

# Wireless Sensor Networks - Assignment 1

author: Kristoffer Plagborg Bak Sørensen

auid: 649525

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## Methodology

In each experiment configuration, the matrix  $H$  has been precomputed and embedded in the binary as a static array. The pros and cons of this approach will be expanded upon in the conclusion.

```
static const float H[8][8] = {
    { 0.354f, 0.354f, 0.354f, 0.354f, 0.354f, 0.354f, 0.354f, 0.354f },
    // ...
    { 0.098f, -0.278f, 0.416f, -0.490f, 0.490f, -0.416f, 0.278f, -0.098f }
};
```

$$x[n] = 5 \cos(2n) + \cos(8n - \pi/2) + wgn(0, 0.1), \quad 0 \leq n < 10$$

```
def gen_test_signal(N: int) -> np.ndarray:
    noise = np.random.normal(0, 0.1, N)
    signal = (
        5 * np.cos(np.linspace(0, 10, N) * 2)
        + np.cos(np.linspace(0, 10, N) * 8 - np.pi / 2)
        + noise
    )
    return signal
```

How time was measured

```
#include "contiki.h"
// ...

clock_init(); // init timer lib

clock_time_t t_start, t_end, dt_compression;

t_start = clock_time();
dct(test_signal); // modifies compressed_signal
t_end = clock_time();
dt_compression = t_end - t_start;

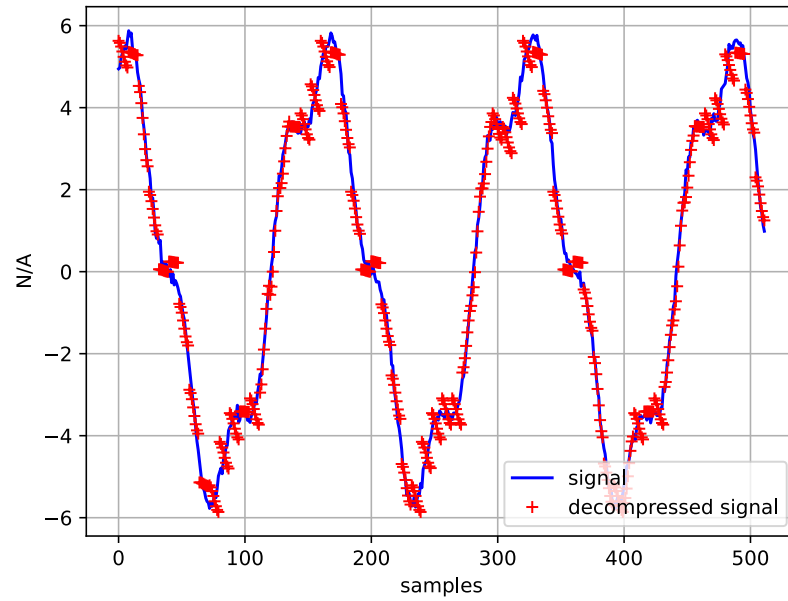
// ...

LOG_INFO("DT in clock ticks: %ld\n", dt_compression);
```

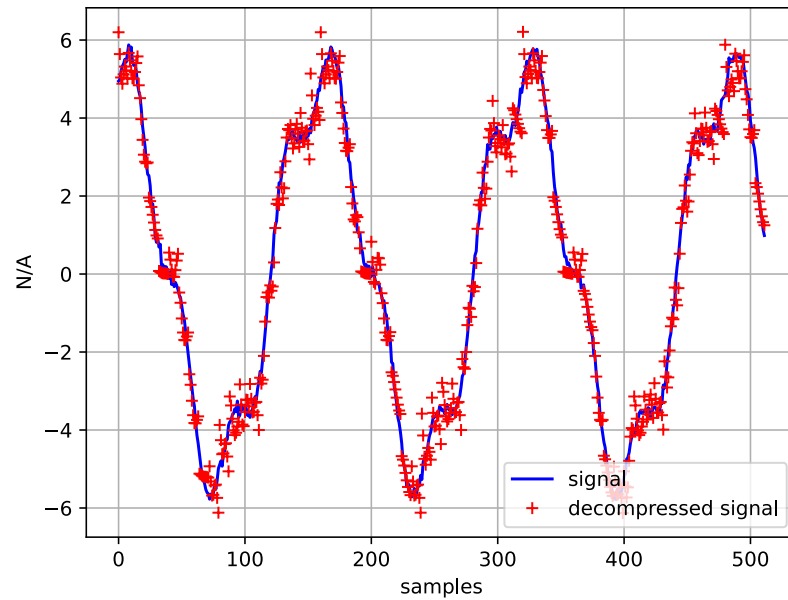
```
LOG_INFO("arch platforms CLOCK_SECOND: %ld\n", CLOCK_SECOND);  
LOG_INFO("DT in seconds: %ld\n", dt_compression / CLOCK_SECOND);  
hello  
tt
```

## Results

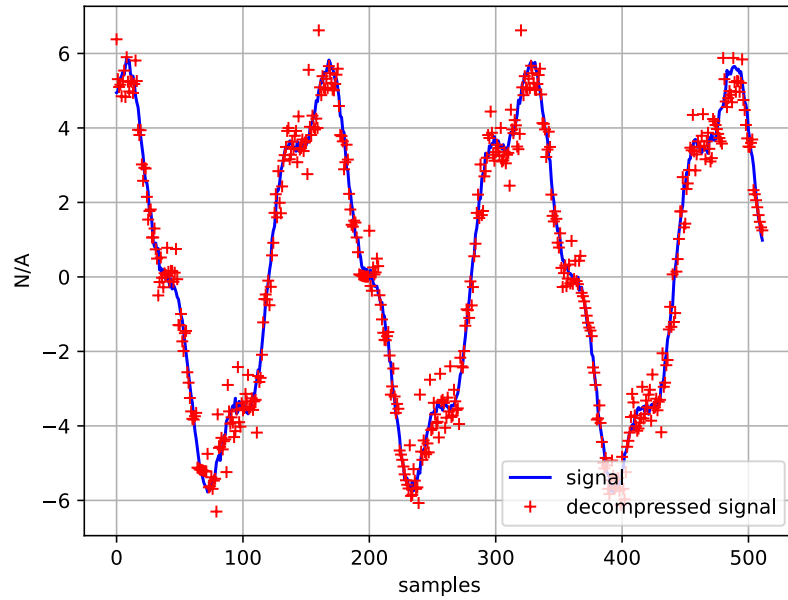
$N = 512, L = 8, M = 2, \text{MSE} = 0.13, \text{TAE} = 143.74, \text{MTAE} = 0.28$



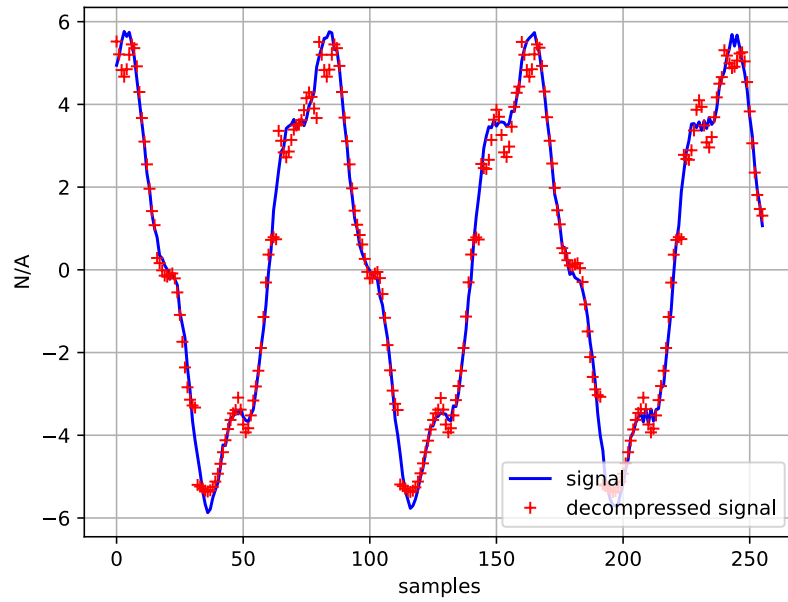
$N = 512, L = 8, M = 4, \text{MSE} = 0.20, \text{TAE} = 180.81, \text{MTAE} = 0.35$



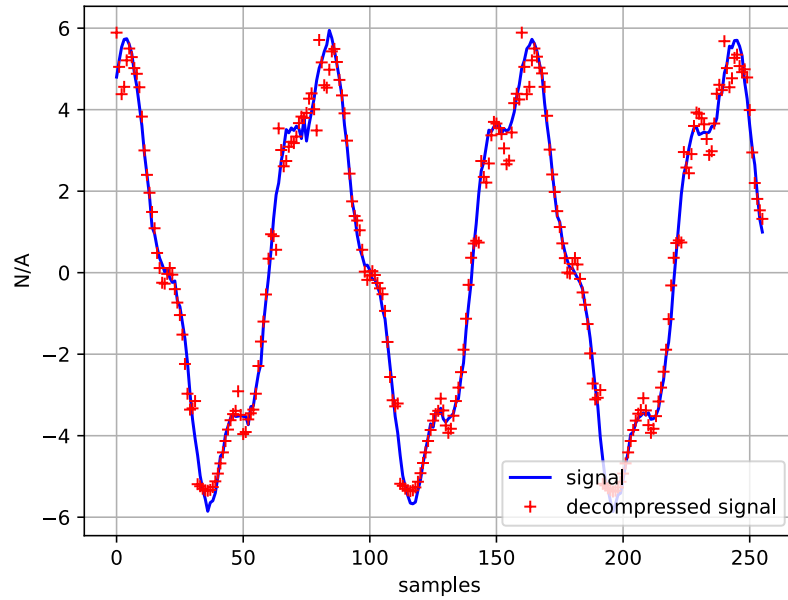
$N = 512, L = 8, M = 6, \text{MSE} = 0.27, \text{TAE} = 203.82, \text{MTAE} = 0.40$



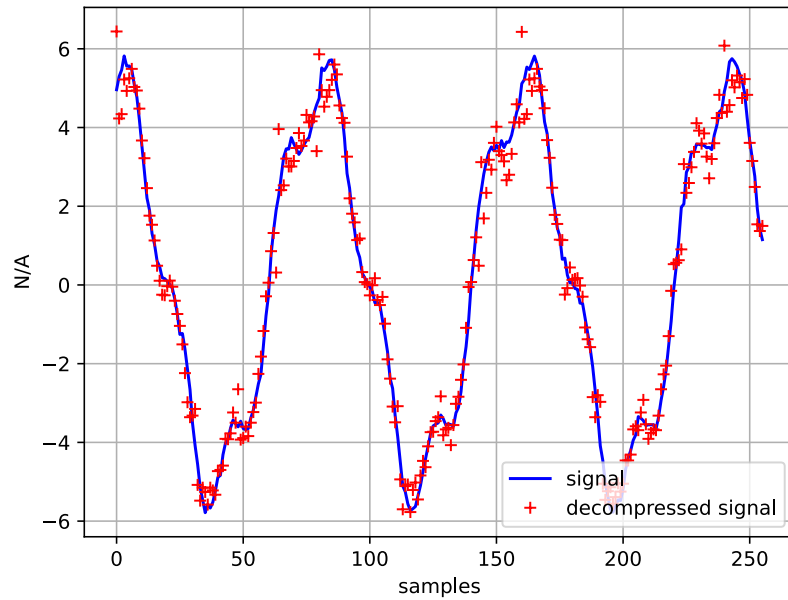
$N = 256, L = 16, M = 6, \text{MSE} = 0.15, \text{TAE} = 74.79, \text{MTAE} = 0.29$



$N = 256, L = 16, M = 8, \text{MSE} = 0.18, \text{TAE} = 81.23, \text{MTAE} = 0.32$



$N = 256, L = 16, M = 12, \text{MSE} = 0.24, \text{TAE} = 94.33, \text{MTAE} = 0.37$



issues

time

| experiment ID | $dt$ in arch platform ticks | $dt$ in seconds |
|---------------|-----------------------------|-----------------|
|               |                             |                 |

```
./experiments/N256-L16-M12/timing.dat ./experiments/N256-L16-M6/timing.dat
./experiments/N256-L16-M8/timing.dat ./experiments/N512-L8-M2/timing.dat
./experiments/N512-L8-M4/timing.dat ./experiments/N512-L8-M6/timing.dat
307 128 2 307 128 2 307 128 2 308 128 2 309 128 2 309 128 2
```

## Conclusion

[illegible]