

## Control Systems Engineer: Definition, Scope, and Tasks.

**Key Definition of a Control Systems Engineer:** A control systems engineer designs, develops, and maintains systems that regulate the behaviour of machines and processes to achieve desired outcomes. This role involves creating control algorithms, implementing hardware and software systems, and ensuring optimal performance and stability of the overall system.

**Scope of the Control Team and Their Importance:** The Control Team is essential in the construction and functionality of the ROV. Their scope includes integrating and programming sensors and actuators with the Nvidia Jetson Nano, ensuring seamless communication and control. They are responsible for managing data transmission over Ethernet, setting up camera systems for effective visual feedback, and configuring the propulsion system and user interfaces. Their work ensures that the ROV performs optimally, operates safely, and meets the technical demands of its missions.

### Updated Tasks for the Control Team:

#### **1. Sensor Overview:**

- Review all sensors on the ROV, including IMUs, sonars, BAR30 depth sensor, temperature sensors, and the servo motor for the ZED camera.
- Investigate how to program and integrate them with the Nvidia Jetson Nano.

#### **2. Programming Sensors and Actuators:**

- Explore how to program the Jetson Nano to interface with all sensors and actuators, ensuring proper communication and control.

#### **3. Ethernet Communication:**

- Investigate how to transmit data between the laptop and the Jetson Nano over Ethernet for real-time data access and control.

#### **4. ZED Camera and Servo Motor Control:**

- Look into controlling the ZED camera via its servo motor using the Jetson Nano.
- Handle camera data processing and transmission.

#### **5. Camera Integration:**

- Determine how to connect and integrate multiple cameras into the ROV, ensuring compatibility and efficient data transfer with the Jetson Nano.

#### 6. T-200 Propellers and ESC Setup:

- Investigate how to connect and control the T-200 thrusters, ESC from Blue Robotics, and PWM generator via the Jetson Nano.
- Ensure smooth thruster control.

#### 7. PS4 Controller Implementation:

- Research how to implement the PS4 controller as the primary control interface for the ROV.
- Map its inputs to control the thrusters, sensors, and other systems on the ROV.

#### 8. Kill Switch Implementation:

- Develop and implement a reliable kill switch for the ROV to ensure immediate deactivation in case of emergencies. This system is crucial for safety and will provide a fail-safe mechanism to prevent accidents and control system failures.

#### 9. Water Leak Detection System:

- Research and select a suitable water leak sensor for the ROV. Implement this sensor to monitor and detect any potential water ingress within the ROV's housing. Ensure the system can provide timely alerts and integrate effectively with the ROV's control systems for prompt action.

**Important Note:** Control teams working on this should ensure that the code is well-commented and neatly laid out. Follow Python coding standards, including:

- **PEP 8:** Adhere to the PEP 8 style guide for Python code, which covers naming conventions, code layout, and other best practices.
- **Docstrings:** Use docstrings to describe the purpose and usage of functions, classes, and modules.
- **Consistent Naming:** Use descriptive and consistent names for variables, functions, and classes.
- **Modular Code:** Write modular code with functions and classes to improve readability and maintainability.
- **Error Handling:** Implement proper error handling to manage exceptions and unexpected conditions gracefully.



These objectives cover the main tasks for the control team. However, I expect the team to identify any additional components or systems needed for the ROV, including exploring further electronics for improved control and functionality.

You can look at the sensors, servomotors selected, vice versa by going to 'Chassis & Actuation Team' -> 'ROV' -> 'ROV Design & Expenses' -> 'ROV Expenses'. This is going to be useful to write code even though you don't have the physical product. However, once we buy the components and test the code. We can debug and modify the code if required.