831, 895,
 959, 1023,
 1087, 1151, 1215, 1279, 1343, 1407, 1471, 1535, 1599, 1663, 1727,
 1791, 1855, 1919, 1983, 2047,
 2111, 2175, 2239, 2303, 2367, 2431, 2495, 2559, 2623, 2687, 2751,
 2815, 2879, 2943, 3007, 3071,
 3135, 3199, 3263, 3327, 3391, 3455, 3519, 3583, 3647, 3711, 3775,
 3839, 3903, 3967, 4031, 4095,
 4032, 3968, 3904, 3840, 3776, 3712, 3648, 3584, 3520, 3456, 3392,
 3328, 3264, 3200, 3136, 3072,
 3008, 2944, 2880, 2816, 2752, 2688, 2624, 2560, 2496, 2432, 2368,
 2304, 2240, 2176, 2112, 2048,
 1984, 1920, 1856, 1792, 1728, 1664, 1600, 1536, 1472, 1408, 1344,
 1280, 1216, 1152, 1088, 1024,
 960, 896, 832, 768, 704, 640, 576, 512, 448, 384, 320, 256, 192, 128,
 64, 0,
 };
```

Zero voltage

```
zero_voltage = zeros(1, 128);

% Output to C code
fprintf("uint32_t Zero_LUT[NS] = {\n");
fprintf("\t");
for d = a
    if (x == 127)
        fprintf("%d", zero_voltage(d));
```

```
    else
        fprintf("%d, ", zero_voltage(d));
    end
    i = i + 1;
    x = x + 1;
    if (i == 16)
        i = 0;
        fprintf("\n\t");
    end
end
fprintf("};\n");
```

```
uint32_t Zero_LUT[NS] = {
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
 };
```

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