**Goal**: Implement a cooperative scheduler on an ESP32 to manage multiple tasks within a Remotely Operated Vehicle (ROV) system.

**1. Task Identification:**

* **Sensor Data Acquisition**: Reading data from the MPU6050 accelerometer and gyro via I2C.
* **Motor Control**: Generating PWM signals to control ESCs for the motors.
* **Ethernet Communication**: Handling data transmission between the ROV and the land unit.
* **User Command Processing**: Executing commands received from the user.
* **Camera Data Streaming**: Managing the video feed from the camera.
* **Communication with Raspberry Pi (SoC)**: Exchanging data between the MCU and the Raspberry Pi.
* **Battery Monitoring**: Monitoring the voltage and health of the battery pack.
* **System Monitoring**: Checking the overall health of the system.
* **Battery Pack Management**: Managing charging and discharging of the battery packs.
* **Relay Control**: Controlling relays connected to various actuators.

**2. Prioritization Algorithm:**

* **Rate Monotonic Scheduling (RMS)** was suggested, where tasks with higher periodicity (i.e., those that need to run more frequently) are given higher priority.

**3. Task Priorities:**

* Tasks were assigned priorities from 1 to 10, with 1 being the highest and 10 being the lowest.

| **Task** | **Priority** | **Reasoning** |
| --- | --- | --- |
| **Sensor Data Acquisition** | **1 (Highest)** | **Critical for stabilization and control; requires frequent updates.** |
| **Motor Control** | **2** | **Essential for ROV movement; needs quick response to control inputs.** |
| **Ethernet Communication** | **3** | **Crucial for command processing and data transmission to the land unit.** |
| **User Command Processing** | **4** | **Important for executing user commands; slightly less critical than control tasks.** |
| **Camera Data Streaming** | **5** | **Important for navigation; can buffer data if necessary.** |
| **Communication with Raspberry Pi** | **6** | **Supports other tasks with less frequent data exchange.** |
| **Battery Monitoring** | **7** | **Ensures the ROV doesn’t run out of power; can be checked periodically.** |
| **System Monitoring** | **8** | **Maintains overall system health; can run periodically.** |
| **Battery Pack Management** | **9** | **Important for battery health; can be managed in the background.** |
| **Relay Control** | **10 (Lowest)** | **Likely controls non-essential systems; can run when other tasks are not active.** |

**4. Scheduler Implementation:**

* **Fixed-Priority Preemptive Scheduling** was suggested, allowing higher-priority tasks to preempt lower-priority ones.
* **Implement a yielding mechanism** to allow tasks to give up control voluntarily.