Home Automation Using Node-MCU

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Introduction:

This project implements a robust IoT-based home automation system using NodeMCU that provides dual control for appliances:

1. remote voice control via SinricPro (Google Assistant)
2. local manual switches

The system controls two devices (Light and Fan) through relay modules, with intelligent state synchronization between cloud commands and physical switch toggles. Local switches are debounced to prevent false triggers, and all state changes are reported back to SinricPro to keep voice assistants in sync. The system requires internet connectivity for cloud control but continues to function locally via switches even if WiFi is lost.

Schematics:

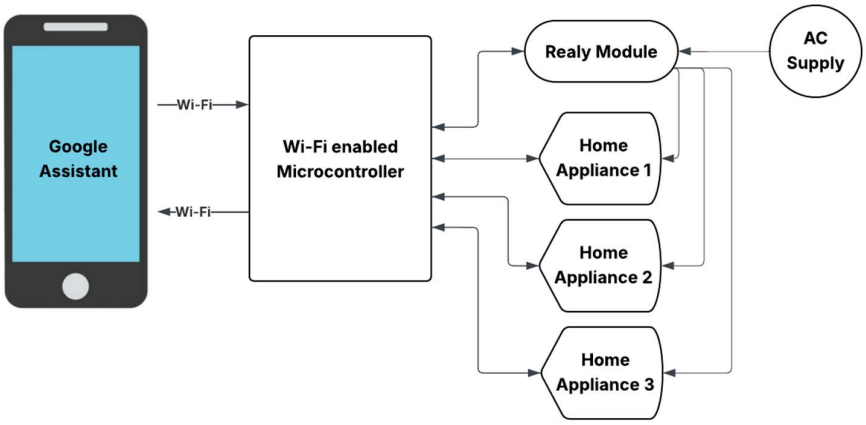

Fig. Block Diagram of system

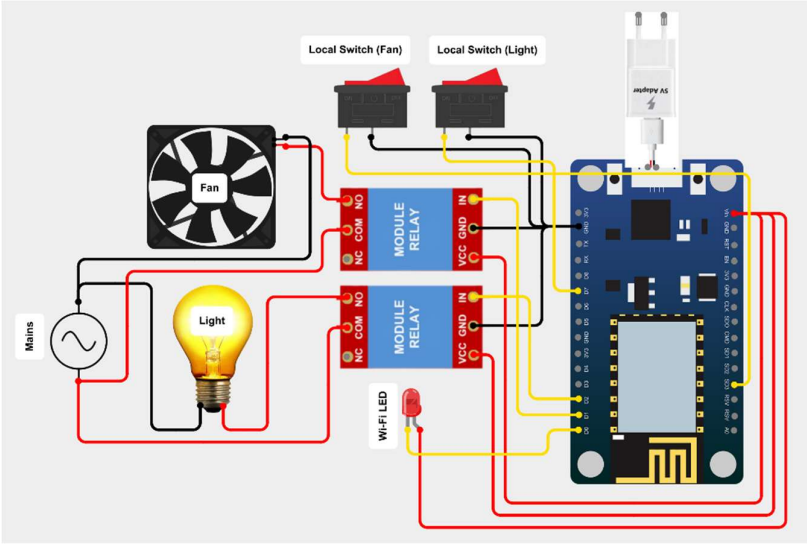

Fig. Wiring Diagram of system

Working Principle:

The NodeMCU connects to WiFi and registers two SinricPro "Switch" devices (device_ID_1 for Light, device_ID_2 for Fan). Each device maps to:

- A relay pin (D1=5, D2=4) for physical appliance control
- A local flip switch pin (SD3=10, D7=13) for manual control

Cloud Control Flow (SinricPro):

1. User says "OK Google, turn on Room Light", SinricPro receives command
2. SinricPro calls onPowerState(deviceId, state) callback on NodeMCU
3. Callback looks up relay pin from devices map and toggles it
4. Relay switches appliance ON/OFF

Local Control Flow (Flip Switches):

1. Main loop calls handleFlipSwitches() every cycle
2. For each switch pin, checks if debounce time (250ms) has passed
3. Reads current switch state (INPUT_PULLUP: HIGH=open, LOW=pressed)
4. If state changed and debounced, toggles corresponding relay
5. Calls SinricProSwitch.sendPowerStateEvent() to sync cloud state

Key Features:

- Dual Control: Voice + physical switches
- State Sync: Cloud always reflects physical state
- Debounce Protected: Reliable switch operation
- Scalable: Add devices by extending devices map
- Offline Fallback: Local switches work without internet

Hardware Components:

Component	Pin Connection	Purpose
NodeMCU	-	Main controller with WiFi
Relay Module 1	D1 (GPIO5)	Controls Light
Relay Module 2	D2 (GPIO4)	Controls Fan
Flip Switch 1	SD3 (GPIO10)	Manual Light control
Flip Switch 2	D7 (GPIO13)	Manual Fan control
WiFi LED	D0 (GPIO16)	Connection status indicator

Setup Instructions:

1. SinricPro Account:
   - Create account at sinricpro.com
   - Add two Switch devices with IDs matching device_ID_1/device_ID_2
   - Link to Google Assistant
2. Arduino IDE:
   - Install SinricPro library
   - Update WIFI_SSID, WIFI_PASS, APP_KEY, APP_SECRET
   - Upload sketch

3. Test:
    - WiFi LED turns OFF when connected
    - Voice: "OK Google, turn on Room Light"
    - Local: Toggle physical switches

Future Scope:

- Add temperature / humidity sensors with SinricPro
- MQTT backup for local network control
- Power monitoring with current sensors
- Multi-room support

Actual Image of Project:

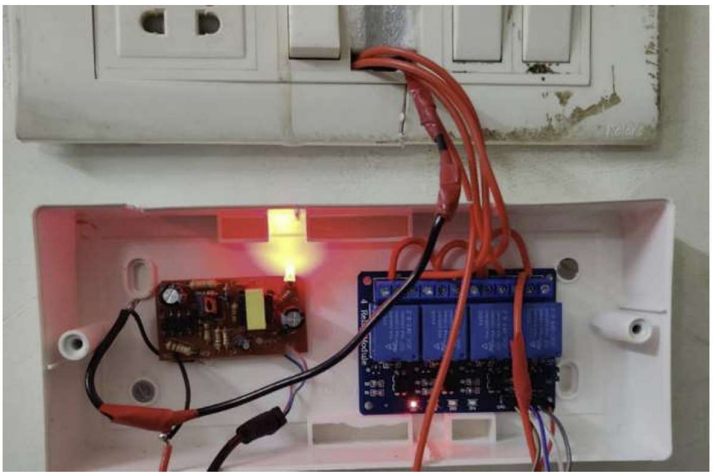

Fig. Actual Image of Project

Conclusion:

This Home Automation project with NodeMCU and SinricPro successfully integrates cloud-based voice control and local manual switches for seamless dual mode operation. It enhances user convenience by allowing remote control via Google Assistant, while maintaining reliable offline control through debounced physical switches. The two way state synchronization ensures devices and cloud remain in perfect harmony, providing an effective and scalable solution for smart home applications.