UNIVERSIDAD TECNOLÓGICA DE TAMAULIPAS NORTE

Facultad de Tecnologías de la Información

*T.S.U en Tecnologías de la Información Área Desarrollo De Software Multiplataforma*

|  |  |  |  |
| --- | --- | --- | --- |
| **Subject** | **Quartermonth period** | **Group** | **Period** |
| Aplicaciones IoT | 5to | A | May-Ago |

|  |  |  |
| --- | --- | --- |
| **No.** | **Practice** | **Duration** |
| 5 | Unlock the Secrets: Using a 4x4 Keypad with  Arduino | 1 hr |

|  |
| --- |
| **1. Introduction**    Keypads are commonly used in various electronic systems such as security systems, ATMs, and calculators. In this practice, you will learn how to use a 4x4 keypad with  Arduino. The 4x4 keypad is a matrix of buttons arranged in four rows and four columns. It works by using a combination of row and column pins to determine which button is pressed. |

|  |  |
| --- | --- |
| **2. Description** |  |
| **A) Materials needed**     * Arduino board (UNO, Nano, or   similar)   * PIR sensor * Jumper wires * Breadboard * USB cable * LED light (optional) | **Other** |

|  |
| --- |
| **B) Practice development**    A matrix is a grid of rows and columns. In the case of a keypad, the buttons are arranged in a matrix of rows and columns. The Arduino uses a combination of row and column pins to determine which button is pressed. When a button is pressed, it connects the corresponding row and column pins, and the Arduino can read the unique combination of row and column to determine which button was pressed.    Step 1. Wiring the keypad: Connect the keypad to the breadboard. Connect the four rows to Arduino digital pins 11, 10, 9, and 8. Connect the three columns to Arduino digital pins 7, 6, and 5. Place a 220-ohm resistor in series with the LED and connect it to Arduino digital pin 13.    Step 2. Include the Keypad library in your Arduino IDE by going to Sketch > Include Library > Keypad.    Step 3. Initialize the keypad in the setup() function by creating a Keypad object with the makeKeymap() function, passing the keys array, pinsFilas, pinsColumnas, filas, and columnas as arguments.    Step 4. In the loop() function, use the getKey() function to read the keypad's input values. If a key is pressed, print the value of the key to the serial monitor using the Serial.println() function.    Step 5. Upload the code to your Arduino board and open the Serial Monitor to see the output.    #include <Keypad.h>    // Define the number of rows and columns on the keypad const byte filas = 4; const byte columnas = 3;    // Define the keys on the keypad char keys[4][3] = {  {'1','2','3'},  {'4','5','6'},  {'7','8','9'},  {'\*','0','#'}  };    // Define the pins connected to the rows and columns of the keypad byte pinsFilas[filas] = {11, 10, 9, 8}; byte pinsColumnas[columnas] = {7, 6, 5};    // Create a Keypad object with the specified parameters |
| Keypad teclado = Keypad(makeKeymap(keys), pinsFilas, pinsColumnas, filas, columnas);    // Declare a variable to store the pressed key char tecla;    void setup()  {  // Initialize serial communication  Serial.begin(9600);  }  void loop()  {  // Get the pressed key from the keypad tecla = teclado.getKey();    // If a key is pressed, print it to the serial monitor if(tecla > 0){  Serial.println(tecla);  }  }    The code defines the rows and columns of a 4x3 keypad, and the keys on the keypad. It also sets the pins connected to the rows and columns of the keypad. In the setup() function, it initializes serial communication. In the loop() function, it gets the pressed key from the keypad using the getKey() function, and if a key is pressed, it prints it to the serial monitor.      Follow-up questions:  I. What other applications can you think of for a keypad besides a simple calculator? II. How could you modify the code to add more functionality to the keypad?   1. How does the keypad matrix work? How do the rows and columns interact to determine which key is being pressed? 2. How could you integrate the keypad with other components, such as an LCD display? 3. How could you add password protection to the keypad so that only authorized users can access certain features? 4. How could you use the keypad in combination with other sensors or inputs to create a more complex system, such as a home automation or security system?   **ANSWERS**   * 1. Security systems   Door locks  Entry systems  Industrial control panels   * 1. By changing the code, you can add more features to the keypad.   2. The keypad matrix works by arranging the keys in rows and columns. When a key is pressed, the microcontroller detects the intersection of the corresponding row and column to determine which key is pressed.   3. You can integrate the keypad with an LCD display by connecting them to a microcontroller. The microcontroller can receive input from the keypad and display information on the LCD.   4. To add password protection, you can modify the code to require a specific sequence of key presses. Only those who enter the correct password will be granted access to certain features.   5. The keypad can be used with other sensors or inputs to create a more complex system. For example, in a home automation system, the keypad can be used to enter commands for controlling lights, temperature, or security systems. It can work in conjunction with sensors to trigger specific actions based on user input or environmental conditions.     **RESULTS** |