M1QP – Interrupt-Based Sense-Think-Act System

How to Run the Simulation in TinkerCad

Step 1 — Enter the Code

- Click the Code button (top-right in TinkerCad)
- Switch from Blocks → Text mode
- Delete all existing code, paste the full code from Section 2 above

Step 2 — Start Simulation

- Click Start Simulation (green button)
- Click the Serial Monitor icon at the bottom of the code panel
- Set baud rate to 9600
- You should immediately see the startup message:

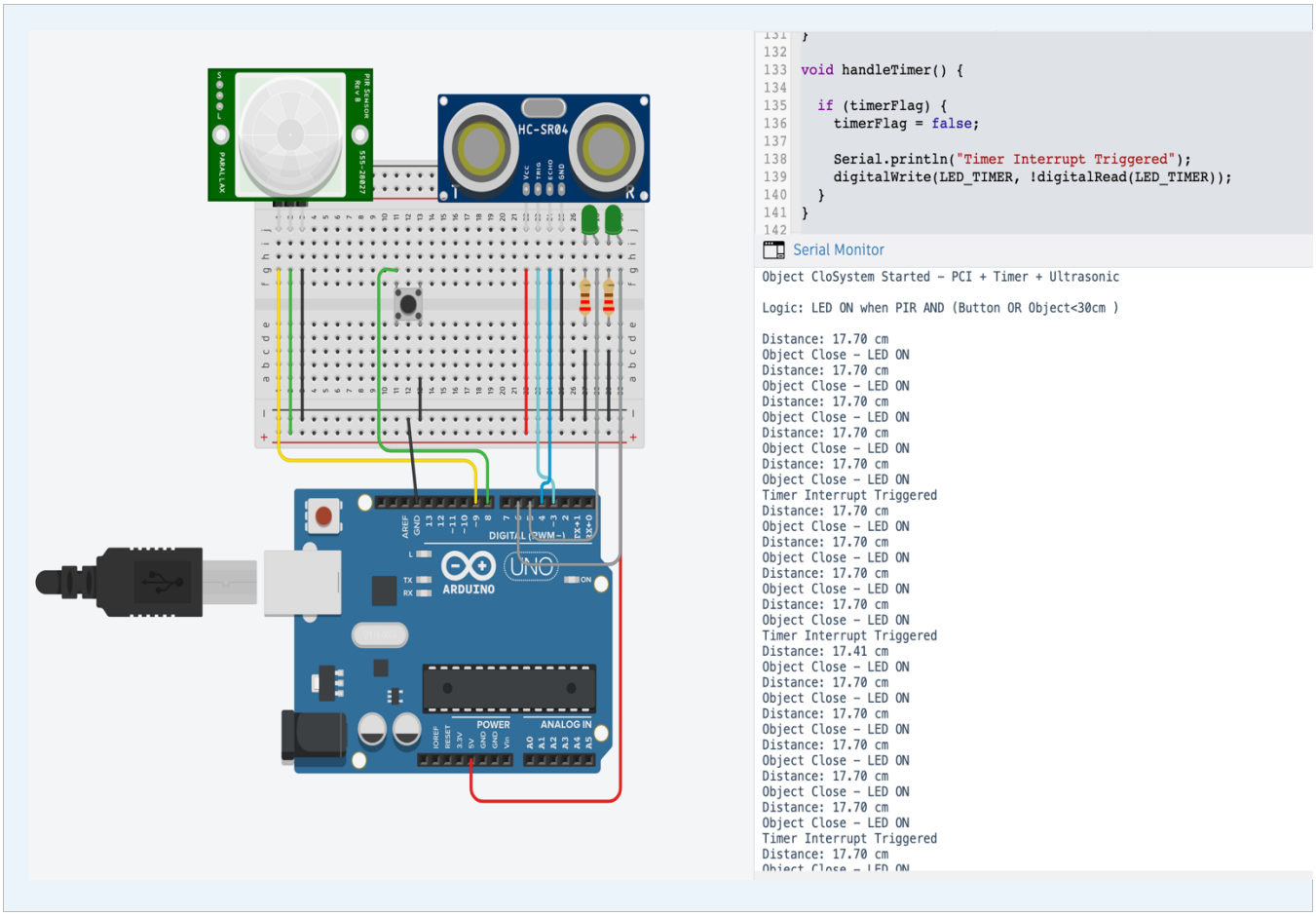
```
System Started - PCI + Timer + Ultrasonic

Logic: LED ON when PIR AND (Button OR Object<30cm )

Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Timer Interrupt Triggered
Distance: 17.70 cm
Object Close - LED ON
```

Step 3 — Trigger Each Sensor

- PIR: Click the PIR sensor in simulation → toggle its output HIGH
- Button: Click the button to press/release it
- HC-SR04: Click the sensor → drag the distance slider to under 30cm

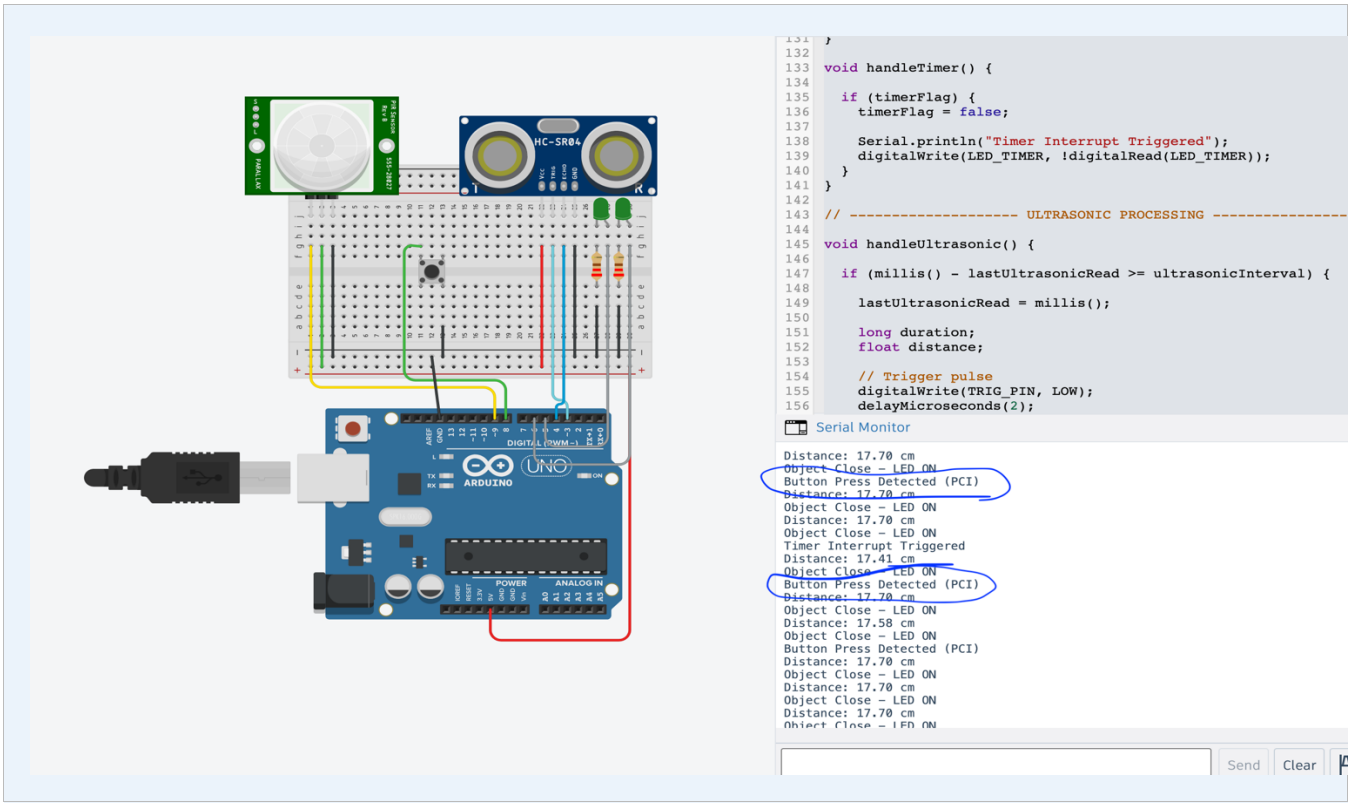
Required Screenshots — Serial Monitor

Screenshot 1 — System Startup (QP1) and Timer Heartbeat Ticks (QP4)



Button Press PCINT Event (QP2 + QP3)

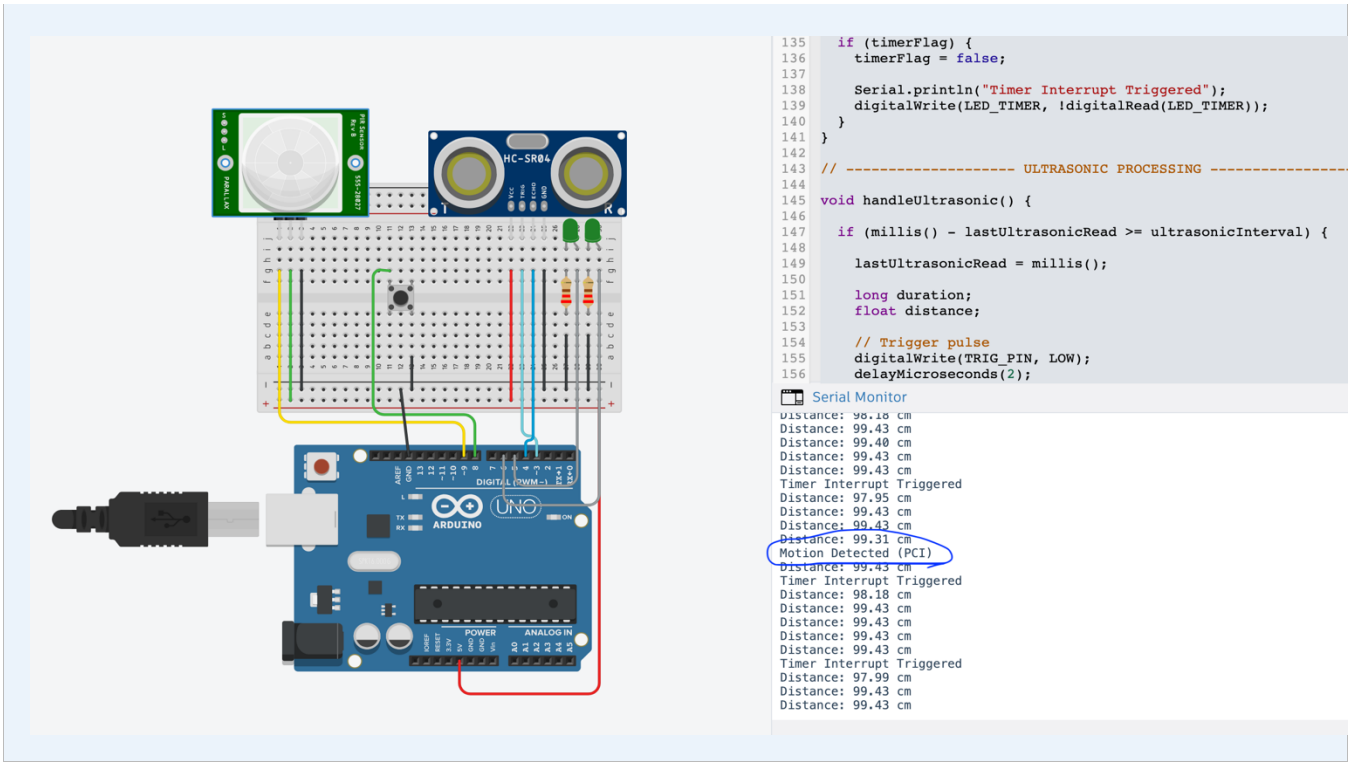
How to get it: During simulation, click the push button. You will see [PCINT] Button: PRESSED then [PCINT] Button: Released when you release it.




```
}

void handleTimer() {

  if (timerFlag) {
    timerFlag = false;

    Serial.println("Timer Interrupt Triggered");
    digitalWrite(LED_TIMER, !digitalRead(LED_TIMER));
  }
}

// -------------------- ULTRASONIC PROCESSING ----------------

void handleUltrasonic() {

  if (millis() - lastUltrasonicRead >= ultrasonicInterval) {

    lastUltrasonicRead = millis();

    long duration;
    float distance;

    // Trigger pulse
    digitalWrite(TRIG_PIN, LOW);
    delayMicroseconds(2);
```

Screenshot 4 — PIR Motion Detected PCINT Event (QP3)

How to get it: Click the PIR sensor component → set its OUT pin to HIGH. You will see [PCINT] PIR: MOTION DETECTED.




```
  if (timerFlag) {
    timerFlag = false;

    Serial.println("Timer Interrupt Triggered");
    digitalWrite(LED_TIMER, !digitalRead(LED_TIMER));
  }
}

// -------------------- ULTRASONIC PROCESSING ----------------

void handleUltrasonic() {

  if (millis() - lastUltrasonicRead >= ultrasonicInterval) {

    lastUltrasonicRead = millis();

    long duration;
    float distance;

    // Trigger pulse
    digitalWrite(TRIG_PIN, LOW);
    delayMicroseconds(2);
```

Screenshot 5 — HC-SR04 Object Near PCINT Event (QP3)

How to get it: Click the HC-SR04 → drag the distance slider under 30cm threshold. The ECHO pin change triggers PCINT.