📑 Smart Poultry Farm System with QR Code Display

Using LilyGo TTGO T-Display V1.1, MQ Gas Sensor, DHT11 Sensor, and Relay Module

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📌 Project Overview

The **Smart Poultry Farm System** is an IoT-based monitoring and control solution that utilizes the **LilyGo TTGO T-Display V1.1**, **MQ Gas Sensor**, **DHT11 Temperature Sensor**, and a **Relay Module**. The system monitors environmental parameters like gas concentration, temperature, and humidity, displays real-time data on the TFT screen, and provides remote access via **Bluetooth**. Additionally, a **QR code** is displayed for quick access to relevant resources.

⚙️ Hardware Components

1. **LilyGo TTGO T-Display V1.1 (ESP32-based microcontroller)**
   - Built-in **240x240 TFT Display**
   - **Bluetooth Communication**
2. **MQ Gas Sensor**
   - Detects gas concentration (Analog Output)
3. **DHT11 Temperature and Humidity Sensor**
   - Measures temperature and humidity levels
4. **Relay Module**
   - Controls devices (e.g., fans, heaters)
5. **Power Management**
   - **USB Detection Pin**
   - **Battery Voltage Monitoring Pin**

🛠️ Pin Configuration

1. LilyGo TTGO T-Display V1.1 Pinout Reference

Pin Label	Description
3V	3.3V Power Output
36	GPIO36 (ADC)
37	GPIO37 (ADC)

Pin Label	Description
38	GPIO38 (ADC)
39	GPIO39 (ADC)
32	GPIO32 (PWM, ADC)
33	GPIO33 (PWM, ADC)
25	GPIO25 (DAC, PWM)
26	GPIO26 (DAC, PWM)
27	GPIO27 (Relay Control)
G	Ground
5V	5V Power Output
21	SDA (I2C Data)
22	SCL (I2C Clock)
17	GPIO17 (DHT11 Data Pin)
2	GPIO2 (USB Detection)
15	GPIO15 (PWM, ADC)
13	GPIO13 (PWM)
12	GPIO12 (MQ Sensor)

2. Pin Mapping for Components

Component	Pin on TTGO	Description
MQ Gas Sensor	GPIO12	Analog Output (Gas Data)
DHT11 Sensor	GPIO17	Digital Pin (Data)
Relay Module	GPIO27	Digital Control Pin
Battery Voltage	GPIO36	ADC Input
USB Detection	GPIO2	Digital Input (USB Status)
I2C SDA	GPIO21	I2C Data Line
I2C SCL	GPIO22	I2C Clock Line
Ground	G	Common Ground
Power (3.3V)	3V	Power Supply (3.3V)
Power (5V)	5V	Power Supply (5V)

📚 Libraries Used

1. **DHT Library:** For reading temperature and humidity.
2. **TFT_eSPI Library:** For controlling the TFT display.
3. **BluetoothSerial Library:** For Bluetooth communication.
4. **PNGdec Library:** For rendering images and QR codes on the display.

🚀 Setup Instructions

1. Install Required Libraries

- Open **Arduino IDE → Sketch → Include Library → Manage Libraries.**
- Install:
    - **DHT Sensor Library**
    - **TFT_eSPI**
    - **BluetoothSerial**
    - **PNGdec**

2. Hardware Wiring

Gas Sensor (MQ Sensor):

- **Analog Output:** GPIO12
- **VCC:** 3.3V / 5V
- **GND:** Ground

DHT11 Temperature Sensor:

- **Data Pin:** GPIO17
- **VCC:** 3.3V / 5V
- **GND:** Ground

Relay Module:

- **Control Pin (IN):** GPIO27
- **VCC:** 5V
- **GND:** Ground

Battery and USB Detection:

- **Battery Voltage Pin:** GPIO36
- **USB Detection Pin:** GPIO2

📝 Code Explanation

1. Initialization (setup())

- **Serial Communication:** 115200 baud rate for debugging.
- **Bluetooth Initialization:** Device name AKIJ_Poultry.

- **TFT Display Initialization:** Display welcome message and QR code.
- **Sensor Initialization:** Set pin modes for MQ, DHT11, and Relay pins.

2. Main Loop (loop())

Battery Monitoring

- Display battery voltage and USB charging status every 15 seconds.

Sensor Readings

- **MQ Gas Sensor:** Analog values from GPIO12.
- **DHT11 Sensor:** Temperature and humidity values from GPIO17.

Relay Control

- If **gas levels exceed the threshold** or **temperature is too high**, the **relay is activated**.
- If values are normal, the **relay is deactivated**.

Data Display on TFT

- Temperature, gas level, and relay status are displayed on the **TFT screen**.

Bluetooth Updates

- Data is sent in **JSON format** over Bluetooth for external monitoring.

QR Code Display

- A QR code (https://akijresource.com/) is shown on the TFT screen for quick access.

🧩 Bluetooth Data Example

json
Copy code

```json
[
 {"Temp": 26.5, "icon": "coolant-temperature"},
 {"Gas": 550, "icon": "run"}
]
```

- **Temp:** Displays temperature in degrees Celsius.
- **Gas:** Displays analog gas level reading.

⚠️ Threshold Values

Parameter	Threshold
Gas Level	750
High Temp	27°C
Low Temp	5°C

You can adjust these thresholds based on your farm's environmental requirements.

📊 System Workflow

1. **Startup:** Display welcome message and QR code.
2. **Monitoring:** Monitor gas and temperature levels.
3. **Relay Control:** Activate or deactivate devices based on thresholds.
4. **Display:** Show sensor data on the TFT screen.
5. **Bluetooth:** Send real-time updates to connected devices.

📈 How to Use the System

1. **Power On:** Connect the TTGO to a power source.
2. **Bluetooth Pairing:** Connect to AKIJ_Poultry.
3. **Data Display:** Monitor real-time data on the TFT screen.
4. **Alerts:** Devices will activate when thresholds are exceeded.
5. **QR Code Access:** Scan the QR code for quick information access.

🔄 Future Improvements

- Integration with **Cloud Platforms** for remote data logging.
- **SMS/Email Alerts** for abnormal conditions.
- Add **Humidity Control** mechanisms.

📚 References

- [DHT Sensor Library Documentation](#)
- [TFT_eSPI Documentation](#)
- ESP32 Bluetooth Documentation