

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 )

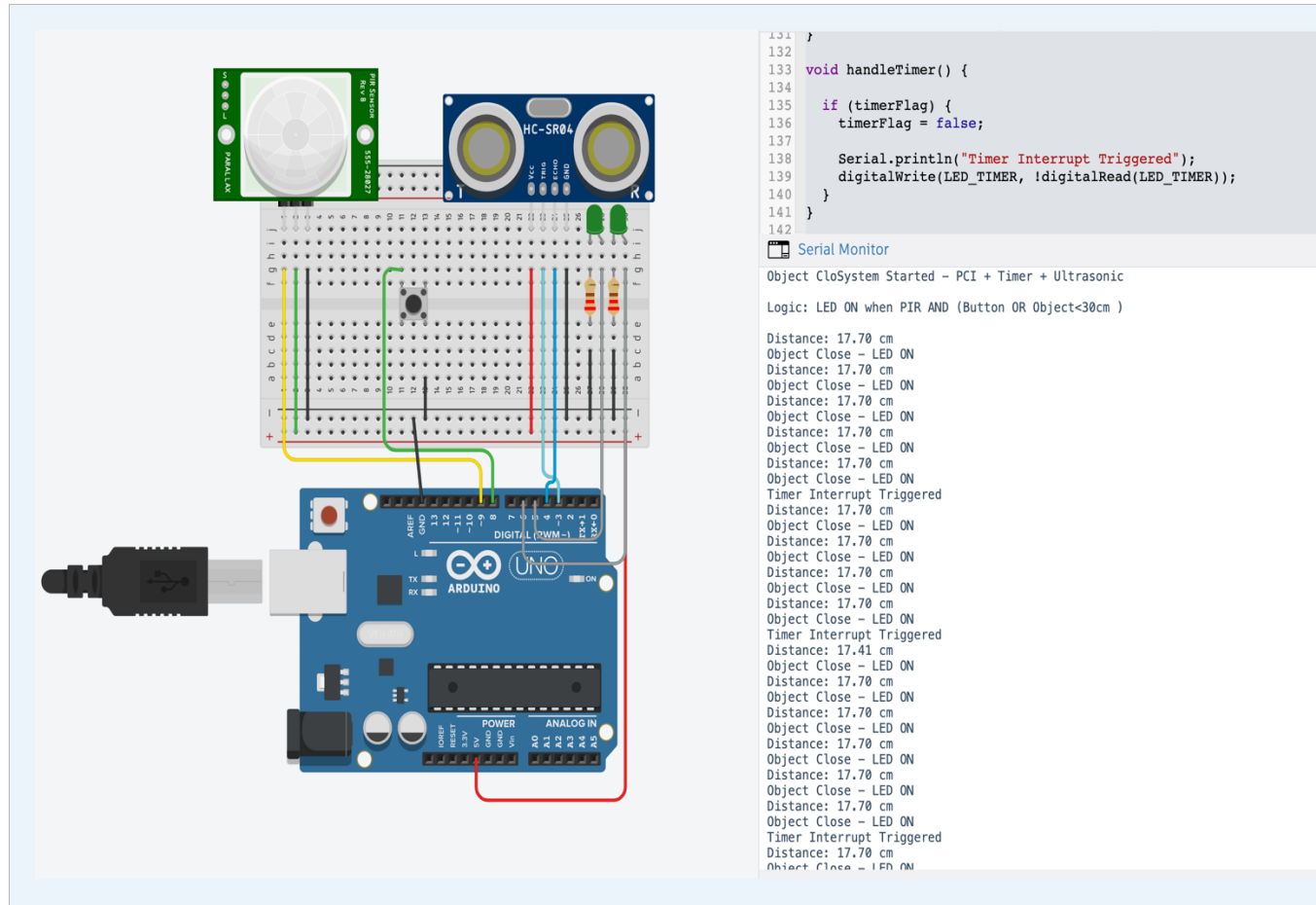
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Timer Interrupt Triggered
Distance: 17.70 cm
Object Close - LED ON
```

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

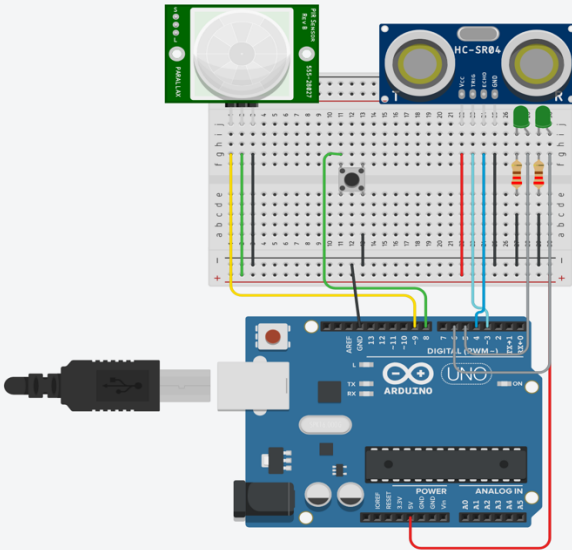
Required Screenshots — Serial Monitor

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.



```

131 }
132
133 void handleTimer() {
134     if (timerFlag) {
135         timerFlag = false;
136         Serial.println("Timer Interrupt Triggered");
137         digitalWrite(LED_TIMER, !digitalRead(LED_TIMER));
138     }
139 }
140
141 // ----- ULTRASONIC PROCESSING -----
142
143 void handleUltrasonic() {
144     if (millis() - lastUltrasonicRead >= ultrasonicInterval) {
145         lastUltrasonicRead = millis();
146         long duration;
147         float distance;
148         // Trigger pulse
149         digitalWrite(TRIG_PIN, LOW);
150         delayMicroseconds(2);
151     }
152 }

```

Serial Monitor

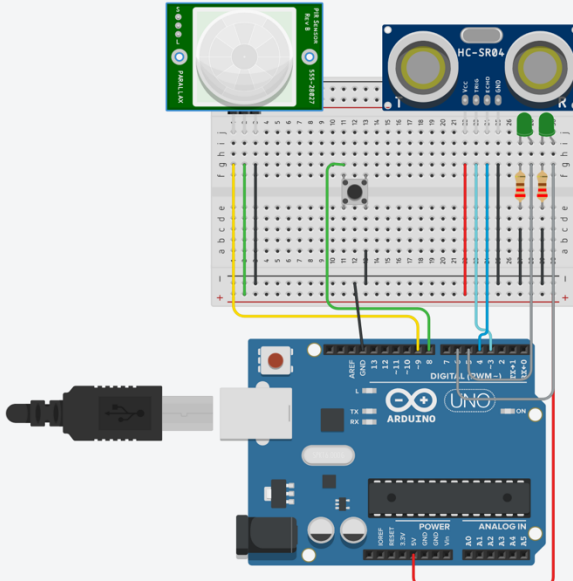
```

Distance: 17.70 cm
Object Close - LED ON
Button Press Detected (PCI)
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Timer Interrupt Triggered
Distance: 17.41 cm
Object Close - LED ON
Button Press Detected (PCI)
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.58 cm
Object Close - LED ON
Button Press Detected (PCI)
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON
Distance: 17.70 cm
Object Close - LED ON

```

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.



```

135     if (timerFlag) {
136         timerFlag = false;
137         Serial.println("Timer Interrupt Triggered");
138         digitalWrite(LED_TIMER, !digitalRead(LED_TIMER));
139     }
140 }
141
142 // ----- ULTRASONIC PROCESSING -----
143
144 void handleUltrasonic() {
145     if (millis() - lastUltrasonicRead >= ultrasonicInterval) {
146         lastUltrasonicRead = millis();
147         long duration;
148         float distance;
149         // Trigger pulse
150         digitalWrite(TRIG_PIN, LOW);
151         delayMicroseconds(2);
152     }
153 }

```

Serial Monitor

```

Distance: 98.18 cm
Distance: 99.43 cm
Distance: 99.40 cm
Distance: 99.43 cm
Distance: 99.43 cm
Timer Interrupt Triggered
Distance: 97.95 cm
Distance: 99.43 cm
Distance: 99.43 cm
Distance: 99.31 cm
Motion Detected (PCI)
Distance: 99.43 cm
Timer Interrupt Triggered
Distance: 98.18 cm
Distance: 99.43 cm
Distance: 99.43 cm
Distance: 99.43 cm
Distance: 99.43 cm
Timer Interrupt Triggered
Distance: 97.99 cm
Distance: 99.43 cm
Distance: 99.43 cm

```

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.

