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| **Iotronics Techlab Pvt Ltd.** | |
| **Aim:** | To design and implement a Bluetooth-controlled LED matrix display using IoT development kits. |
| **Requirements:** | 1. Automation Kit (containing Arduino Uno and necessary sensors/components) 2. Wireless and IoT Kit (for Bluetooth connectivity) 3. LED Matrix 4x4 display 4. Bluetooth Module (HC-05 or similar) 5. Smartphone with Bluetooth capability 6. Matrix controller app link   (https://drive.google.com/file/d/1KBcZFSgm6EIuQ6G35mwFY4zRXzwyQkxA/view?usp=drive\_link) |
| **IDE:** | Arduino IDE |
| **Connection Diagram:** |  |
| **Working** | 1. Bluetooth module establishes communication between Arduino Uno and smartphone. 2. Smartphone app sends commands to control LED matrix display via Bluetooth. 3. Arduino Uno receives commands and updates LED matrix accordingly. 4. Different patterns or messages can be displayed on the LED matrix based on received commands. |
| **Procedure:** | 1. **Setting Up the Hardware**:    * Connect the Bluetooth module to the Arduino Uno following the provided instructions.    * Connect the LED matrix display to the Arduino Uno using jumper wires. 2. **Programming the Arduino Uno**:    * Open the Arduino IDE on your computer.    * Write the code to establish Bluetooth communication and update the LED matrix display based on received commands.    * Define functions to display different patterns or messages on the LED matrix. 3. **Testing**:    * Power on the Arduino setup.    * Pair your smartphone with the Bluetooth module.    * Test the system by sending commands from the smartphone application to display different patterns or messages on the LED matrix. 4. **Finalization**:    * Make any necessary adjustments to the code or hardware setup for optimal performance.    * Document the project for future reference. |
| **CODE:** | #include <MaxMatrix.h>  #include <SoftwareSerial.h>// import the serial library  SoftwareSerial BT(0, 1);  // RX, TX  int DIN = 11;   // DIN pin of MAX7219 module  int CLK = 13;   // CLK pin of MAX7219 module  int CS = 10;    // CS pin of MAX7219 module  int maxInUse = 1;  boolean red = true;  boolean toggle = true;    MaxMatrix m(DIN, CS, CLK, maxInUse);  void setup()  {    BT.begin(9600); //start the Bluetooth communication at 9600 baudrate    Serial.begin(9600);    // BT.println("Bluetooth working");    m.init(); // MAX7219 initialization    m.setIntensity(8); // initial led matrix intensity, 0-15    m.clear(); // Clears the display    }  int incoming;  int Y = 0;  int X = 0;  void loop()  {    if (BT.available())    {      incoming = BT.read();      Serial.println(incoming);      if (incoming==0)        m.clear(); // Clears the display        else if (incoming == 100)//Check if we should on or off the LED      {        if (red == true)        red= false;        else if (red == false)        red= true;          Serial.print("RED:");  Serial.println(red);      }        else if (incoming<=64)      { //Calculate where to ON ro OFF the LED        toggle=true;      Y = incoming / 8;      X = incoming - (Y \* 8);      if (incoming%8 == 0)        {X = 8; Y -= 1;}        Serial.println(X - 1);      Serial.println(Y);      if(red==true)      m.setDot((X - 1), (Y), true); //LED ON      else if (red == false)      m.setDot((X - 1), (Y), false); //LED OFF      }    }  } |
| **Result/Output** |  |