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# FINAL PROJECT

## WIFI-CONTROLED TRAFFIC LIGHT


**Group 05 – Class SE1931**

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# INTRODUCTION

- The project aims to develop a **Wi-Fi–controlled smart traffic light system** to enhance **safety and traffic efficiency** at intersections. In Vietnam, most traffic lights still operate on **fixed timing cycles**, leading to **congestion and unsafe conditions for pedestrians**, while many developed countries have already adopted **smart pedestrian push-button systems**.

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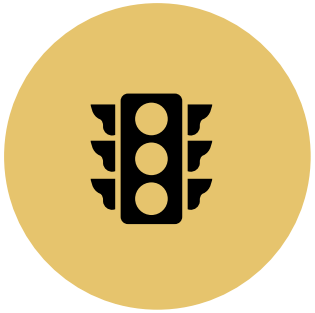
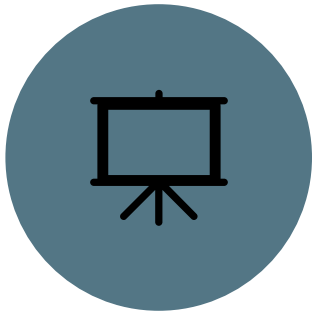
# PROJECT FEATURES

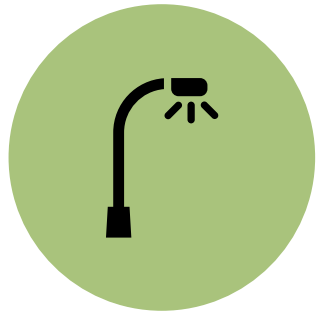


AUTO MODE: 7 – SEGMENT COUNTDOWN AND TRAFFIC LIGHT CHANGE LEDS



MANUAL MODE: DISPLAY LEDS FROM BLYNK'S WEB

GET RTC FROM HTTP CLIENT FOR DISPLAY LEDS IN TIME



PEDESTRIAN STREETS LIGHT HELP PEOPLE CROSS THE STREET SAFELY

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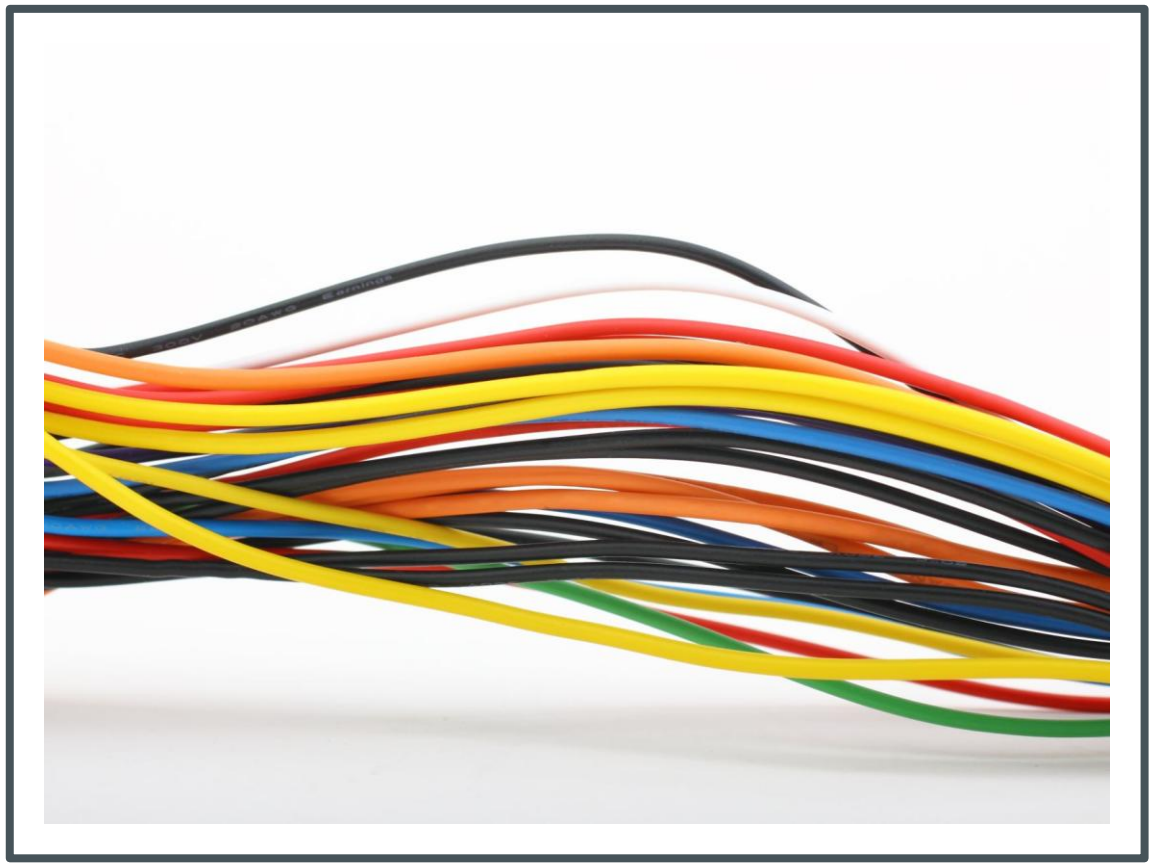
# ELECTRONIC COMPONENTS



- Arduino Uno & ESP32
- Level Shifter x1
- LED x1
- Traffic Light x4
- 7 segment 74HC595D x4
- IR sensor x1
- Buzzer x1
- Wire (M-F & M-M) > x100

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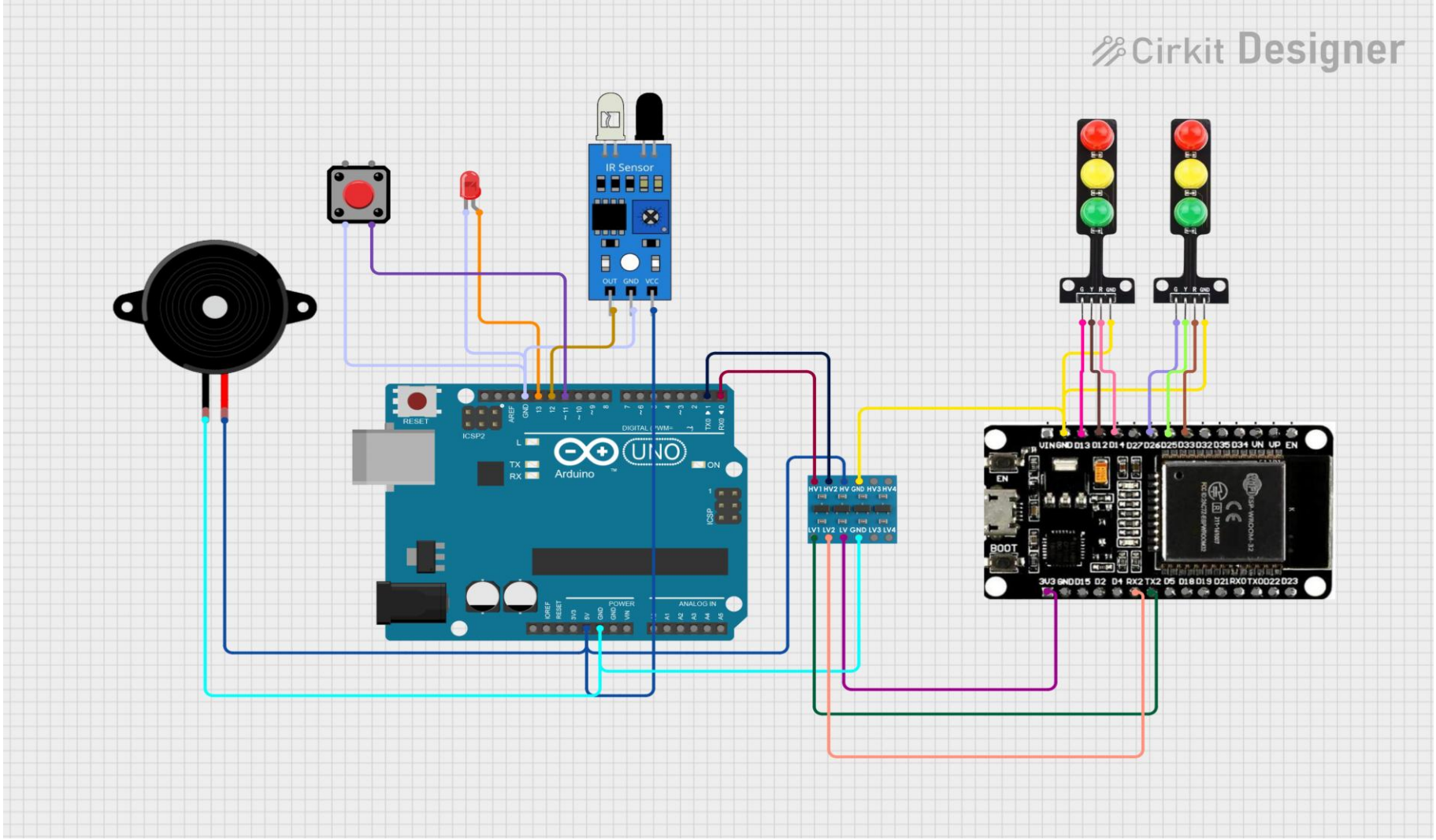
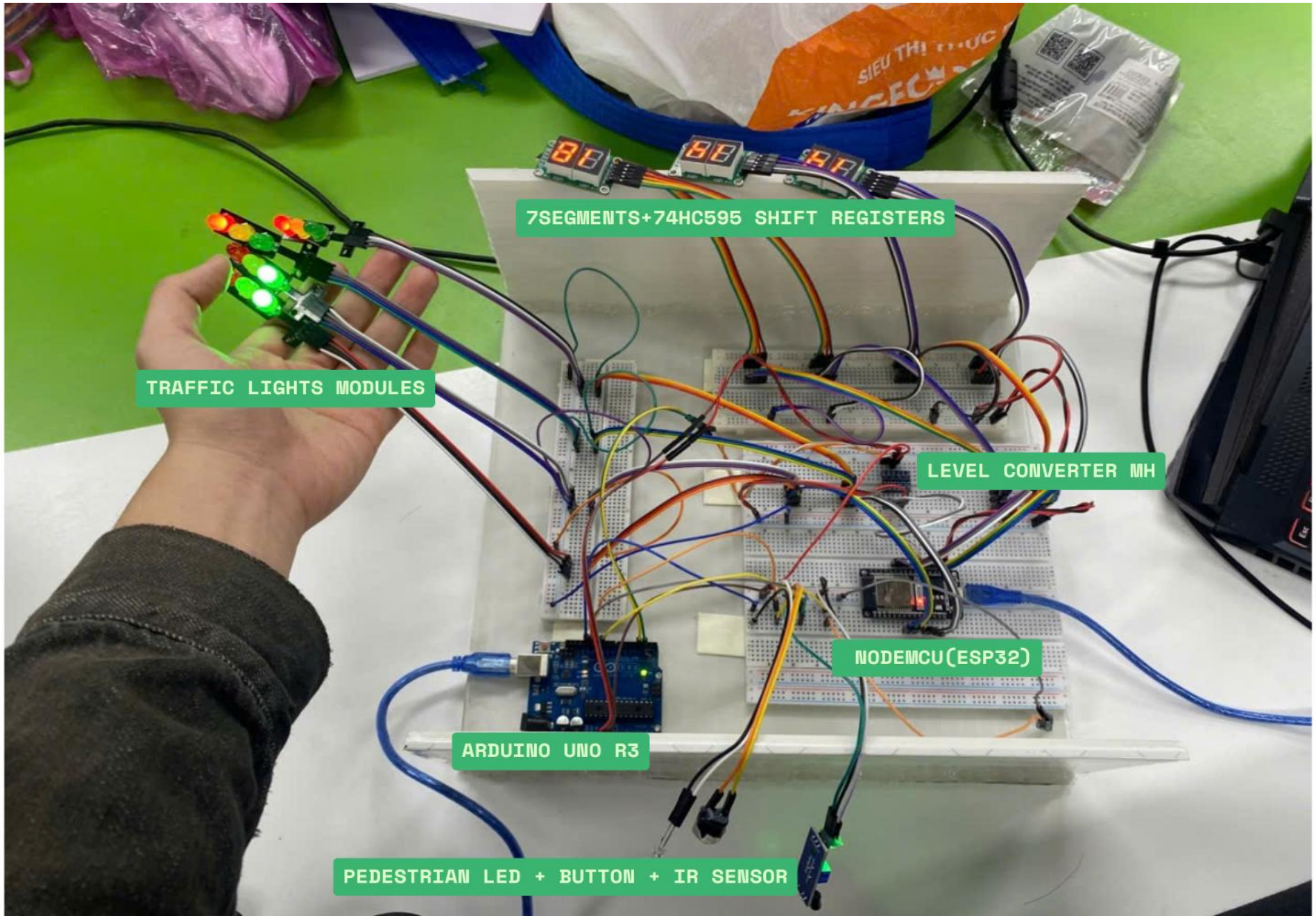
# CIRCUIT DEMO




7SEGMENTS+74HC595 SHIFT REGISTERS
TRAFFIC LIGHTS MODULES
LEVEL CONVERTER MH
NODEMCU(ESP32)
ARDUINO UNO R3
PEDESTRIAN LED + BUTTON + IR SENSOR

| ESP32 (DevKit V1) | Arduino UNO | 7-Segment Displays | Traffic LED Heads (R/Y/G) | Logic Level Converter |
|---|---|---|---|---|
| GND | GND (5 V side) | GND | GND (common return) | LV GND ↔ HV GND |
| 3V3 | — | — | — | LV (3.3 V) logic side |
| VIN (5 V) | 5 V (VCC) | VCC → (74HC595D) | 5 V input for modules | HV (5 V) converter input |
| GPIO 15 | — | LATCH_A (74HC595D) | — | — |
| GPIO 2 | — | CLOCK_A (74HC595D) | — | — |
| GPIO 4 | — | DATA_A (74HC595D) | — | — |
| GPIO 5 | — | LATCH_B (74HC595D) | — | — |
| GPIO 18 | — | CLOCK_B (74HC595D) | — | — |
| GPIO 19 | — | DATA_B (74HC595D) | — | — |
| GPIO 26 | — | — | NS RED LED | — |
| GPIO 25 | — | — | NS YELLOW LED | — |
| GPIO 33 | — | — | NS GREEN LED | — |
| GPIO 13 | — | — | WE RED LED | — |
| GPIO 12 | — | — | WE YELLOW LED | — |
| GPIO 14 | — | — | WE GREEN LED | — |
| GPIO 16 (RX2) | TX (Pin 3 via 5→3.3 converter) | — | — | LV RX ↔ HV TX |
| GPIO 17 (TX2) | RX (Pin 2 via 3.3→5 converter) | — | — | LV TX ↔ HV RX |

| Arduino UNO | Push Button | IR Sensor | Buzzer | Pedestrian LED | ESP32 (UART2) |
|---|---|---|---|---|---|
| GND | GND | GND | GND | GND | GND ↔ ESP32 GND |
| 5 V (VCC) | VCC | VCC | +5 V | +5 V | 5 V ↔ ESP32 VIN |
| Pin 10 | Signal (input pull-up) | — | — | — | — |
| Pin 11 | — | Signal (LOW when detected) | — | — | — |
| Pin 12 | — | — | IN | — | — |
| Pin 13 | — | — | — | LED (output) | — |
| Pin 2 (RX) | — | — | — | — | ESP32 TX (GPIO 17 via converter) |
| Pin 3 (TX) | — | — | — | — | ESP32 RX (GPIO 16 via converter) |

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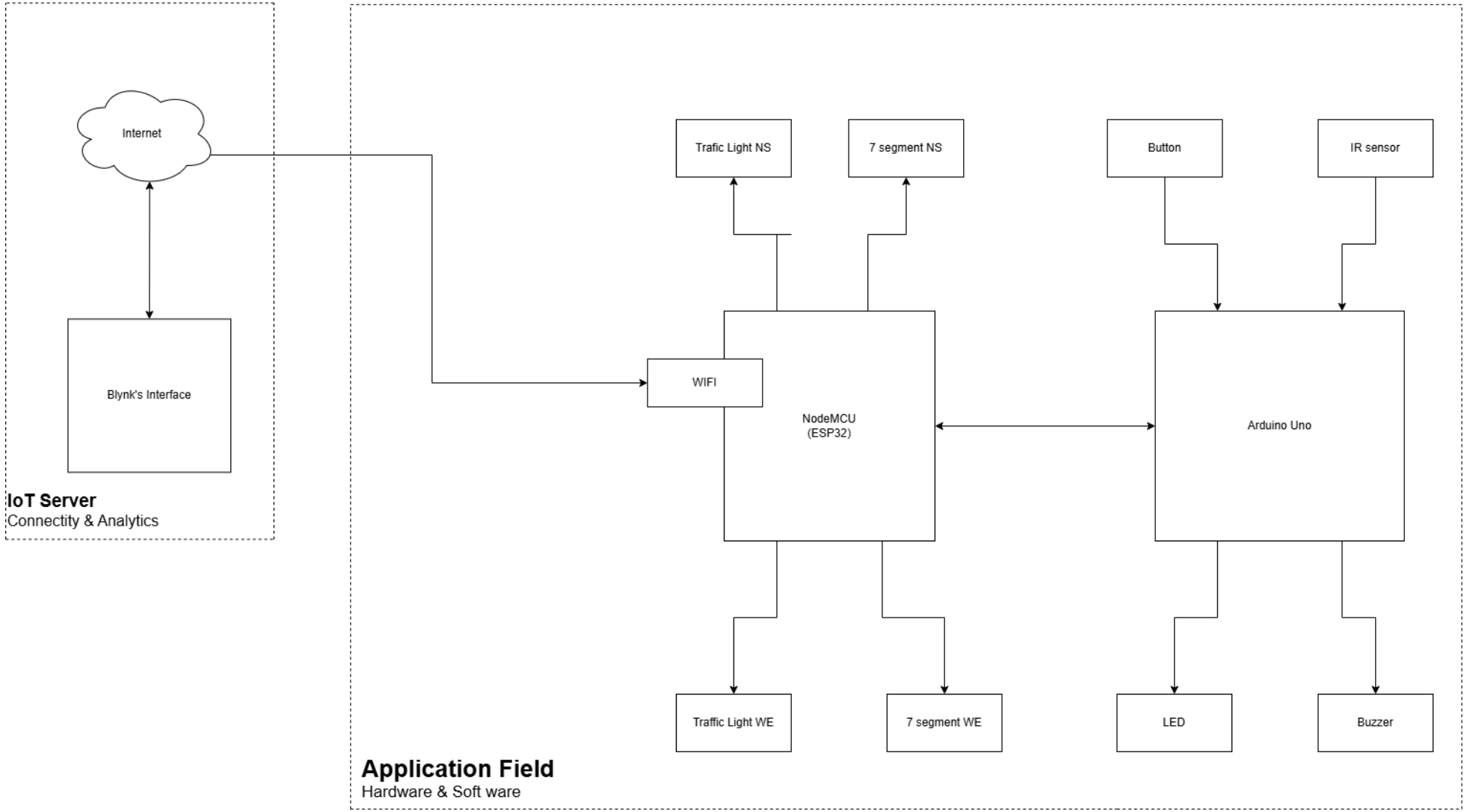
# BLOCK DIAGRAM



# FLOWCHART

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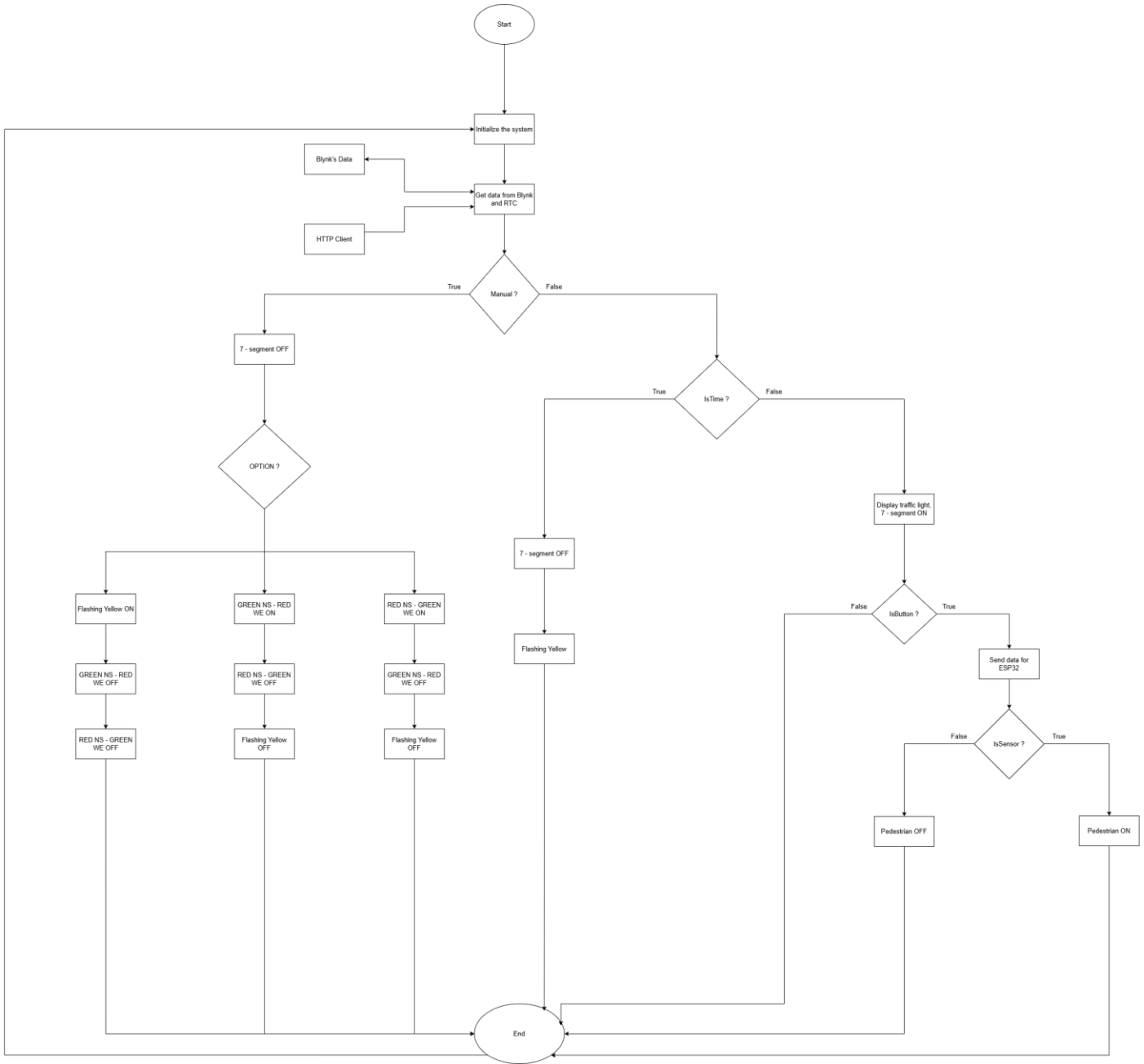

# PROGRAMMING FLOWCHART

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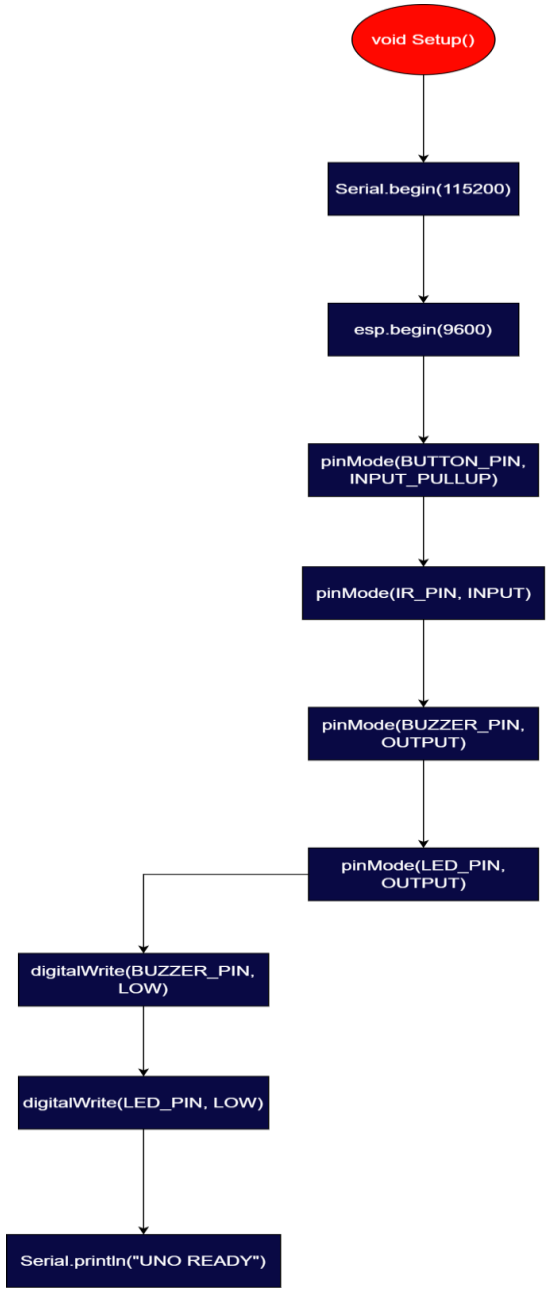


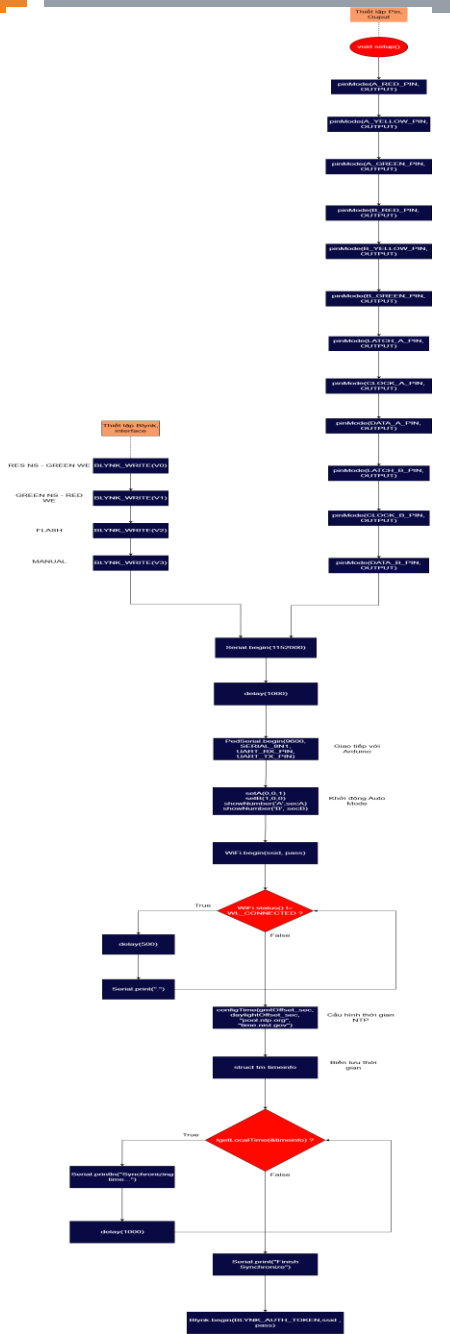

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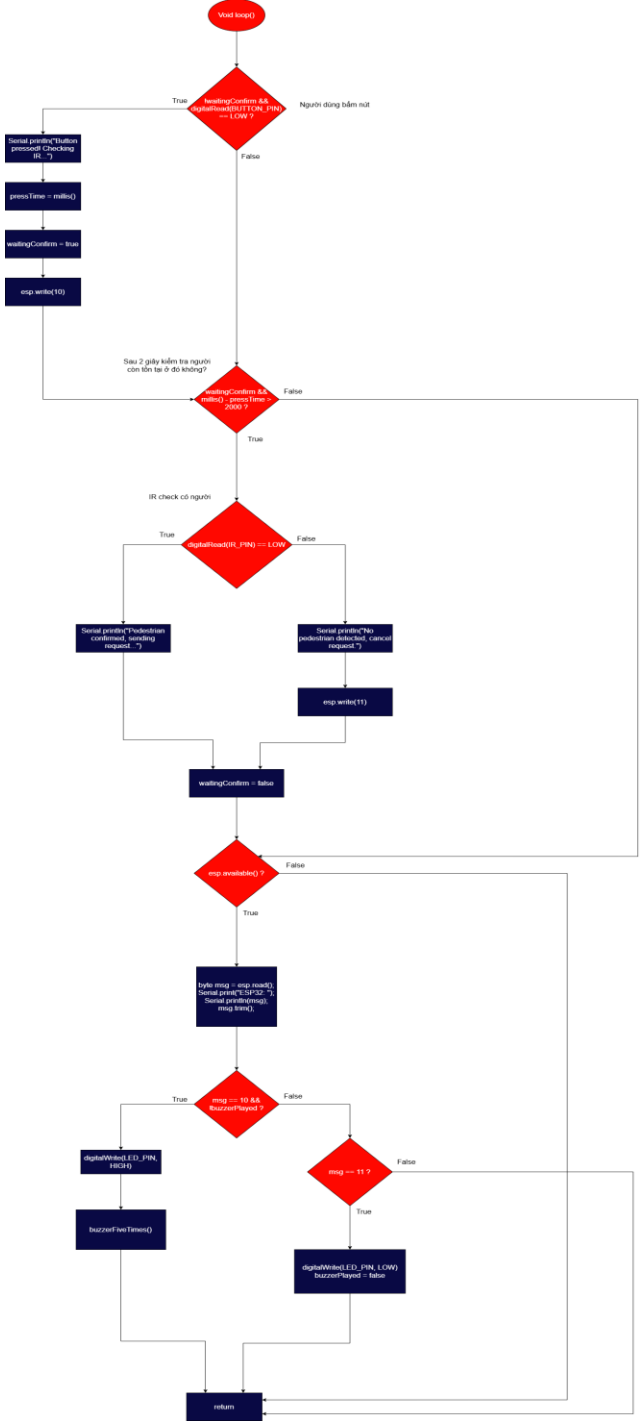


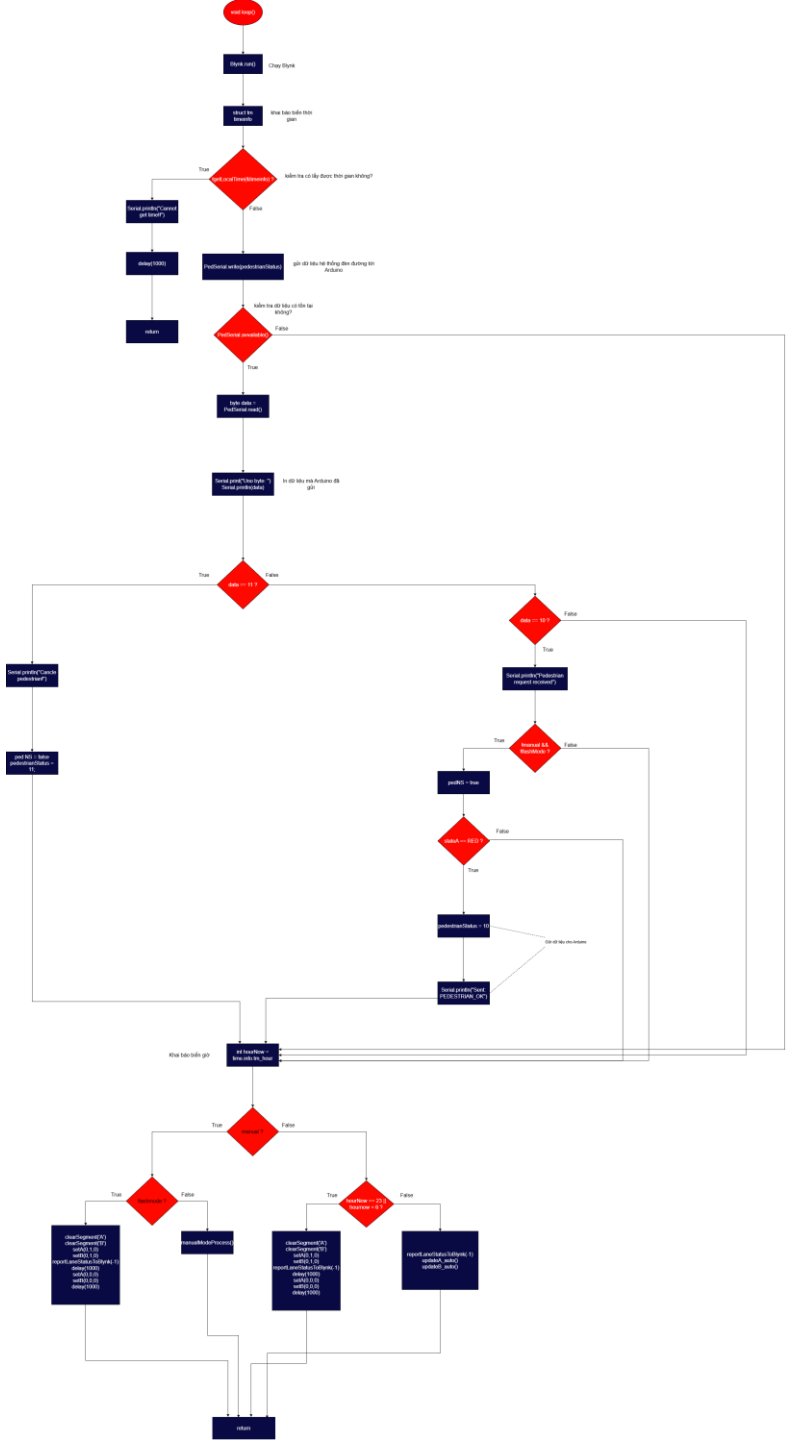

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# DEMO
# (*GG DRIVE*)

# CONCLUSION

- In this project, an ESP32-based Wi-Fi traffic light control system was successfully designed and implemented.
- The system operates automatically and fully integrates a pedestrian control subsystem via a reliable UART link with an Arduino.
- The integration of RTC synchronization night mode further enhances the system's autonomy, enabling scheduled Day/Night profile switching.
- All planned features, including automatic, manual, and pedestrian-actuated phases, function as expected.

# FUTURE WORK

- Integrate and store a database to analyze pedestrian button usage behavior.
- Install additional cameras to monitor traffic flow in order to adjust the countdown timer duration to match the actual traffic conditions at the intersection.
- Add a user-input timer function on Blynk combined with real-time data to flexibly adjust traffic flow.

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# THANK YOU

Q&A