



UNIVERSITI  
TEKNOLOGI  
PETRONAS

# LAB WEEK 11

SEP 2025 SEMESTER

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BACHELOR OF COMPUTER SCIENCE

INTERNET OF THINGS

TFB2093

## Contents

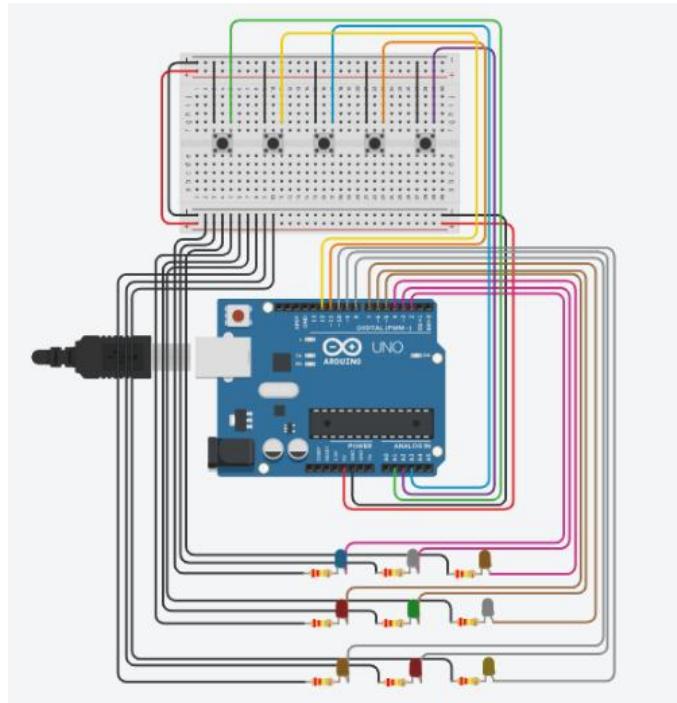
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## Code and Design

Activity 4 Link: <https://www.tinkercad.com/things/fopX6WCx7X-lab8w11-4>

Activity 5 Link: <https://www.tinkercad.com/things/69T046f56Jp-lab8w11-5>

### Activity 4 and 5



## Code

### Activity 4

```
//Activity 4

const int ledPins[3][3] = {
    {2, 3, 4},    // Row 0
    {5, 6, 7},    // Row 1
    {8, 9, 10}   // Row 2
};

const int BTN_UP      = 11;
const int BTN_DOWN    = 12;
const int BTN_LEFT    = A1;
const int BTN_RIGHT   = A2;
const int BTN_OK      = A3;    // belum guna lagi, untuk Activity 5 nanti

int playerRow = 1;    // start kat tengah
int playerCol = 1;    // start kat tengah

void setup() {
    // Set semua LED pins jadi OUTPUT
    for(int r = 0; r < 3; r++) {
        for(int c = 0; c < 3; c++) {
            pinMode(ledPins[r][c], OUTPUT);
        }
    }

    // Set button pins dengan internal pull-up
    pinMode(BTN_UP,     INPUT_PULLUP);
    pinMode(BTN_DOWN,   INPUT_PULLUP);
    pinMode(BTN_LEFT,   INPUT_PULLUP);
    pinMode(BTN_RIGHT,  INPUT_PULLUP);
    pinMode(BTN_OK,    INPUT_PULLUP);

    // Nyalakan pixel tengah dulu
    digitalWrite(ledPins[playerRow][playerCol], HIGH);
}

void clearAll() {
    for(int r = 0; r < 3; r++) {
        for(int c = 0; c < 3; c++) {
            digitalWrite(ledPins[r][c], LOW);
        }
    }
}

void drawPlayer() {
    clearAll();
    digitalWrite(ledPins[playerRow][playerCol], HIGH);
}

void loop() {
    // Baca button dan gerak (hanya gerak kalau tak keluar grid)
    if (digitalRead(BTN_UP) == LOW && playerRow > 0) playerRow--;
    if (digitalRead(BTN_DOWN) == LOW && playerRow < 2) playerRow++;
    if (digitalRead(BTN_LEFT) == LOW && playerCol > 0) playerCol--;
    if (digitalRead(BTN_RIGHT) == LOW && playerCol < 2) playerCol++;

    drawPlayer();

    delay(150);    // ni penting! debounce + buat gerak tak terlalu laju
}
```

## Activity 5

```
//Activity 5

const int ledPins[3][3] = {
    {2, 3, 4},
    {5, 6, 7},
    {8, 9, 10}
};

const int BTN_UP      = 11;
const int BTN_DOWN    = 12;
const int BTN_LEFT    = A1;
const int BTN_RIGHT   = A2;
const int BTN_OK      = A3;

int score = 0; // ← STUDENT TASK: Score counter
unsigned long targetTime;
bool targetOn = false;
int targetRow, targetCol;

void clearAll() {
    for (int r = 0; r < 3; r++) {
        for (int c = 0; c < 3; c++) {
            digitalWrite(ledPins[r][c], LOW);
        }
    }
}

void showPattern(const byte pattern[3][3]) {
    clearAll();
    for (int r = 0; r < 3; r++) {
        for (int c = 0; c < 3; c++) {
            digitalWrite(ledPins[r][c], pattern[r][c]);
        }
    }
}

void newTarget() {
    targetRow = random(0, 3);
    targetCol = random(0, 3);
    clearAll();
    digitalWrite(ledPins[targetRow][targetCol], HIGH);
    targetTime = millis();
    targetOn = true;
}

// ← STUDENT TASK: WIN pattern (smiley)
void winPattern() {
    byte win[3][3] = {{1,0,1},{0,1,0},{1,1,1}};
    showPattern(win);
    delay(1000);
}

// ← STUDENT TASK: LOSE pattern (cross)
void losePattern() {
    byte lose[3][3] = {{1,0,1},{0,1,0},{1,0,1}};
    showPattern(lose);
    delay(1000);
}

void setup() {
    Serial.begin(9600);
    randomSeed(analogRead(A5)); // Random seed for random()

    // LED pins
```

```
for (int r = 0; r < 3; r++) {
    for (int c = 0; c < 3; c++) {
        pinMode(ledPins[r][c], OUTPUT);
    }
}

// Buttons
pinMode(BTN_UP, INPUT_PULLUP);
pinMode(BTN_DOWN, INPUT_PULLUP);
pinMode(BTN_LEFT, INPUT_PULLUP);
pinMode(BTN_RIGHT, INPUT_PULLUP);
pinMode(BTN_OK, INPUT_PULLUP);

Serial.println("Reaction Game: Press CENTER on the lit LED!");
newTarget(); // Start first target
}

void loop() {
    if (targetOn) {
        // CENTER press: WIN
        if (digitalRead(BTN_OK) == LOW) {
            unsigned long reaction = millis() - targetTime;
            Serial.print("WIN! Reaction time: ");
            Serial.print(reaction);
            Serial.println(" ms");
            score++; // ← STUDENT TASK: Increase score
            Serial.print("Score: ");
            Serial.println(score);
            winPattern();
            delay(500); // Short pause
            newTarget();
        }

        // Timeout: LOSE
        if (millis() - targetTime > 2000) { // ← STUDENT TASK: Reduced time (2000 ms = harder)
            Serial.println("Too slow! LOSE");
            score = 0; // ← STUDENT TASK: Reset score on lose
            Serial.print("Score reset to: ");
            Serial.println(score);
            losePattern();
            delay(500); // Short pause
            newTarget();
        }
    }
}
```

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