MECOP, Microphonics, and workplace environment at Leviton Manufacturing.

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Projects & Assignments

- Microphonics
  - For the MultiTech Wall-box sensor Cost Redux
- Continuation of Ticket Tasks

Existing Codebase

An example

```
        return;       // if buffer was empty (unlikely), nothing to do, just abort
    void *data_arr; // pointer to head of data block within ring buffer

    uint16_t occupied = 0; // hold the occupancy output

    uint16_t gotsize = RINGBUF_get_many_inplace(&Handoff_buffer_int16, &data_arr, wantsize);
#if defined(MICROPHONICS_LOG_DATA)
    Num_future_samples = wantsize - gotsize;
#endif
    occupied = occ_func((int16_t*)data_arr, gotsize);             // process the new data
    RINGBUF_get_many_inplace_finish(&Handoff_buffer_int16); // finalize the 'get many readonly' operation

    // check if I need to do it again due to wraparound
    if (gotsize < wantsize)
    {
        uint16_t gotsize2 = RINGBUF_get_many_inplace(&Handoff_buffer_int16, &data_arr, Handoff_buffer_int16.count);
#if defined(MICROPHONICS_LOG_DATA)
        Num_future_samples = 0;
#endif
        occupied = occ_func((int16_t*)data_arr, gotsize2);         // process the new data
        RINGBUF_get_many_inplace_finish(&Handoff_buffer_int16); // finalize the 'get many readonly' operation
    }

    // publish the occ result by calling the callback
    if (Occ_publish_callback != NULL)
        Occ_publish_callback(occupied);

    // check whether the ring buffer overflowed when i wasn't looking
    // this isnt possible in simulation mode, but is possible in reality... how do i handle the error in reality??
    // this should be after "occ_func" processing because when logging data via PUART i want to know when an overflow happens
    // functionally, it makes no difference where this block is
    if (Handoff_buffer_int16.overflow)
    {
#if defined(MICROPHONICS_DEBUG) && !defined(MICSIM_MODE)
        HAL_printf("MIC_DBG: handoff buff overflow! time=%u, state=%u, lost=%ums\r\n", UTILS_get_ms_ticks(), occupied, num_pa
#endif
        Handoff_buffer_int16.overflow = 0;
        num_packets_missed_from_overflow = 0;
    }

#if defined(MICROPHONICS_DEBUG) && !defined(MICSIM_MODE)
    // method for calculating CPU utilization for the microphonics module only
    // currently about 24%
    uint64_t processtime_us = UTILS_get_elapsed_us_ticks(UTILS_get_us_ticks(), starttime_us);
    // if i actually iterated over some data, accumulate the time i used
```


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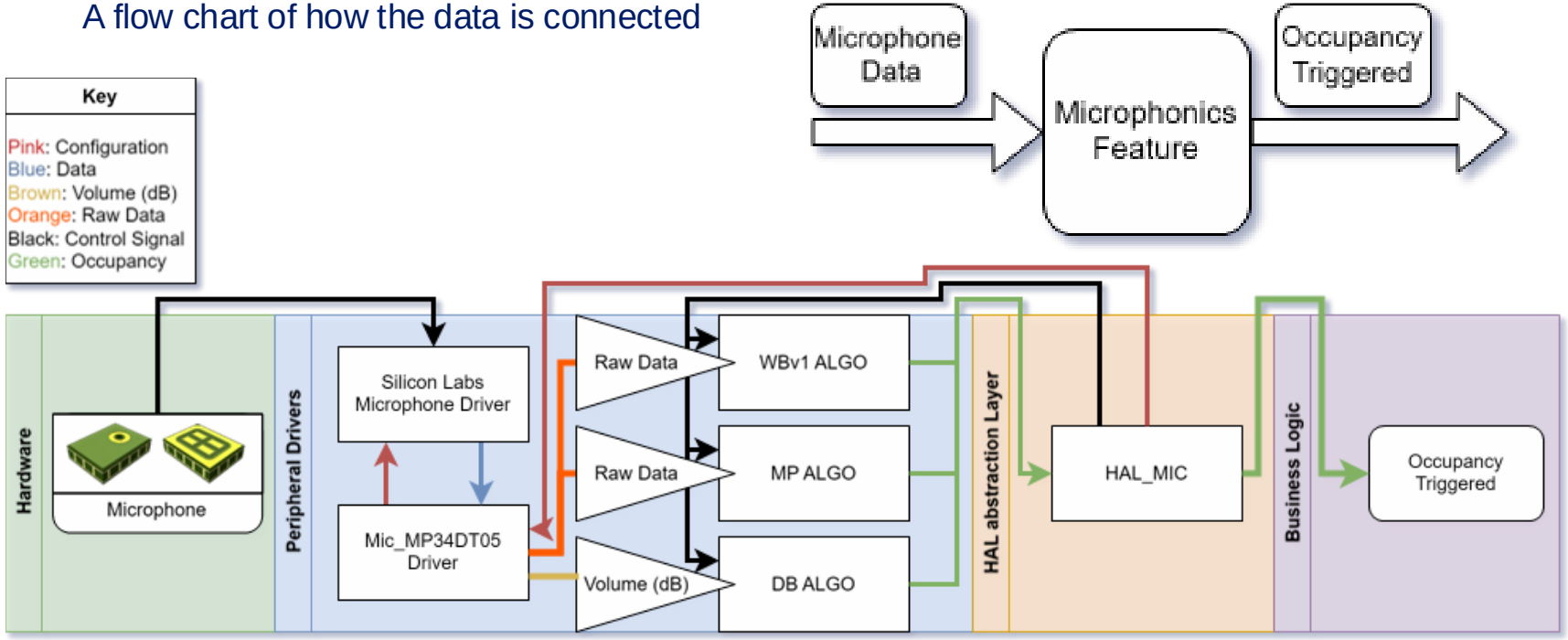
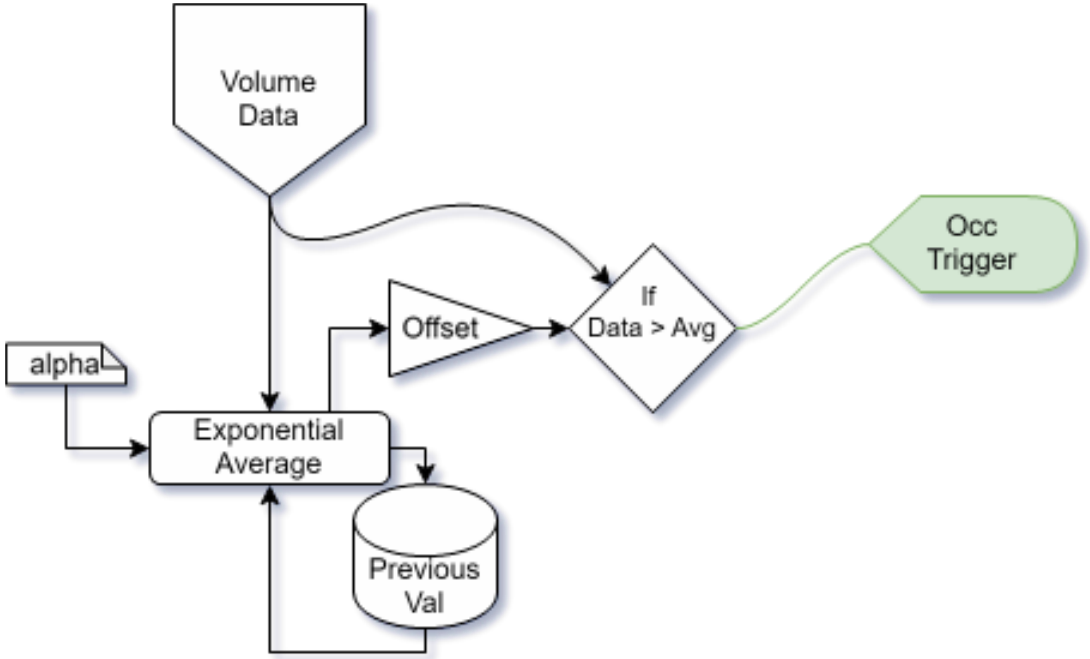
Signal Chain

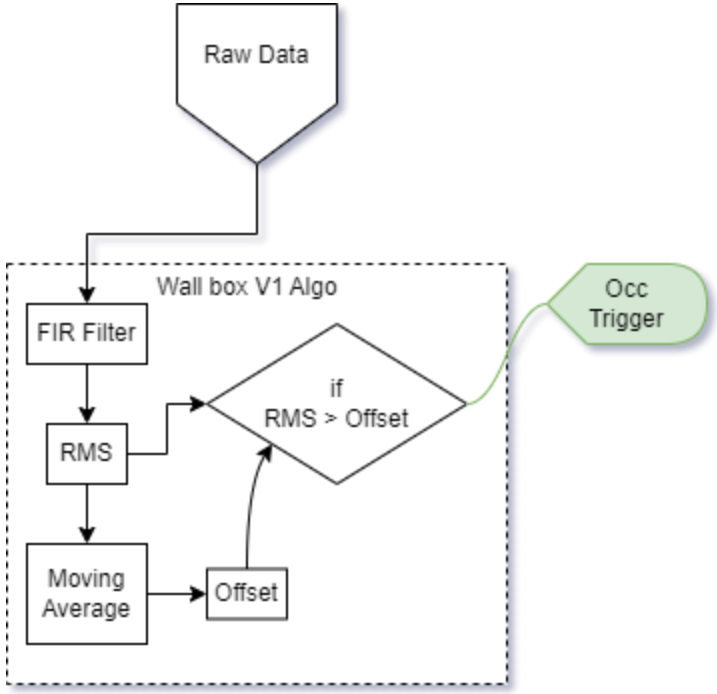
A flow chart of how the data is connected



Decibel Algorithm

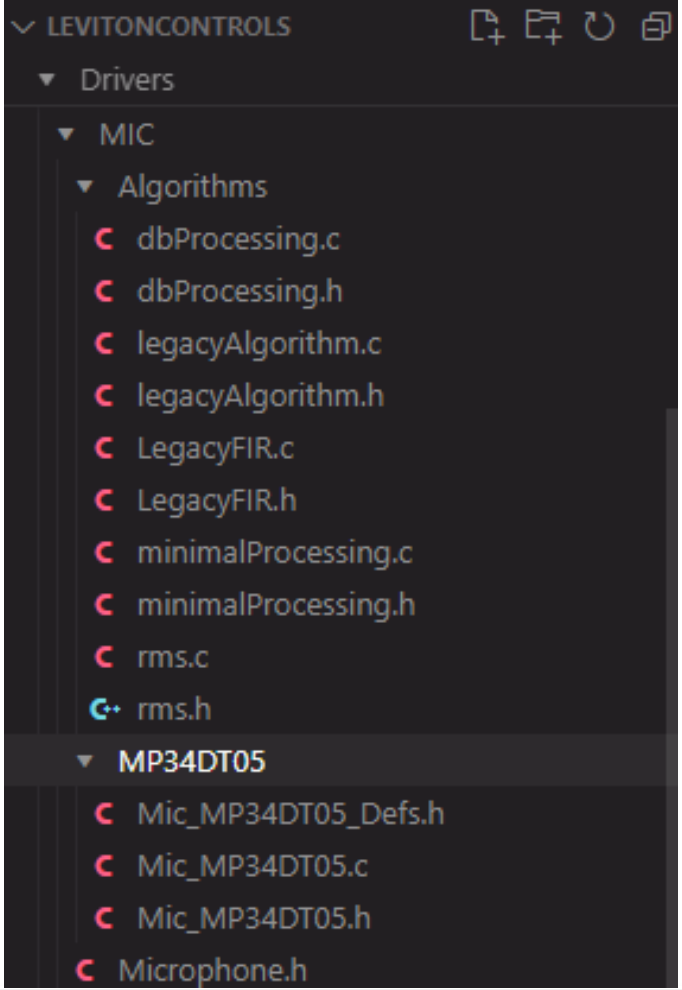


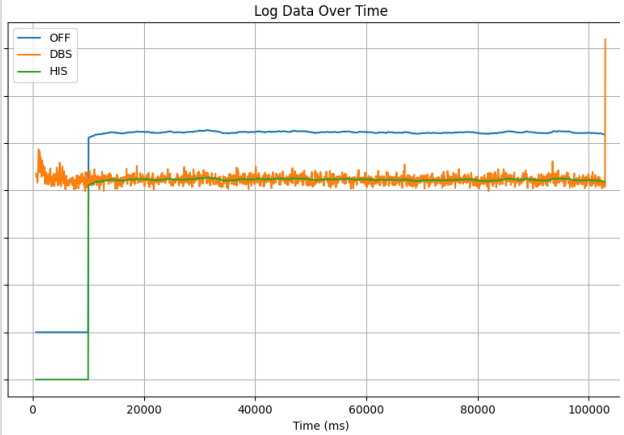
Wallbox BLE Mesh Algorithm



Abstraction

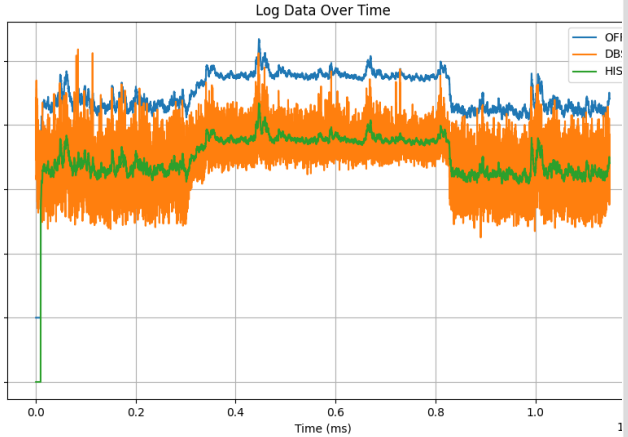
- The C language
- Organizational Expectations
- My Opinions





Analysis

Graphs of simulated environments



Lessons Learned

- Microphones
- PDM signals
- Testing Procedure
- Infrastructure
- Abstraction
- Research Tactics

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Impacts on future goals

Size of company

- Smaller than last internship

Work Culture

- Relaxed in some areas, but strict in others
- Uneven application of policies

My Future Goals

- Robotics
- Sustainability

Q & A

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