Day-2

TASK-2

Team- 2

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1. Aim of the Project

Aim: Develop an intelligent Bathroom Ventilation Fan Controller that optimizes indoor air quality and energy efficiency by automating fan operation based on real-time environmental data.

2. Problem Statement and Solution

Problem Statement: Traditional on/off switches for bathroom ventilation fans lack efficiency and automation, leading to energy wastage and inadequate ventilation. There is a need for a smart controller that integrates sensors and algorithms to automate fan control based on occupancy and humidity levels.

Solution: Implement a microcontroller-based system with sensors to detect humidity and occupancy, coupled with a web interface for monitoring and remote control. The system will automate the fan's operation to optimize ventilation and minimize energy consumption.

3. Project Design Specification and Architecture

Specifications:

- Microcontroller: ESP8266/ESP32/Raspberry Pi Pico W for its Wi-Fi capabilities.
- Sensors: DHT22 for humidity and temperature, PIR sensor for occupancy detection.
- Actuator: Relay module to control the fan.
- Power Supply: Adequate power supply for the microcontroller and sensors.
- Web Interface: Accessible from any internet-enabled device to display real-time data and provide control options.

Architecture:

- Sensor Module: Collects real-time data (humidity, temperature, occupancy).
- Microcontroller: Processes sensor data and runs control algorithms.
- Control Module: Activates/deactivates the fan based on processed data.
- Web Interface: Displays real-time data and provides user control over the fan.

4. Wiring Diagram

Create a detailed wiring diagram showing connections between the microcontroller, sensors, relay module, and power supply.

5. KiCad PCB Design & Gerber File Submission

Design the PCB layout using KiCad, ensuring all components are correctly placed and connected. Generate and submit the Gerber files for manufacturing.

6. Components Working Principles/Functionality

- Microcontroller (ESP8266/ESP32/Raspberry Pi Pico W): Central processing unit for data collection and control algorithms.
- DHT22 Sensor: Measures temperature and humidity.
- PIR Sensor: Detects occupancy based on infrared radiation.
- Relay Module: Controls the power to the ventilation fan.

7. Assembling Hardware Components & Coding

- Assembling: Physically connect the sensors, relay module, and power supply to the microcontroller.
- Coding: Write and upload firmware to the microcontroller to read sensor data, process it, and control the relay. Ensure Wi-Fi connectivity and integration with the web interface.

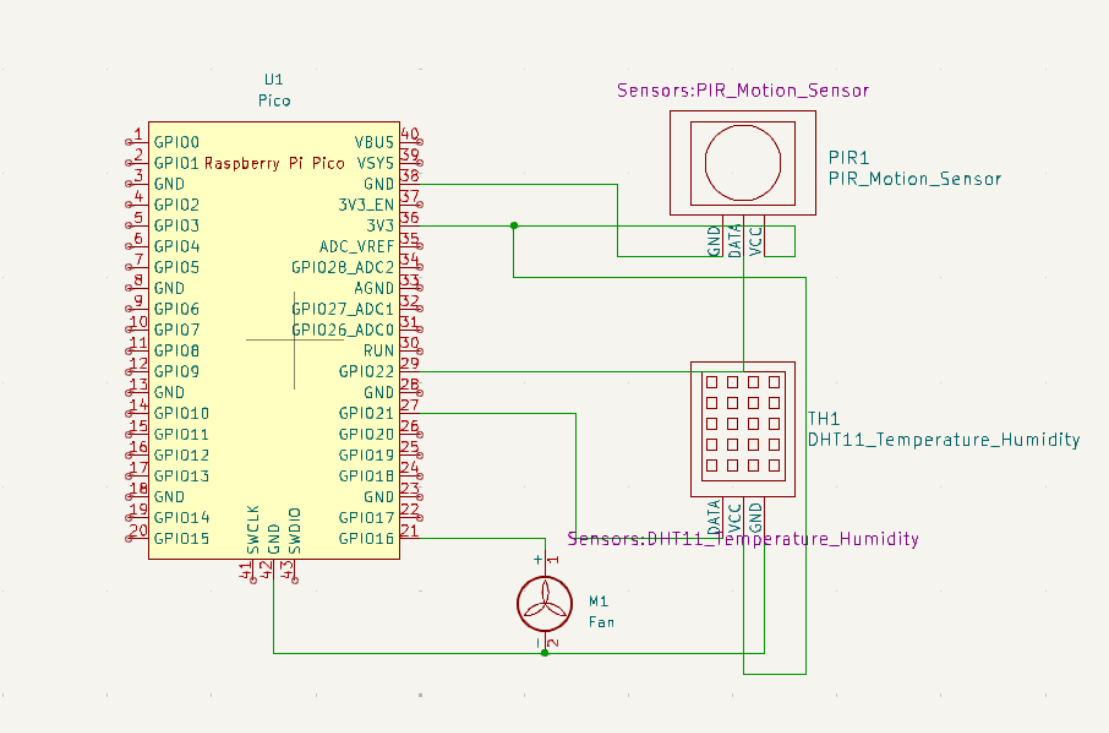

Fig. 1: Schematic

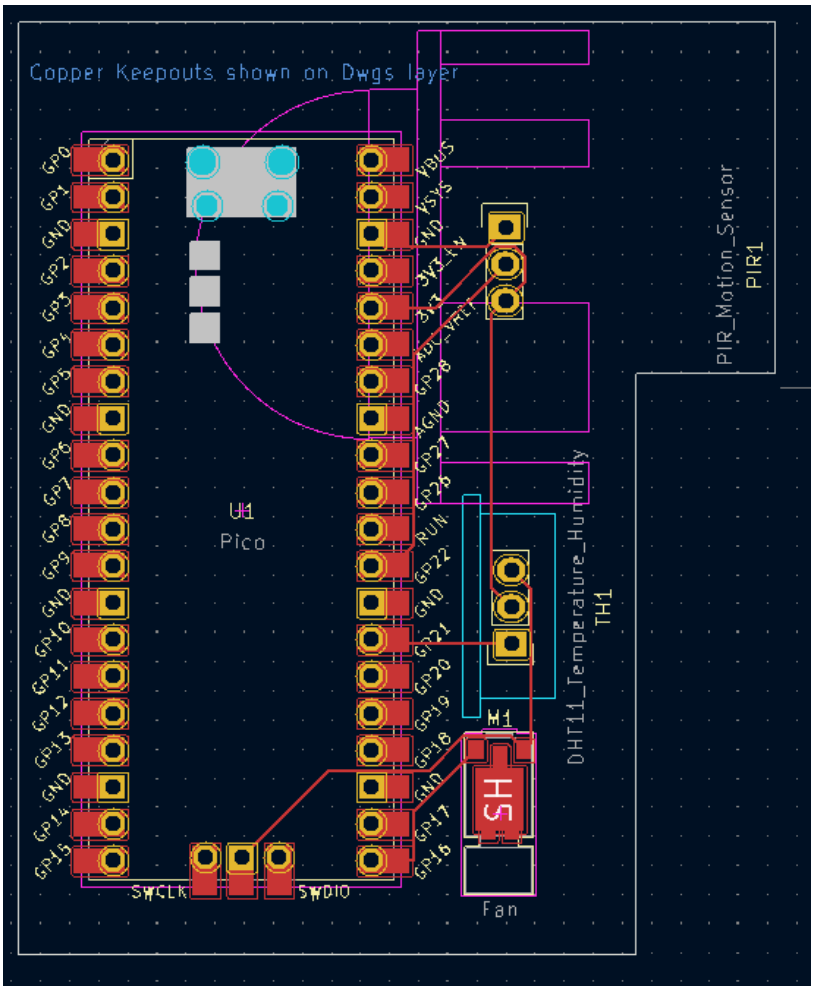

Fig. 2: PCB

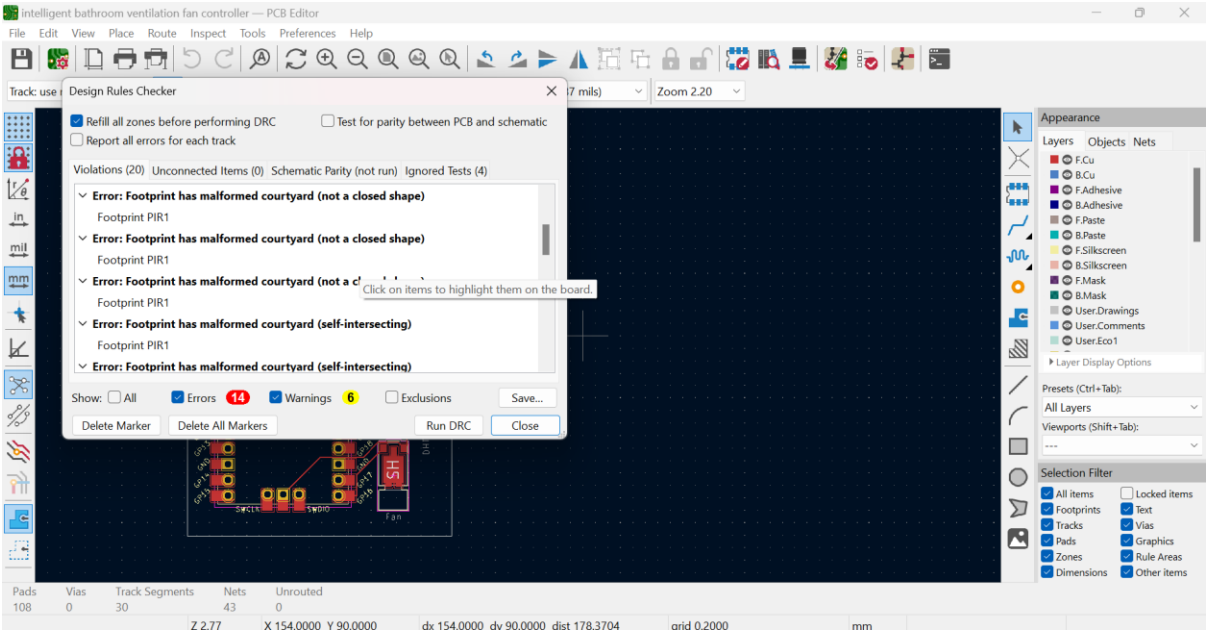

Fig. 3: DRC check

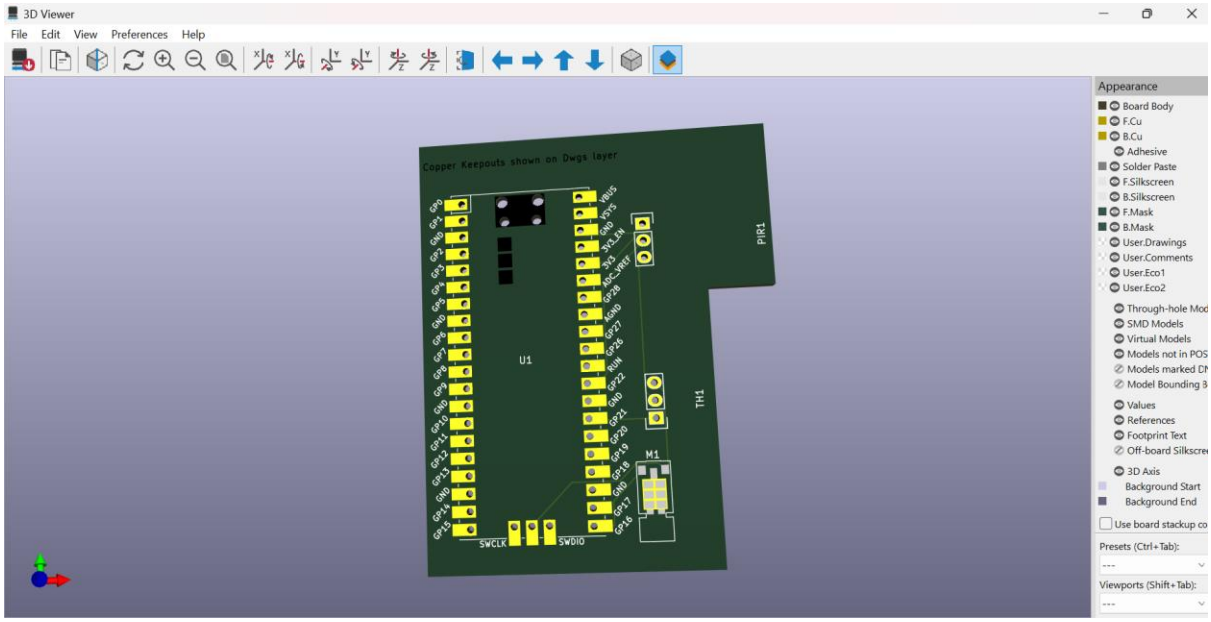

Fig. 4: PCB 3D view