Department of Computer Science & Engineering

University of Asia Pacific

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Assignment: 01

Submitted to

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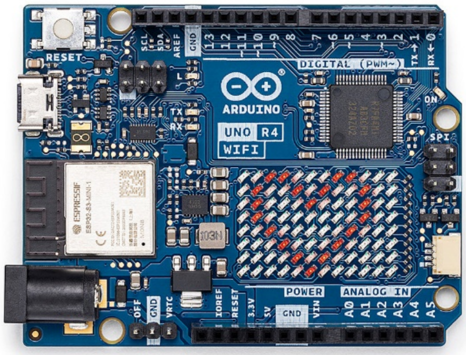
Section: A1

a) Which components do you prefer and why?

Vertical vegetable farming refers to the practice of growing vegetables vertically, often in stacked layers or vertically inclined surfaces rather than traditional horizontal planting. This innovative farming method maximizes the use of vertical space, making it suitable for urban environments or areas with limited land availability. It utilizes techniques such as hydroponics or aeroponics, where plants are grown without soil and receive nutrients through a nutrient-rich water solution or mist. To design an IoT based vertical vegetable system, we need these components:

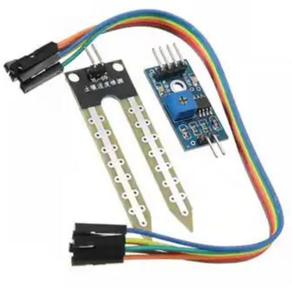
1. **Arduino Uno R4 WiFi:** The Arduino Uno R4 WiFi is chosen for its compatibility with IoT applications. Its integrated WiFi module enables easy connectivity to the internet, allowing for remote monitoring and control of the farming system.



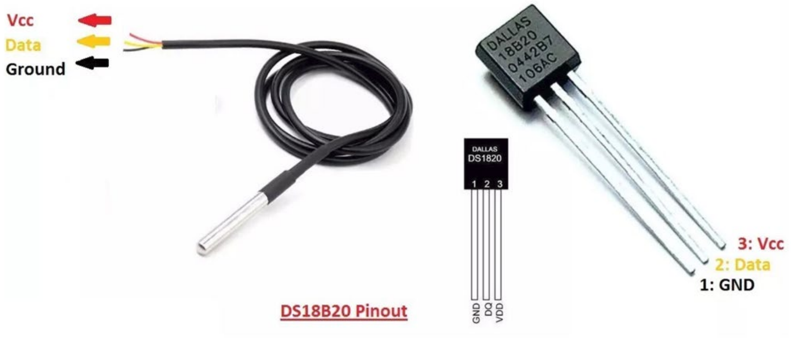
2. **SEN18 Water Level Sensor:** This Sensor for Arduino has Operating voltage DC3-5V and Operating current less than 20mA. The Sensor is the Analog type which produces analog output signals according to the water pressure with its Detection Area of 40x16mm.

3. **pH Sensor:** This PH detection sensor base board is an easy solution to detect the level of PH; meaning the presence of acidity or alkalinity in liquid material. It has a high measurement accuracy at real time from 0 to 14. It provides analog signals to the host.

4. **DHT11 Humidity Sensor:** The soil moisture sensor or the hygrometer is usually used to detect the humidity of the soil. So, it is perfect to build an automatic watering system or to monitor the soil moisture of your plants.

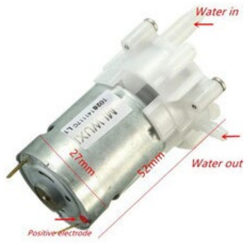


5. **DS18B20 Temperature Sensor:** The DS18B20 temperature sensor is a 1-wire digital temperature sensor. This means that you can read the temperature with a very simple circuit setup. This also has a waterproof version for more accurate data.



6. **YF-S201 Hall Effect Water Flow Meter:** Measures water flow using the Hall Effect, providing crucial data for monitoring and regulating the flow of nutrient solution throughout the system.

7. **RS-360 Mini Water Pump:** Essential for circulating the nutrient solution within the vertical farming system, ensuring plants receive adequate nutrients for healthy growth.



8. **Power Supply:**

Components such as the Arduino Uno R4 WiFi, sensors, water pump, and webcam necessitate a stable power supply to function optimally. Total power consumption is calculated as follows:

- Arduino Uno R4 WiFi: 100mA
- SEN18 Water Level Sensor: 20mA
- pH Sensor: 20mA
- DS18B20 Temperature Sensor: 1mA
- DHT11 Sensor: 1mA
- YF-S201 Water Flow Meter: 15mA
- RS-360 Water Pump: 500mA
- Webcam: 250mA

Total power consumption = 100mA + 20mA + 20mA + 1mA + 1mA + 15mA + 500mA + 250mA = 907mA

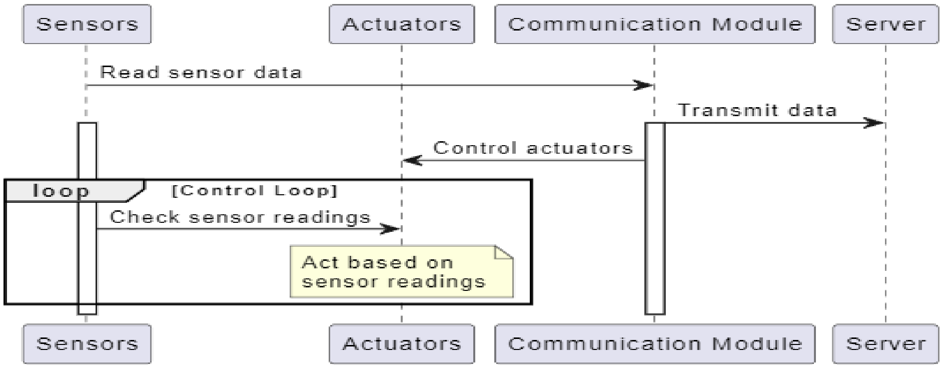
Given a 2800mAh battery capacity, the estimated battery life is approximately:

Battery life ≈ 2800mAh / 907mA ≈ 3.09 hours

Therefore, a 6V 2800mAh battery should be sufficient to power the system for approximately 3 hours.

b) Draw necessary block diagram, pseudo-code and iterations on it.

Block Diagram:



Pseudo-Code:

```
# Define pin connections
water_level_sensor_pin = A0
pH_sensor_pin = A1
temperature_sensor_pin = 2  # digital pin for DS18B20
humidity_sensor_pin = 3     # digital pin for DHT11
water_flow_sensor_pin = 4   # digital pin for YF-S201
water_pump_pin = 5

# Initialize communication module
wifi.connect("SSID", "password")

while True:
    # Read sensor data
    water_level = analogRead(water_level_sensor_pin)
    pH_level = analogRead(pH_sensor_pin)
    temperature = read_temperature(temperature_sensor_pin)
    humidity = read_humidity(humidity_sensor_pin)
    water_flow = digitalRead(water_flow_sensor_pin)

    transmit_data_to_server(water_level, pH_level, temperature, humidity, 
water_flow)

    if water_level < threshold:
        digitalWrite(water_pump_pin, HIGH)
    else:
        digitalWrite(water_pump_pin, LOW)

    if pH_level < threshold:
        adjust_pH()

    if temperature > high_temp_threshold:
        digitalWrite(cooler_pin, HIGH)
    elif temperature < low_temp_threshold:
        digitalWrite(heater_pin, HIGH)
    else:
        digitalWrite(cooler_pin, LOW)
        digitalWrite(heater_pin, LOW)

    delay(interval)
```

Iterations:

1. **Hardware Setup:** Connect all hardware components including sensors, actuators, Arduino Uno R4 WiFi, and power supply according to the block diagram.

2. **Sensor Integration:** Write code to interface with each sensor (SEN18, pH Sensor, DHT11, DS18B20, YF-S201) to collect data accurately.

3. **Actuator Control:** Implement logic to control actuators (RS-360 Mini Water Pump) based on sensor readings to maintain optimal farming conditions.

4. **Communication Setup:** Configure the Arduino Uno R4 WiFi to establish internet connectivity and enable data transmission to the cloud/local server.

5. **Data Transmission:** Develop code to transmit sensor data to a cloud/local server, ensuring real-time monitoring of farming parameters.

6. **Threshold Logic:** Define thresholds for each parameter and implement logic to trigger actions when readings deviate from optimal levels.

7. **Power Supply Integration:** Connect the power supply (battery) to the system to ensure continuous operation even in the absence of external power.

8. **Mobile Application Design:** Design and develop a mobile application that connects to the WiFi enabled Arduino Uno R4 and allows users to monitor and control various aspects of the vertical farming system remotely.

9. **Testing and Optimization:** Test the system in real-world conditions, fine-tune thresholds, and optimize code for efficiency and reliability.

10. **Deployment:** Deploy the IoT vertical farming system in the desired environment for continuous monitoring and management of farming parameters, accessible via the mobile application.