Weekly Lab Progress Report

Reporting period: September 15 to December 14, 2025

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1. Week Objectives/Action Items:

a) Evaluate the Sampling Rate of the IMU Sensor BHI260AP to record all events
b) Evaluate the power consumption of wireless BLE data transfer against flash memory
c) Obtain lab access and work authorization for the GRA position
d) Meet with Team 12 (Capstone Team) to analyze current batteries on system

2. Work Accomplished

- Obtained Lab Access to 4287 for work in project
- Read over Arduino Nicla Sense ME Documentation
- Form I9 verification
- Signed deliverables document for project
- Researched Bosch BHI260AP + BMI270 IMU specs
- Determined a 200 Hz sampling rate (accelerometer + gyroscope) captures gait, pecks, and bump events without data loss. Nyquist rate of 100 Hz
- Presented work to Professor Salas' lab session on Friday(s)

3. Results and Data

Papers Read: https://docs.arduino.cc/resources/schematics/ABX00050-schematics.pdf

Summary: The Nicla Sense ME is a small, powerful microcontroller unit capable of handling multiple subsystems. Although the memory capabilities are limited, there will still be room to add external memory on the boards using the second chip to achieve the time needed for the system. It can also be manually programmed using the SWD interface.

Results:

- Calculated data rate: 12 B/sample × 200 Hz ≈ 2.4 kB/s (~8.6 MB/hr). On-board 2 MB flash fills in 13 minutes, 57 seconds.
- Energy Comparisons
    - IMU active: ~1.2–1.9 mA
    - Flash logging: +0.3 mA duty cycle ≈ 1.5–2.2 mA total
    - BLE streaming: ~4–6 mA total
- Found flash logging ~2–3× more energy-efficient than wireless streaming.
- Estimated battery: 100–150 mAh Li-Po (flash logging) or 200–300 mAh (wireless streaming) for 6-hour runs.
- Sampling at 200 Hz yields reliable event capture for chickens.
- Storage: 2 MB SPI flash ≈ 14 min at 200 Hz raw data (extend with external memory or selective logging).
- Energy analysis confirmed flash logging is the better approach for multi-hour battery-powered use.

- Battery sizing indicates small Li-Po cells (100–300 mAh) are sufficient for 4–6 h operation depending on mode.

4. Work Plan for Next Week

- Test IMU logging at 200 Hz
- Explore event-triggered IMU logging to reduce storage and power load
- Test and Valid Arduino Nicla Sense ME for defects
- Start flashing code onto Arduino Nicla Sense ME

5. Comments

- Lot of administrative things this week, all lab access and verification taken care of
- More clarity on the project given during Professor Salas' Friday lab meetings
- Will continue to present regularly at Professor Salas' lab meetings