Reflection Report – SIT315 Task M1

- System Architecture and Logic

The system is designed on a modular basis with the logic separated into input handling, processing, and output functions. It includes two digital inputs: a push-button on D8 (through Pin Change Interrupt), and an ultrasonic sensor (HC-SR04) on pins D9 (Echo) and D10 (Trig). It has two outputs: LED1, which blinks every 1 second through a Timer1 interrupt, and LED2, which blinks only when an object is within 20 cm or whenever the button is pressed.

The loop() function reads the sensor and updates the logic continuously without the use of delay(), with millis() being used for non-blocking LED2 control. This allows the system to handle concurrent events in a stable manner. Serial output is used to monitor all events for easy debugging.

- Interrupt Configuration and Usage

Pin Change Interrupt (PCI) on pin D8 is utilized for button press detection. Upon activation, it sets a flag (buttonPressed) to mark the button as pressed, and this flag is then utilized in the main loop for LED2 control.

Timer1 Interrupt is initialized in CTC mode at 1Hz frequency. It toggles a timerFlag every 1 second. If this flag is set, the system toggles LED1, realizing a regular, periodic hardware-timed blinking function.

Both interrupts are minimal and safe — they merely toggle flags, and the logic is realized in the loop(), so it is interrupt-safe design.

- Issues Encountered and Resolutions

LED2 blinking incorrectly every second: LED2 was initially blinking with the timer due to shared logic. This was remedied by separating LED2 from the timer and handling it in terms of distance and button state alone, using millis() to time the blink.

Button bounce causing multiple triggers: This was remedied by using the internal pull-up resistor and detecting the falling edge using !digitalRead() logic in the ISR.

Sensor and timer logic interference: Because both required timing control, care was taken to bound sensor polling within the timer ISR and avoid delay-based functions.