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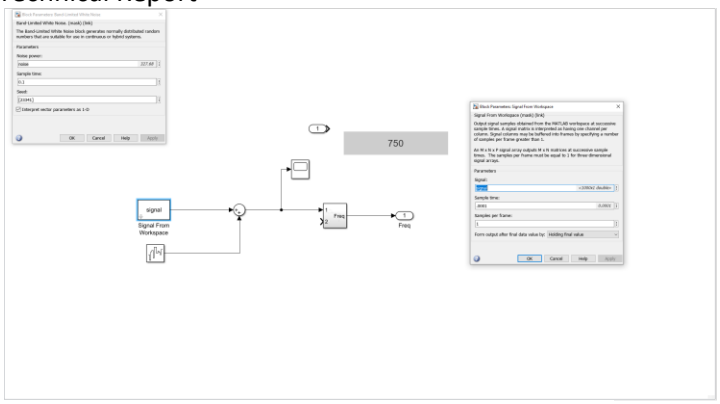
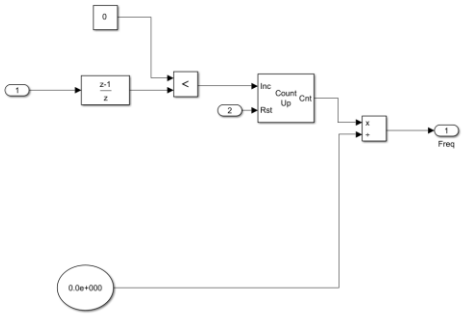
Project 1 Module 6

ECEN 5803-002

SOFTWARE DESIGN OUTLINE

1. Design your algorithm by using a Simulink model in MATLAB. Include the Simulink Block Diagram in your Technical Report
   a. 

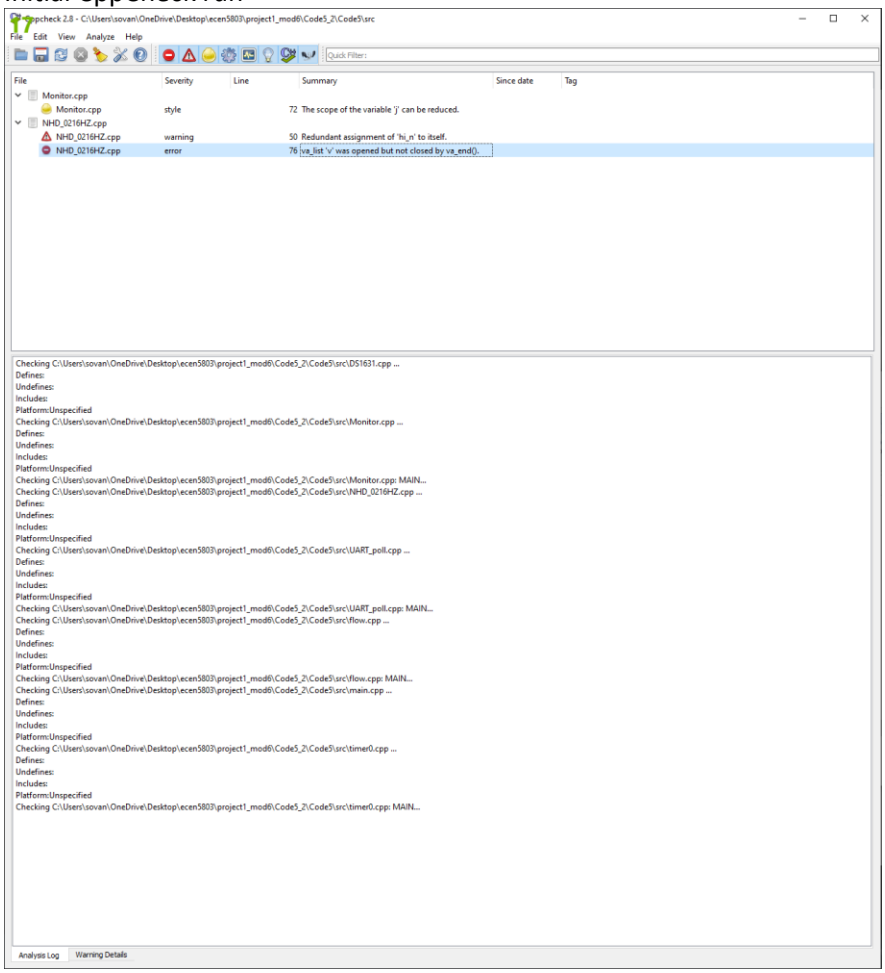


2. Record the reported values of frequency and flow from your monitor program.
   a.
   b. 

3. Auto-generate documentation using Doxygen. Provide either an HTML directory or PDF file documenting your codebase.
   a. The Doxygen documentation is attached to the project as

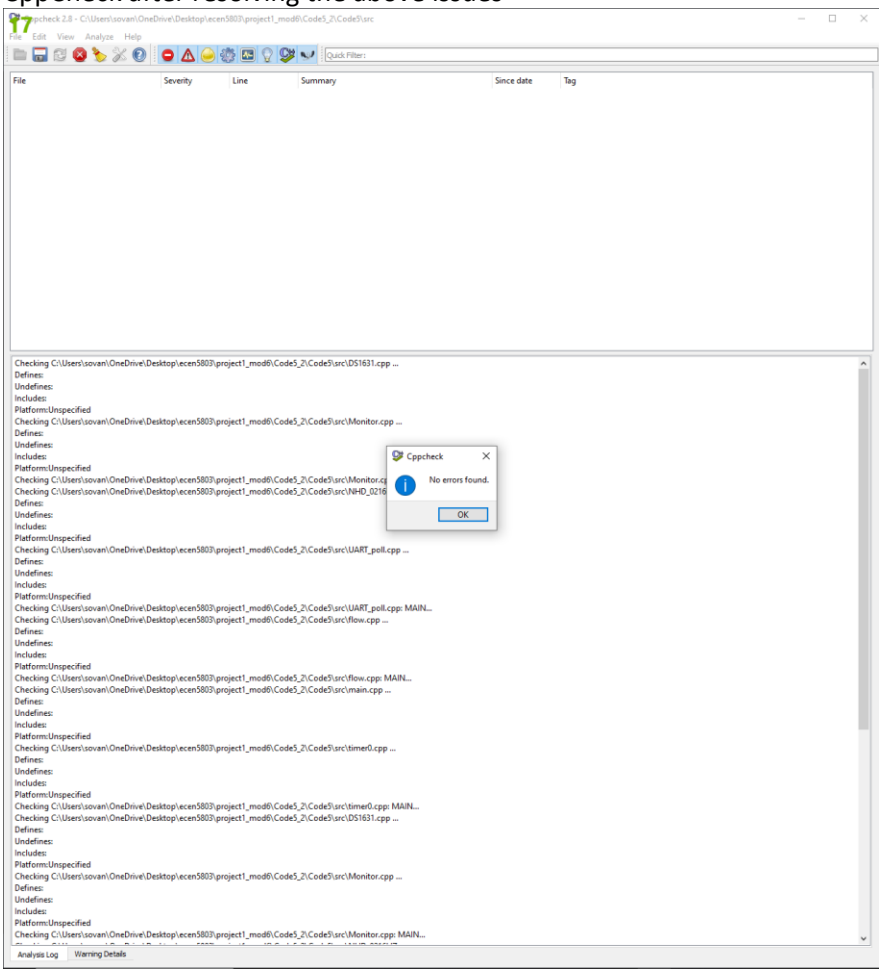
4. Run Splint or an equivalent code checker (like CppCheck or Cpplint) on your code in this module. Resolve any errors, explain the warnings.

a. Initial CppCheck run



-Monitor had a style finding: the variable j had a scope which could be reduced. We reduced the scope of j to rid of the style finding.
-NHD_0216HZ had a warning, variable hi_n was assigned to itself and then assigned to a proper value. This was a redundant assignment and was fixed by removing the redundant assignment.
- NHD_0216HZ had an error: a va_list was opened but never closed. This error was fixed by simply closing the va_list after we were finished using it.

b. CppCheck after resolving the above issues



QUESTIONS

1. What is the frequency estimate from your provided sample ADC data?
    a. We calculated the frequency to be 750 Hz.
2. What is the calculated flow you see from your input?
    a. We calculated the flow to be ~2415.26 gallons/min.
3. What is the range of temperatures you measured with your embedded system?
    a. We saw a range of 28 degrees Celsius to ~29 degrees Celsius.
4. How much time does the code spend in the main loop versus in Interrupt Service Routines?
    a. The code spends about 1% of its time in the ISR. This is based on the number of times the code enters the ISR, ~300000, compared to the number of times the main loop iterates, ~626, during a 30 second run time.
5. Estimate the % of CPU cycles used for the main foreground process, assuming a 100-millisecond operating cycle.
    a. The main foreground process used ~99% of the CPU cycles.
6. Calculate the power consumption for your complete system (including proposed hardware additions) when in full run mode, and again in low power mode.

a. At full power, based on the 146 uA/MHz provided by the STM32 data sheet, the processor will consume approximately .06 watts. The LEDs are driven by a 3v3 source and draw approximately .06 watts. The LCD screen will consume approximately 0.45 watts of power. The keypad consumes a negligible amount of power; making the overall system power consumption approximately 0.54 watts. In low-power mode, the microcontroller's power consumption will drop to 12 uA as specified in the datasheet. The system will spend (insert percentage of time) in this mode and will cause the overall system power consumption to be approximately 0.5 watts. This assumes the processor spends 99% of the time in the sleep state.