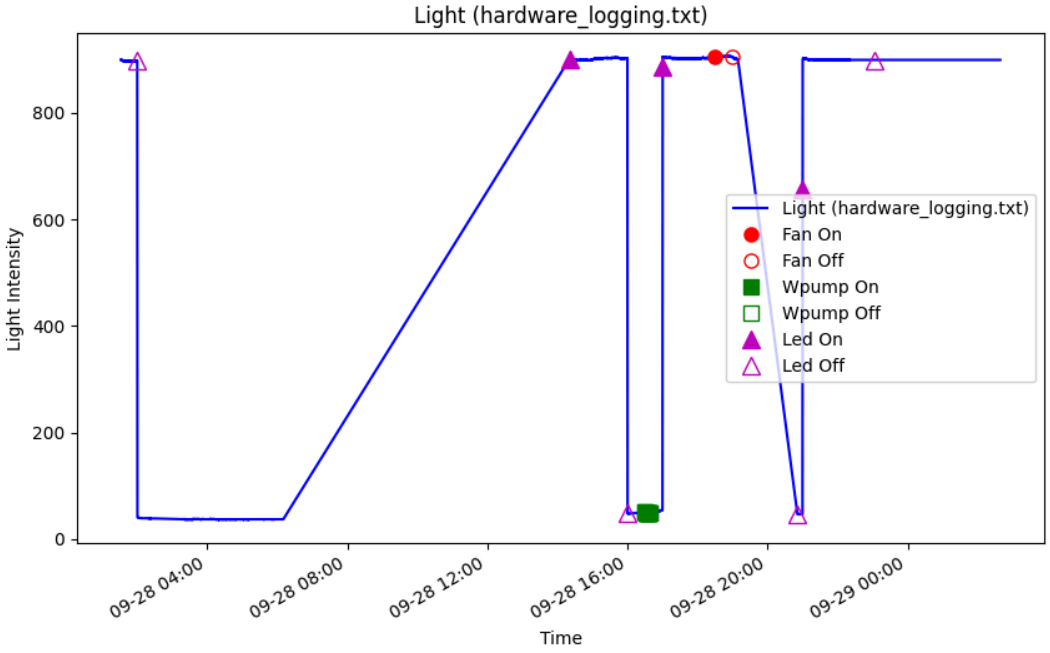
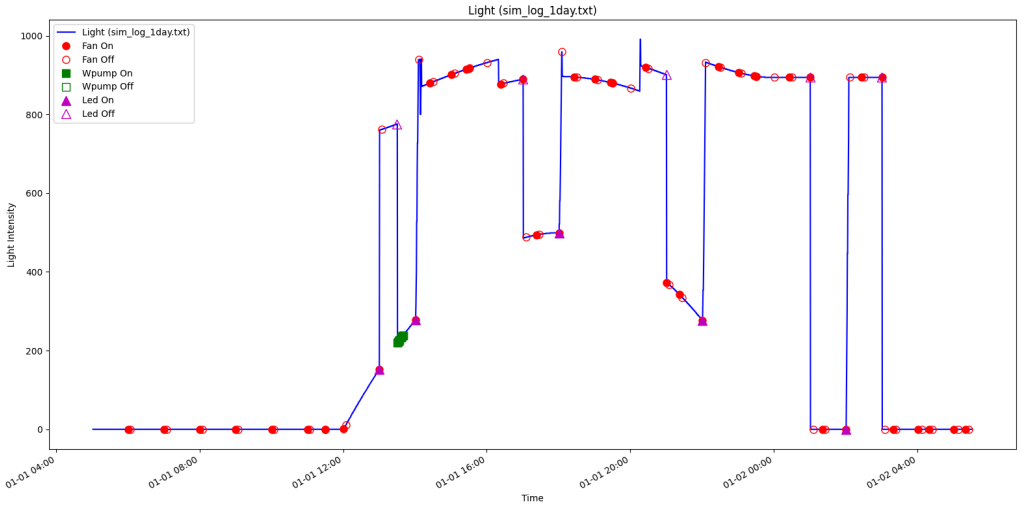
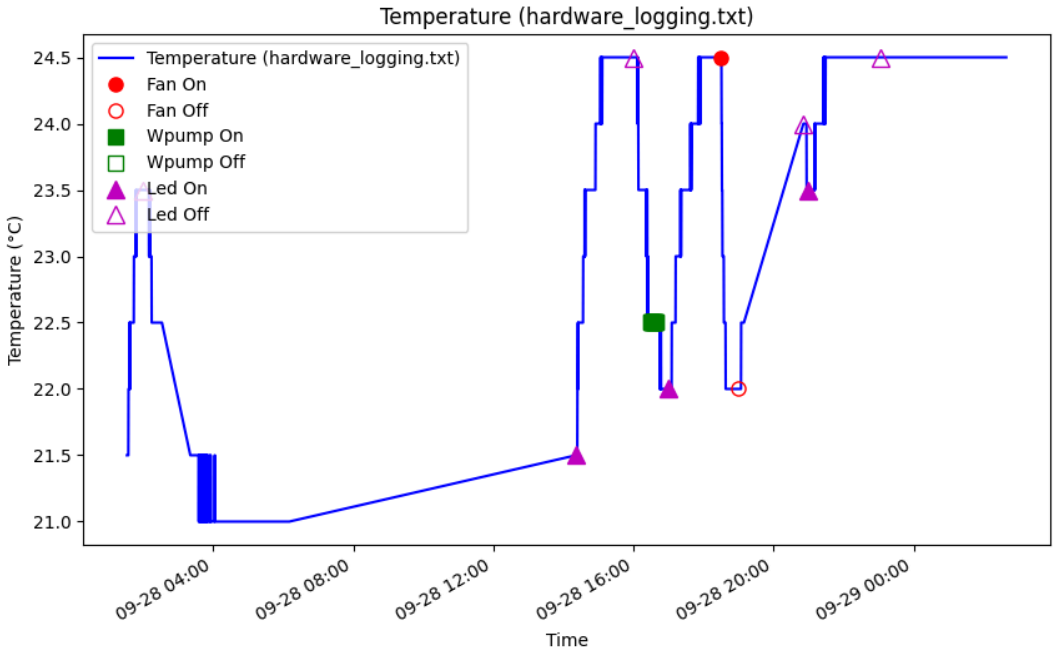
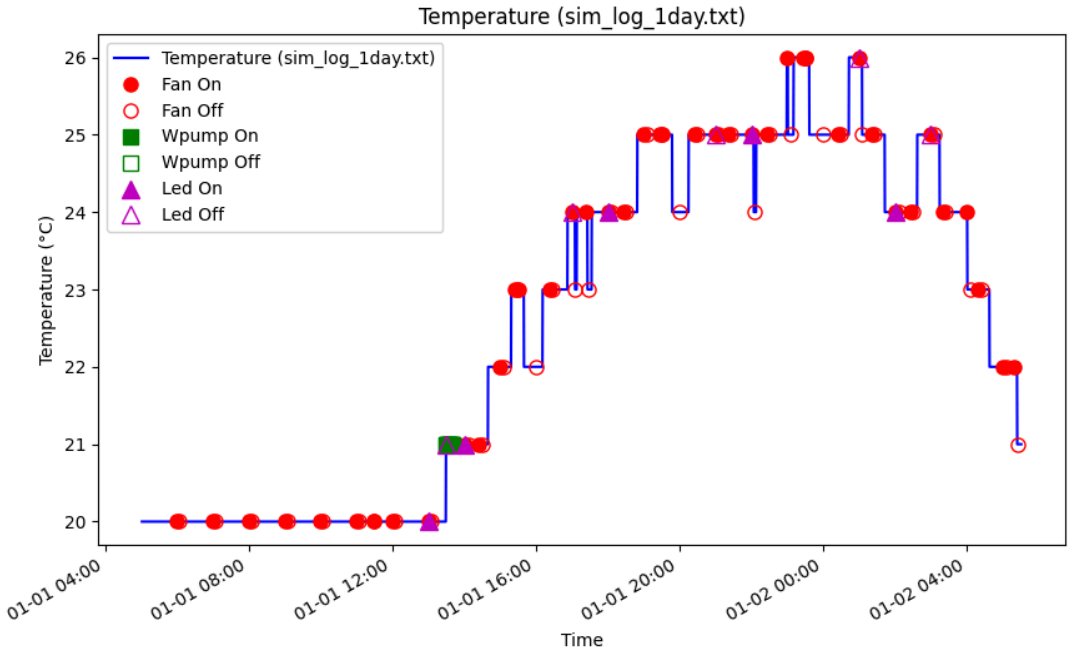




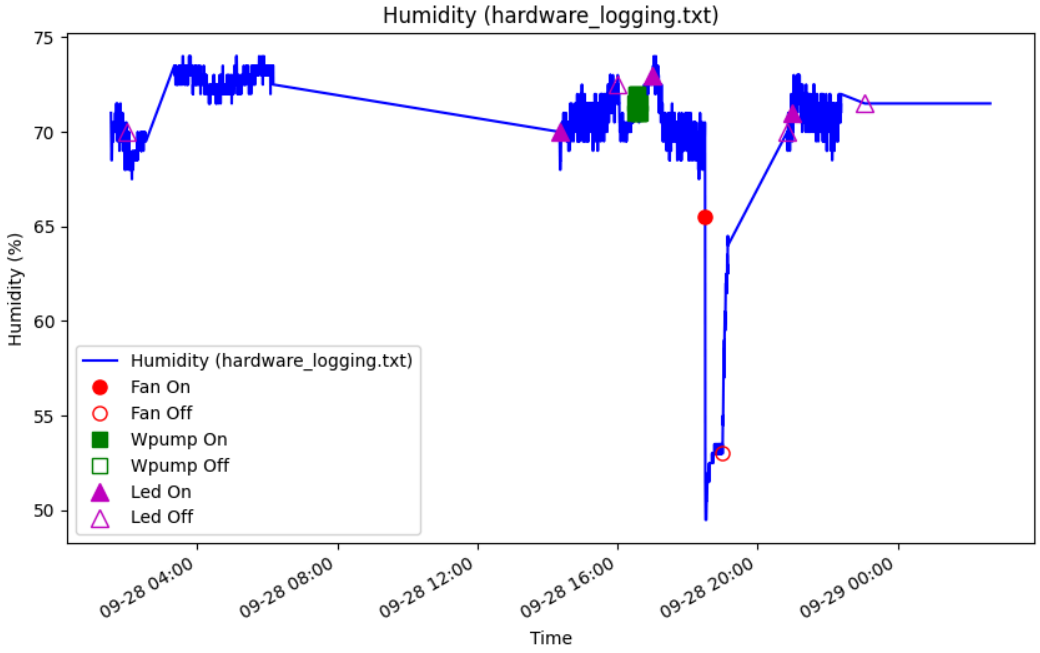
In the simulator, light intensity consistently correlates with LED state changes, increasing when LEDs are turned on and decreasing when they are turned off, indicating that the LEDs are the sole controller of light intensity. However, the hardware plot shows discrepancies where light intensity fluctuates independently of LED state changes, with instances of light intensity dropping when LEDs are on and increasing when they are off. This suggests that external factors, such as ambient light sources or sensor inaccuracies, are influencing the light readings on the hardware. Additionally, there may be issues with the LED actuators on the hardware that are not present in the simulated environment. To address this, further testing under different

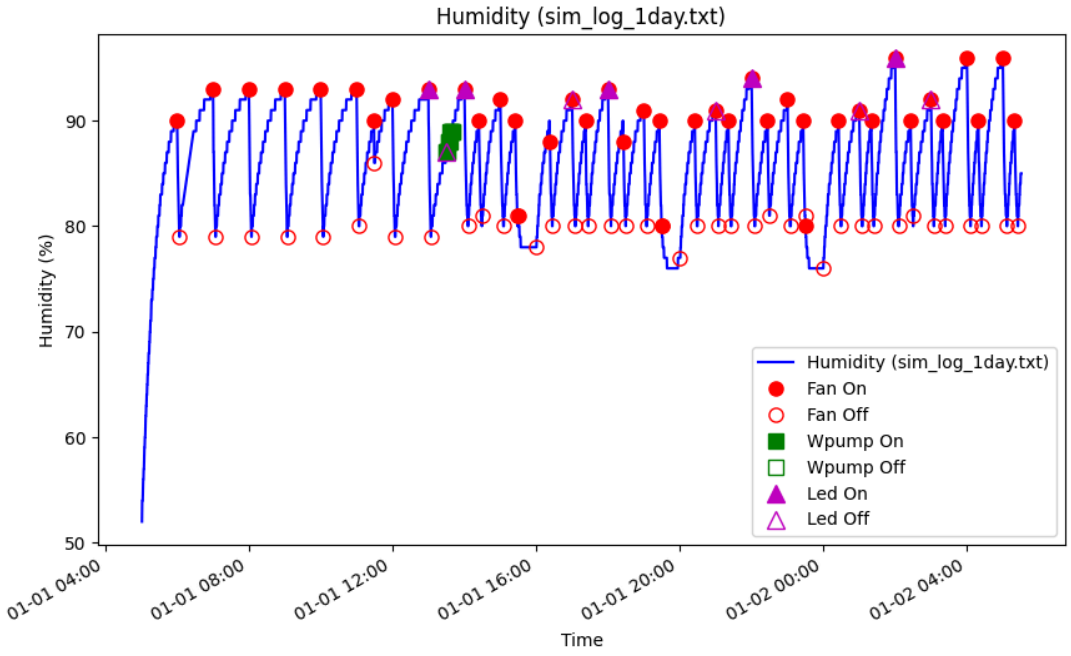
environmental conditions is necessary to identify the root cause of these discrepancies. Adjustments to thresholds for light control may be required to ensure that external influences do not interfere with TerraBot's behavior.





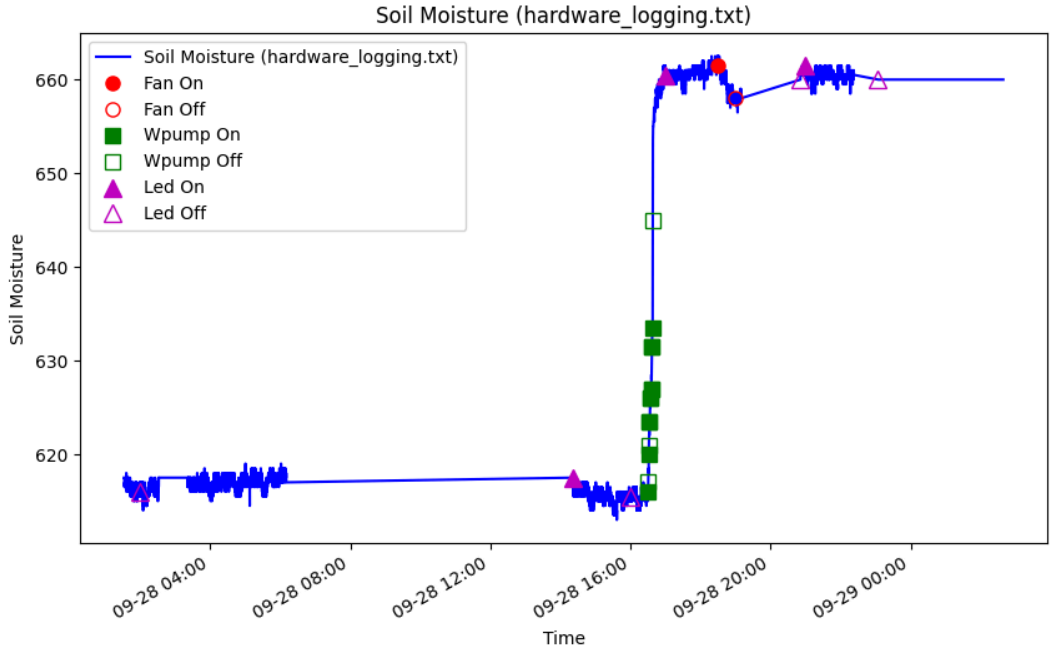
In both the hardware and simulated plots, the temperature responds predictably to the LED and fan states. In the hardware plot, we observe that the temperature rises when the LEDs are turned on and decreases when they are turned off. Similarly, when the fans are turned on, the temperature decreases. However, the hardware data is somewhat noisier and less consistent compared to the simulated data. In contrast, the simulated plot shows a much clearer correlation between the fan and LED states and the temperature changes. The temperature tends to spike more significantly when the LEDs are on and the fans are off, indicating that the LEDs generate heat which is dissipated when the fans are active. This relationship is more easily discernible in the simulation due to the smoother data and clearer, repeated patterns of LED and fan activity.

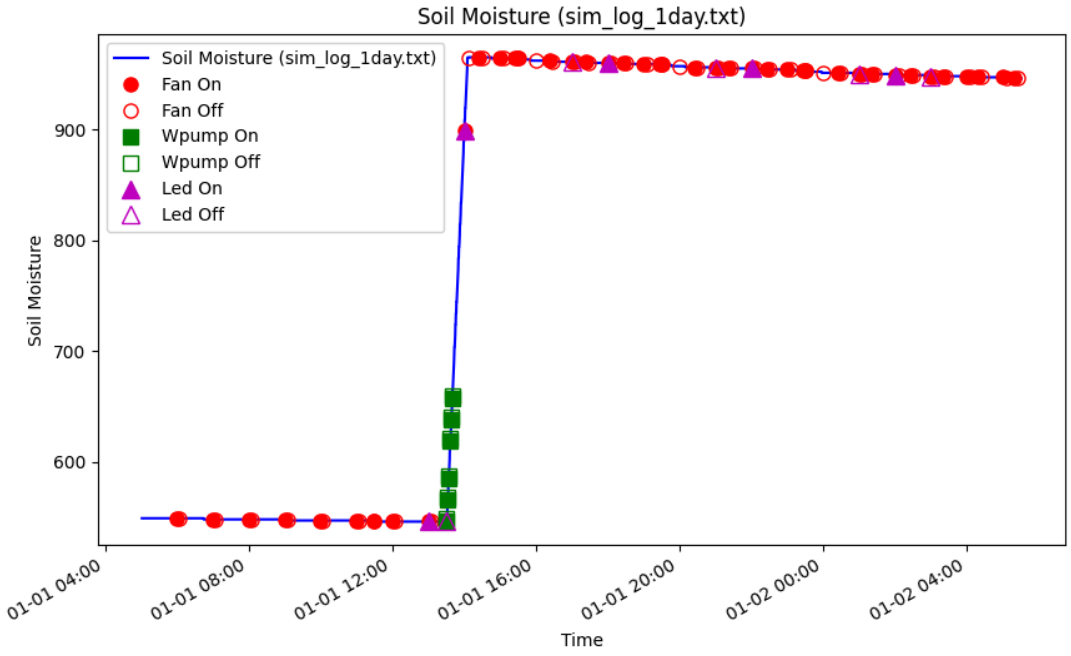




The humidity plots reveal that the fan has a clear impact on the humidity levels. In the hardware logging, when the fan is turned off, humidity tends to rise, and when the fan is turned on, humidity decreases. This pattern can be more distinctly observed in the simulator plot, where the fan's state change markers are aligned with the peaks and troughs of the humidity

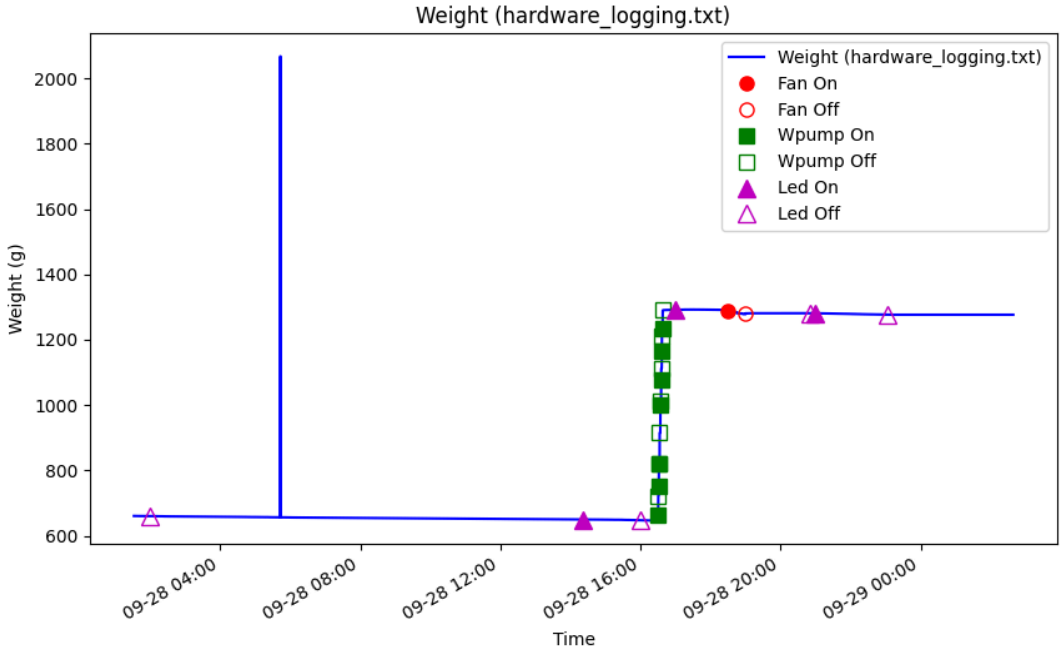
fluctuations. The fan being turned off corresponds to the peaks of the humidity spikes (humidity increases shortly afterward), while the fan being turned on corresponds to the troughs of the humidity dips (humidity decreases shortly afterward). This cyclical behavior indicates that the fan is effectively controlling the humidity, stabilizing it within a certain range, though the effect is more consistent and rhythmic in the simulated environment compared to the hardware logging, where the pattern appears slightly more irregular.

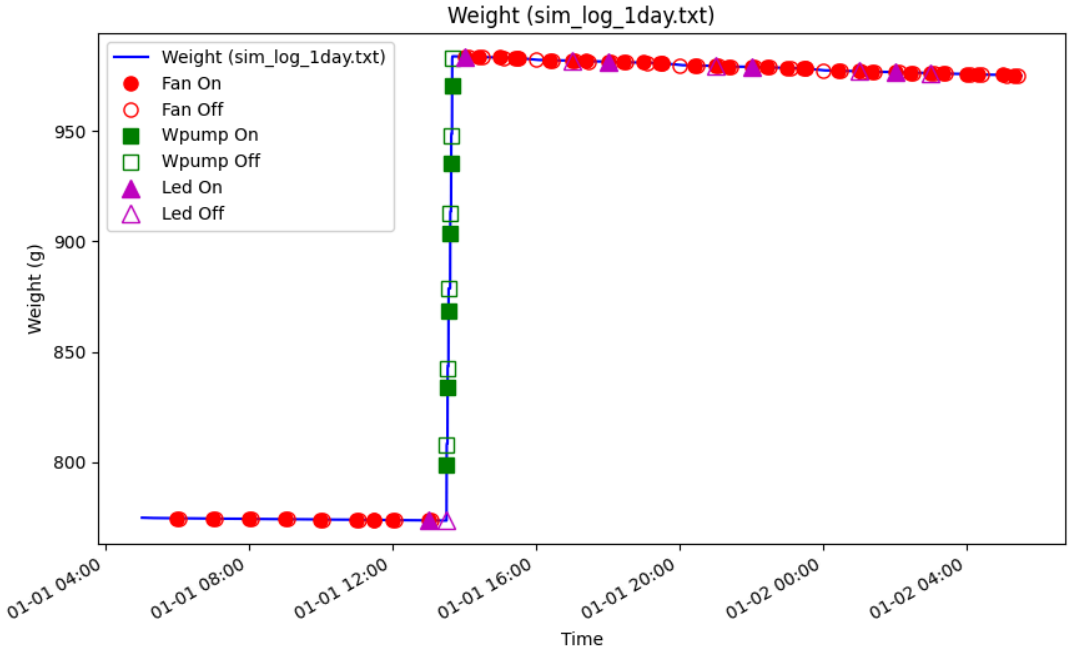




In both the hardware and simulator plots of soil moisture, a significant increase is observed when the water pumps are turned on, as expected. Once the pumps are turned off, the soil moisture begins a steady decline, indicating that moisture retention decreases over time without water input. In the hardware plot, an additional trend emerges: the turning on of fans seems to accelerate the rate of soil moisture decline. This suggests that fan activity may be contributing to

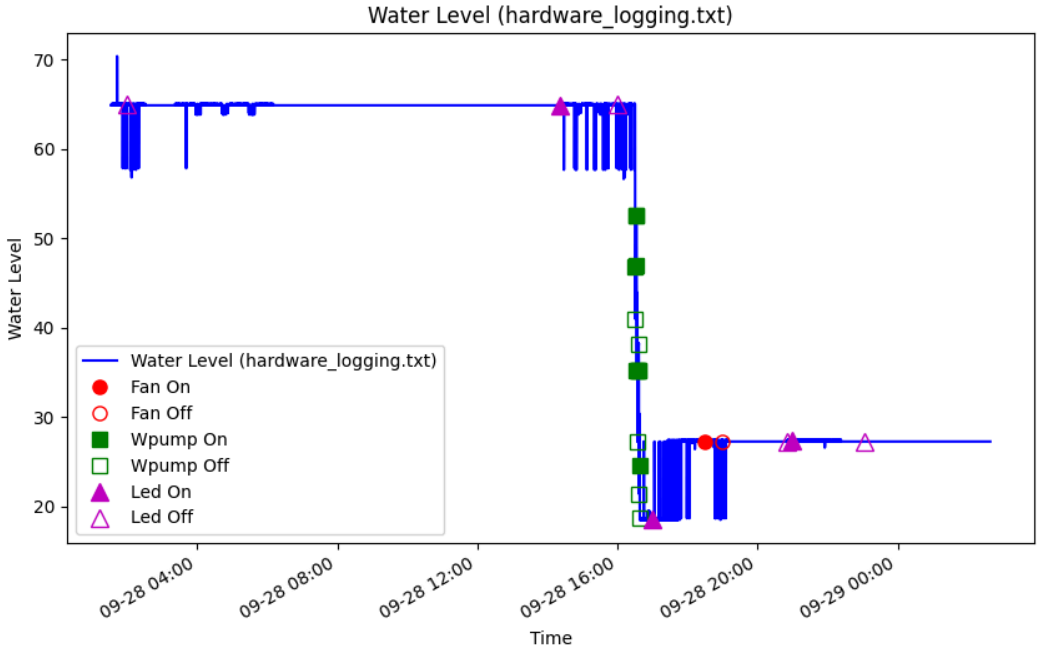
drying the soil, which is not as clearly seen in the simulator data, where the effects of the fans on soil moisture seem less significant.

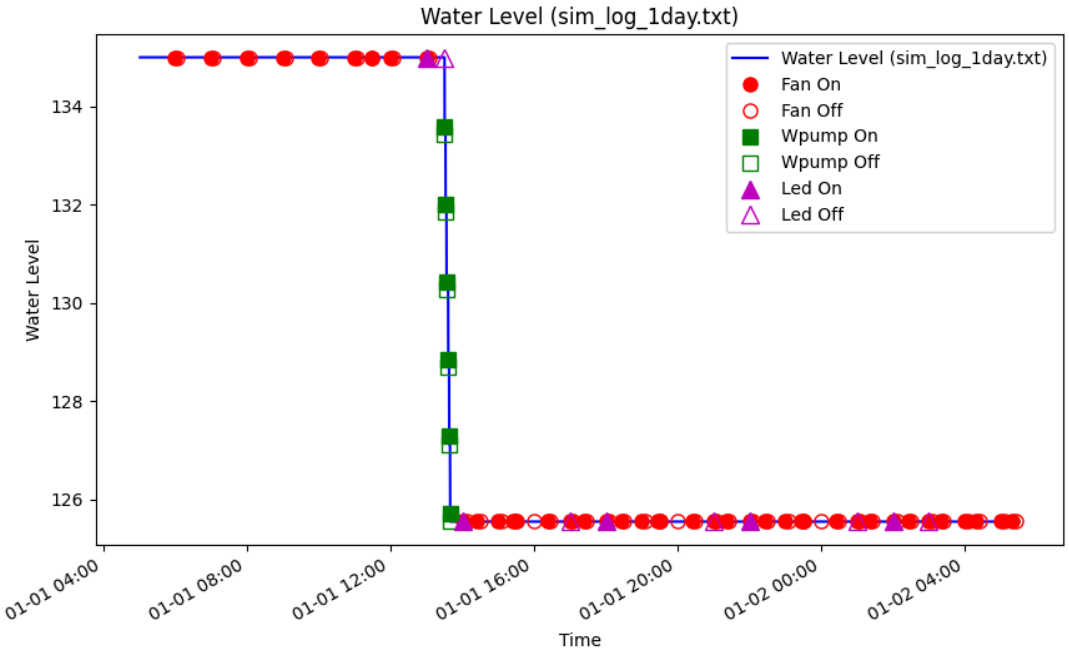




In both the hardware and simulated weight plots, we observe a similar pattern: the weight of the TerraBot increases sharply when the water pump is turned on, likely due to the increase in water

content. Once the water pump is turned off, the weight stabilizes, showing only minimal changes over time. This suggests that the TerraBot's system retains most of the water absorbed during the watering cycle, with little evaporation or loss afterward. The consistency between the hardware and simulated data demonstrates that the watering behavior and weight change mechanics are well-modeled, though minor differences in the rate of weight stabilization might be due to environmental factors in the real-world hardware setup, such as temperature or humidity, influencing the evaporation rate.





In both the simulator and hardware plots, the water level experiences a rapid decline when the water pump is activated. In the simulator plot, the water level remains constant until the water pump is triggered, after which it drops and remains at a low level once the pump is turned off. However, in the hardware data, there are noticeable fluctuations in the water level throughout

the day, even when the water pump is off. This discrepancy suggests that while the overall behavior of water level reduction due to the water pump is consistent between the simulator and hardware, the hardware introduces additional noise or variability in the measurements, possibly due to environmental factors or sensor inaccuracies. Nonetheless, the general trend of declining water levels in response to the water pump's activation is evident in both data sets.