AUTOMATED IRRIGATION CONTROL SYSTEM BASED ON ENVIRONMENTAL SENSING

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AIM:

The aim of an automated irrigation control system based on environmental sensing using ESP8266 is to optimize water usage in agriculture and gardening by providing precise and timely irrigation based on real-time environmental conditions. This system leverages the capabilities of the ESP8266 microcontroller for its Wi-Fi connectivity and processing power, combined with various environmental sensors.

COMPONENTS REQIURED:

1. ESP8266(NodeMCU)
2. Soil Moisture Sensor
3. Relay Module
4. OLED
5. LED x3
6. Water Pump
7. Power Supply

1.ESP8266 (NodeMCU):

The central processing unit (CPU) that collects data from sensors, runs the control logic, and communicates via Wi-Fi.

Range:

Operating Voltage: 3.0–3.6V (uses onboard 3.3V regulator)

Wi-Fi Frequency: 2.4 GHz

Applications:

IoT automation (home, agriculture, industrial)

Remote sensing and control (switches, appliances, pumps)

Data logging to cloud servers (Blynk, Thingspeak, Firebase, etc.)

2.Soil Moisture Sensor:

Measures the water content in the soil, providing data to determine irrigation needs.

Range:

Operating Voltage: 3.3–5V

Output: Analog (moisture level) / Digital (dry/wet threshold)

Applications:

Automatic irrigation systems

Greenhouse and farm monitoring

Smart gardening (alerts when plants need water)

3.Relay Module:

An electrically operated switch that uses the low-voltage output from the ESP8266 to control a higher-voltage device, such as a water pump.

Range:

Control Voltage: 3.3V / 5V (logic)

Load Voltage: Up to 250VAC / 30VDC (depends on relay rating, often 10A max)

Applications:

Controlling pumps, fans, lights, motors

Home automation (AC appliances)

Industrial control systems

4.OLED

A flat-panel display made from organic compounds that emit light when current is applied. Used for showing text, numbers, and graphics in embedded systems.

Range:

Supply Voltage: 3.3 V – 5 V (depending on module)

Logic Level: 3.3 V (I^2C/SPI communication)

Current Draw: ~10 mA – 30 mA (depends on display size and pixels lit)

Interfaces: I^2C or SPI (common address: 0x3C)

Applications:

Displaying sensor data and menus

User interfaces in IoT devices

Wearables and portable electronics

Graphical feedback in automation projects

5.LED

A semiconductor device that emits light when an electric current flows through it. Used as a simple indicator or illumination source.

Range:

Control Voltage (logic): 1.8 V – 3.3 V (forward voltage depends on color)

Current: 2 mA – 20 mA (typical for indicator LEDs)

Drive: Direct from microcontroller pin (with resistor) or via a transistor for higher power.

Applications:

Status indicators (power, activity, error)

Visual feedback in IoT devices

Lighting (when grouped in arrays)

Alarms and signal indication

6.Water Pump:

The device that delivers water to the plants when activated.

Range:

Operating Voltage: 3V–12V DC (for mini pumps; larger ones use AC)

Flow Rate: 100–1000 L/hr (depends on pump type)

Applications:

Automatic plant watering

Aquarium, fountains, hydroponics

Water circulation in cooling systems

6.Power Supply:

A stable power source, often 5V, to operate the microcontroller and sensors.

Range:

Typically 5V / 9V / 12V DC (depending on pump and relay)

Current rating must handle all devices together (e.g., 1A–2A for NodeMCU + sensors + pump)

Applications:

Powers microcontrollers, sensors, relays, and pumps

Essential for IoT devices running continuously

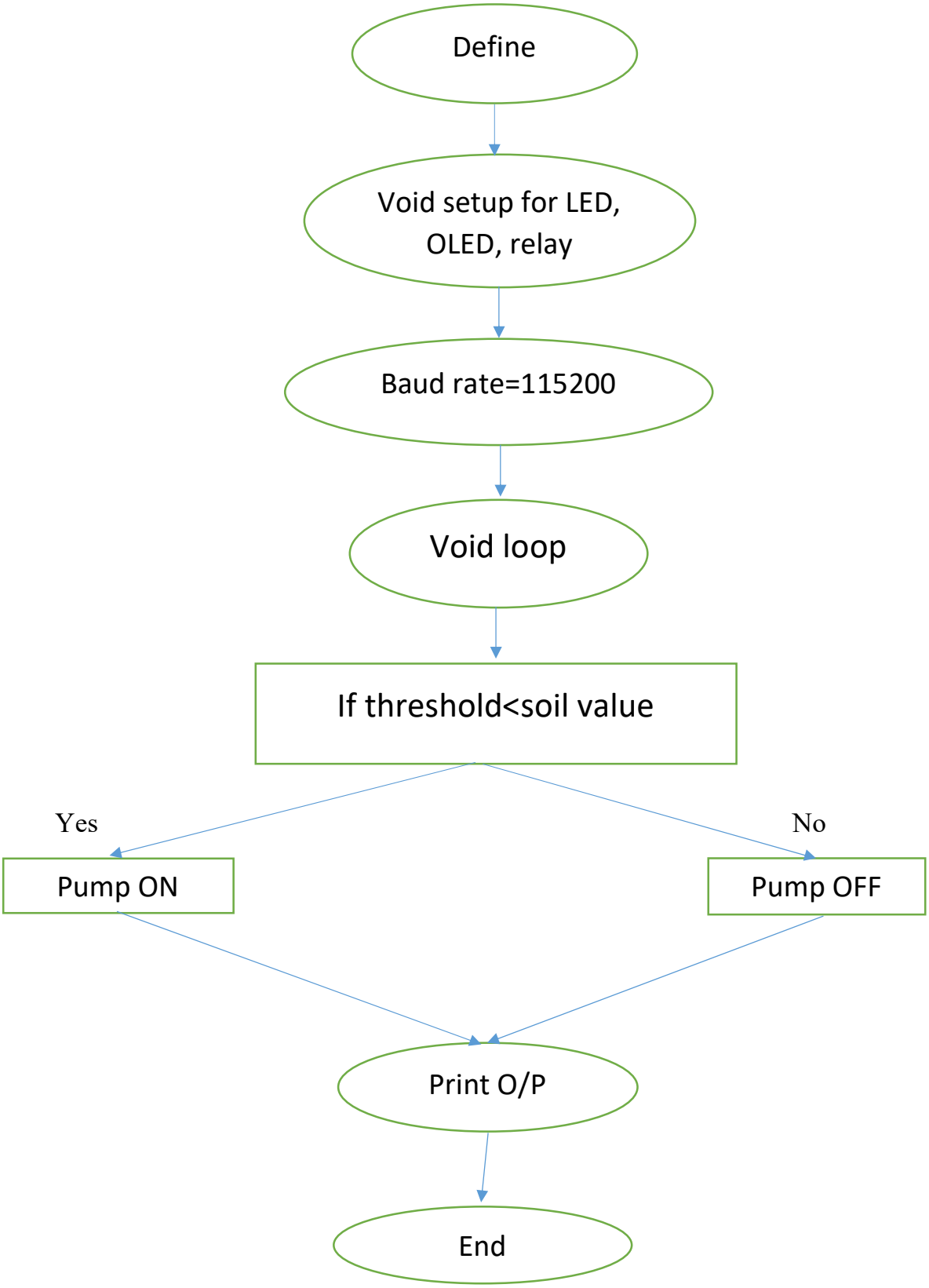
Can integrate with solar + battery for outdoor/remote setups

PIN TABLE:

COMPONENTS	PIN OF COMPONENTS	CONNECT TO:
SOIL MOSITURE	VCC	3.3V OR 5V
	GND	GND
	A0	ESP8266 A0
RELAY MODULE	VCC	3.3V
	GND	GND
	IN	ESP8266 D1

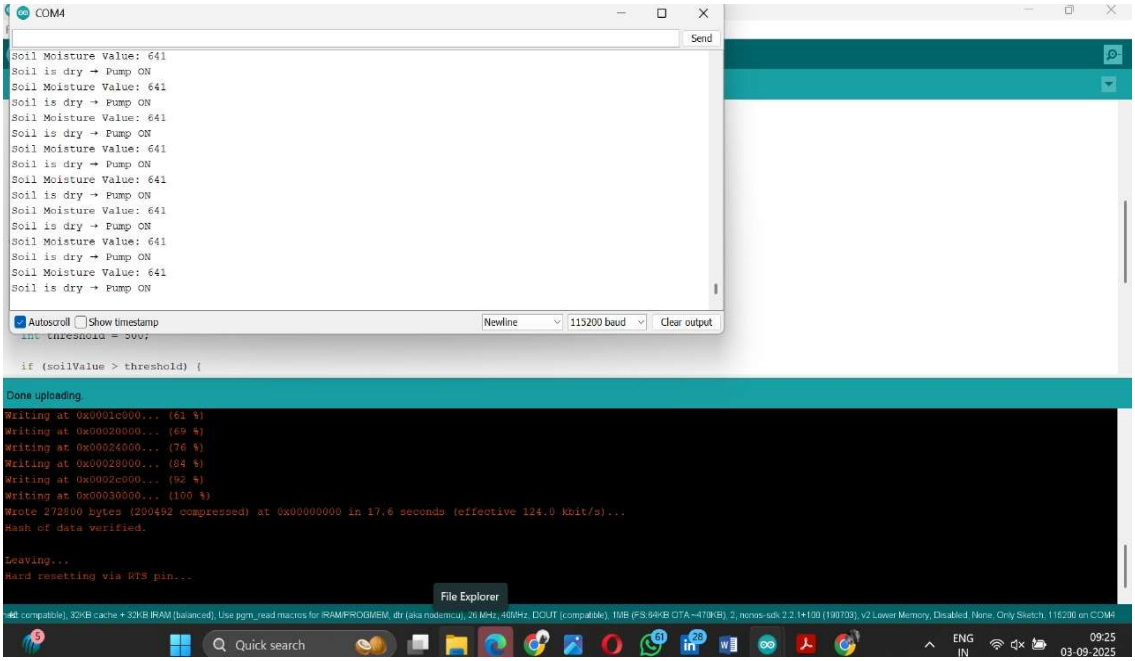
WATER PUMP	+ (Positive)	Relay NO
	-(Negative)	3.3V
OLED	VCC	3.3V
	GND	GND
	SCL	D5
	SDA	D6
RED LED (to notify when soil is too dry)	ANODE	D2
	CATHODE	GND
GREEN LED (WATER Pump ON)	ANODE	D3
	CATHODE	GND
WHITE LED (Optimal moisture achieved)	ANODE	D4
	CATHODE	GND

FLOWCHART :

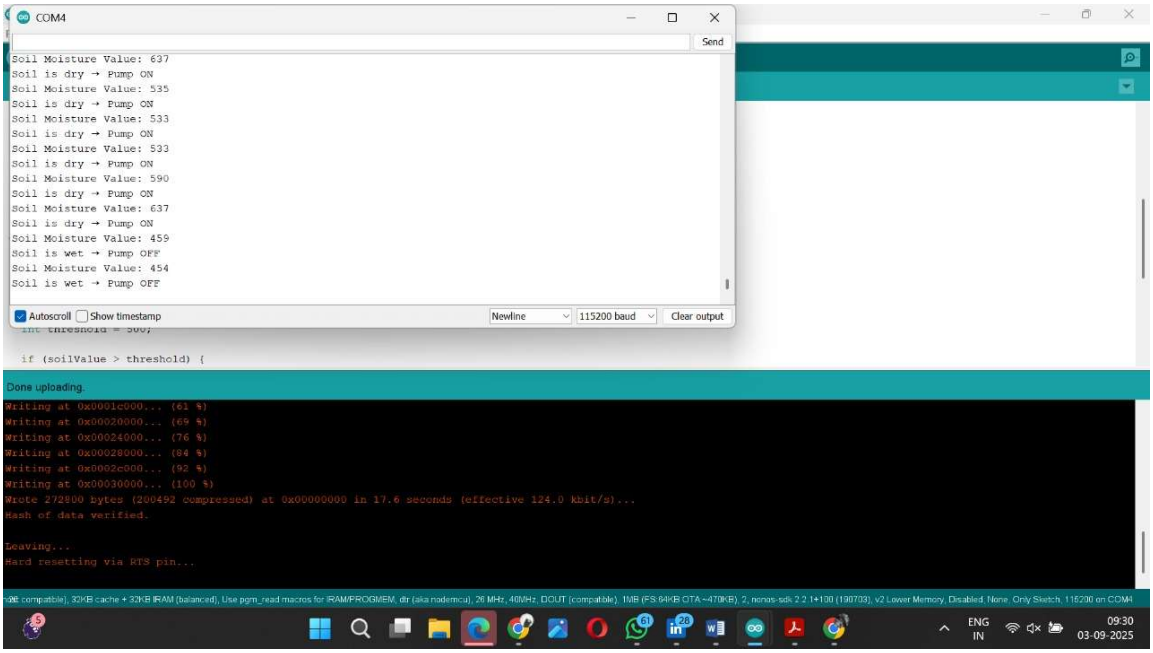

Define
Void setup for LED, OLED, relay
Baud rate=115200
Void loop
If threshold<soil value
Yes
No
Pump ON
Pump OFF
Print O/P
End

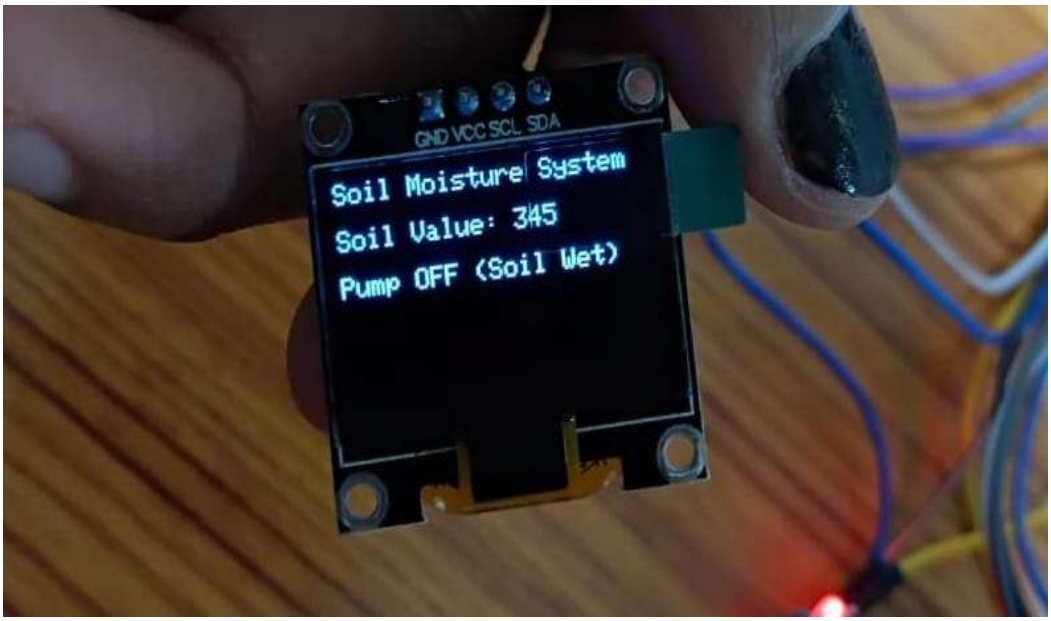
EXECUTION:

When pump is ON



When pump is OFF




GND VCC SCL SDA
Soil Moisture System
Soil Value: 345
Pump OFF (Soil Wet)