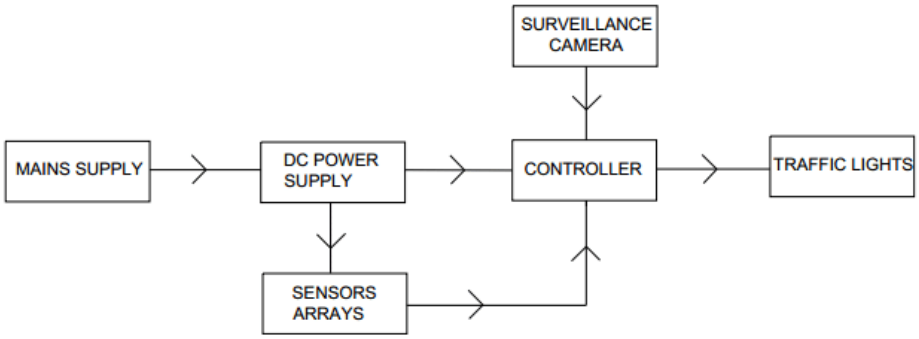
PUBLIC TANSPOTATION OPTIMIIZATION

PROJECT : INTELLGENT TANSPORTATION SYSTEM (SMART TRAFFIC LIGHT CONTROL SYSTEM)

BLOCK DIAGRAM:



DESIGN COMPONENTS LIST:

ESP8266 microcontroller (Node MCU, ESP-12E, etc.)

Traffic lights (red, yellow, green LEDs)

Sensors (e.g., ultrasonic sensor, IR sensor, etc.)

Relay modules for controlling high voltage

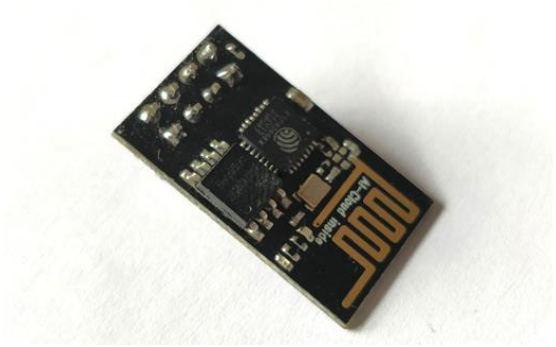
Power supply

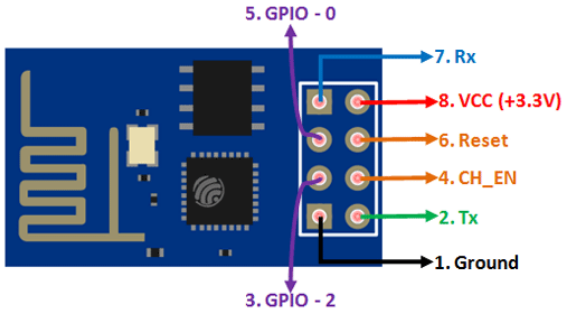
Connecting wires

Breadboard or PCB (Printed Circuit Board)

COMPONENT EXPLANATION:

ESP8266 :





ESP8266 Pin Configuration :

Pin Number	Pin Name	Alternate Name	Normally used for	Alternate purpose
1	**Ground**	-	Connected to the ground of the circuit	-
2	**TX**	GPIO – 1	Connected to Rx pin of programmer/u	Can act as a General purpose

			C to upload program	Input/output pin when not used as TX
3	**GPIO-2**	-	General purpose Input/output pin	-
4	**CH_EN**	-	Chip Enable – Active high	-
5	**GPIO - 0**	Flash	General purpose Input/output pin	Takes module into serial programming when held low during start up
6	**Reset**	-	Resets the module	-
7	**RX**	GPIO - 3	General purpose Input/output pin	Can act as a General purpose Input/output pin when not used as RX

8	**Vcc**	-	Connect to +3.3V only	

ESP8266-01 Features :

- Low cost, compact and powerful Wi-Fi Module
- Power Supply: +3.3V only
- Current Consumption: 100mA
- I/O Voltage: 3.6V (max)
- I/O source current: 12mA (max)
- Built-in low power 32-bit MCU @ 80MHz
- 512kB Flash Memory
- Can be used as Station or Access Point or both combined
- Supports Deep sleep (<10uA)
- Supports serial communication hence compatible with many development platform like Arduino
- Can be programmed using Arduino IDE or AT-commands or Lua Script

The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability, produced by Espress if Systems in Shanghai, China. The chip was popularized in the English-speaking maker community in August 2014 via the ESP-01 module, made by a third-party manufacturer Ai-Thinker.

User application: The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

Traffic light system:

The traffic light system is a signaling device used to control the flow of vehicular and pedestrian traffic at intersections or crossings. It consists of three colored lights:

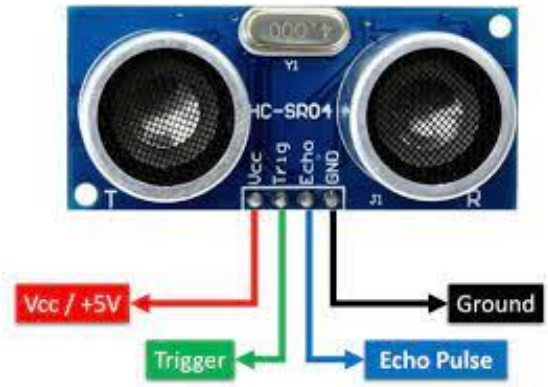
Red Light: When illuminated, it signals to drivers and pedestrians to stop. This allows traffic from other directions to proceed safely.

Green Light: This signals that it's safe to proceed. It allows vehicles and pedestrians to move in the direction indicated.

Yellow Light: This serves as a transition signal between red and green. It warns that the light is about to change, preparing drivers to slow down and stop if needed.

The sequence usually follows: green, yellow, red. Then it cycles back to green once again. This system helps regulate traffic flow and minimize accidents at intersections.

Ultrasonic sensor:



An ultrasonic sensor is a device that uses ultrasonic sound waves to measure the distance between the sensor itself and an object. It works on the principle of echolocation, similar to how bats navigate.

Here's how it operates:

Emission of Ultrasonic Waves: The sensor emits a high-frequency sound wave, typically above the range of human hearing (around 40 kHz or higher).

Reflection of Waves: These sound waves travel through the air and when they encounter an object, they bounce back towards the sensor.

Receiving and Calculating Time: The sensor has a receiver that picks up the reflected sound waves. It measures the time it takes for the waves to return.

Distance Calculation: Using the speed of sound in air (approximately 343 meters per second), the sensor calculates the distance to the object by multiplying the time taken for the waves to return by half of the speed of sound.

Ultrasonic sensors are commonly used in various applications such as distance measurement, object detection, and even in robotics for obstacle avoidance. They are popular due to their accuracy, reliability, and versatility in different environments.

Relay model:

A relay is an electrical switch that's controlled by a small electrical signal. It uses an electromagnetic coil to toggle its contacts, either opening or closing a circuit. This allows low-power signals to control high-power devices, making it crucial in various applications like automation and control systems.

Main power supply:

A power supply is a device that provides electrical energy to other devices or systems. It converts electrical energy from a source (like a wall outlet or a battery) into a form that can be used by electronic devices. In simpler terms, it's like a "translator" that makes sure the right type and amount of power is delivered to.

Connecting wire ESP8266:

To connect an ESP8266 module, like the popular ESP-01, you'll need a few components and follow these steps:

Components needed:

ESP8266 module (e.g., ESP-01)

USB to Serial Adapter (FTDI Programmer)

Breadboard and connecting wires

3.3V Power Source

Steps:

Power the ESP8266:

Connect the VCC pin on the ESP8266 to a 3.3V power source.

Connect the GND pin on the ESP8266 to the ground of the power source.

Connect the USB to Serial Adapter:

Connect the TX pin on the USB to Serial Adapter to the RX pin on the ESP8266.

Connect the RX pin on the USB to Serial Adapter to the TX pin on the ESP8266.

Connect the ground (GND) of the USB to Serial Adapter to the ground of the power source.

Enable Flash Mode (if needed):

For programming, you may need to pull the GPIO0 pin LOW (connect it to GND) and then reset the ESP8266.

Connect CH_PD and Reset:

Connect the CH_PD (Chip Enable) pin on the ESP8266 to the 3.3V power source.

Connect the Reset pin on the ESP8266 to the 3.3V power source.

Connect GPIO pins (if needed):

Depending on your project, connect GPIO pins as required.

Flash and Program:

Use a programming tool like the Arduino IDE or platform-specific tools (e.g., Espress if's ESP-IDF) to write code and upload it to the ESP8266.

Remember to double-check the pinout and voltage requirements of your specific ESP8266 module, as different versions may have variations. Additionally, always ensure proper power levels to prevent damage to module

CONCLUSION:

The smart traffic light control system represents a breakthrough in urban traffic management. By harnessing technology and data, it optimizes traffic flow, enhances safety, and reduces congestion. Its implementation holds the promise of more efficient, sustainable, and safer cities for the future.