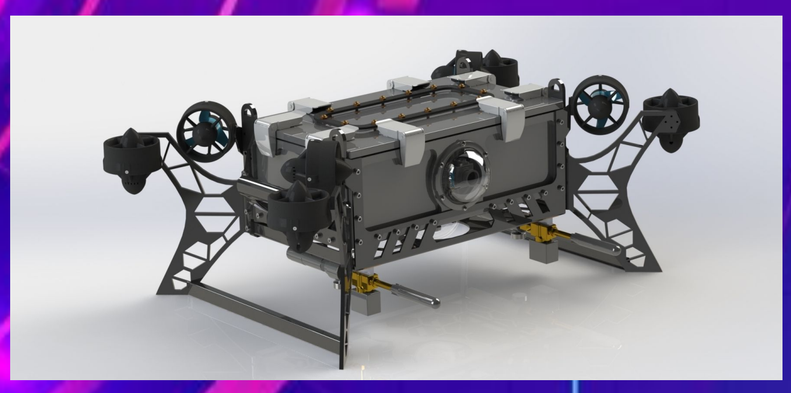
RoboSub

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Background

Lanturn is an autonomous underwater vehicle (AUV) that will be entered into the yearly international Robosub competition. This robot is the result of a collaboration between Electrical and Mechanical Engineer, and Computer Science students. Lanturn must complete a list of tasks without user interference. The robot must be able to understand, see, and localize/analyze objects in the competition surroundings in order to react and interact with them.

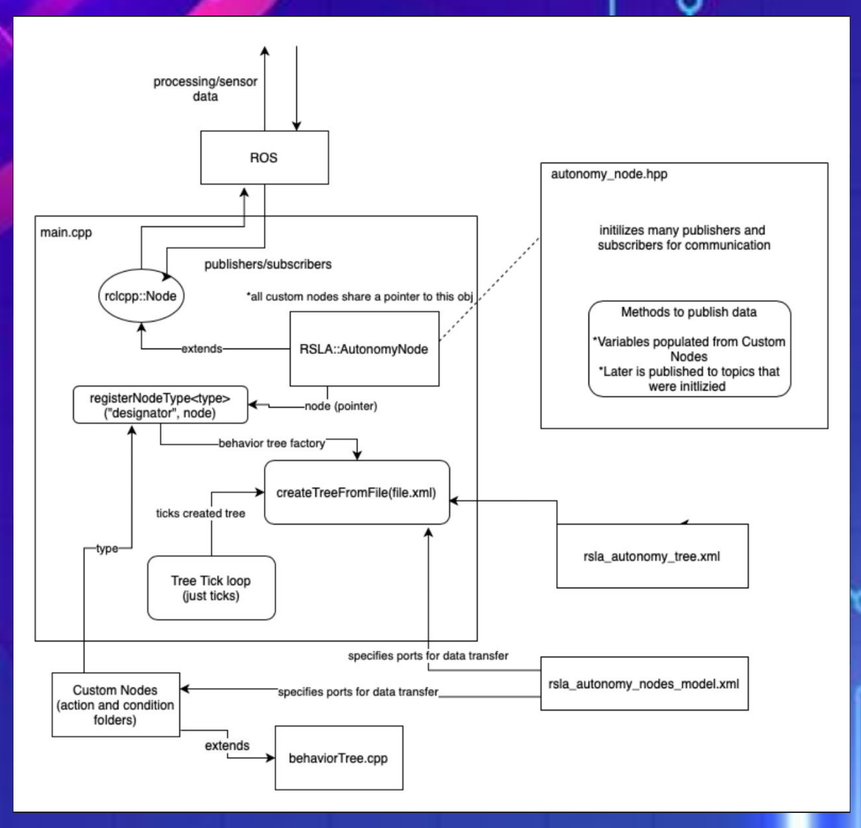


Autonomy

The primary objective of the Fall 2024 semester was to go through the RoboSub repository to understand and practice concepts such as nodes, behavior trees, and setting up environments in Linux using ROS2. The primary objective of the Spring 2025 semester was to start working with communicating with the AUV and writing code for the three new features: a torpedo, claw, and ball dropper, which will be used for the competition.

Controls

The goal for Spring 2025 was to write and implement functionality for the new hardware upgrades aboard the Lanturn sub: the claw, torpedo launcher, and ball dropper. Working with the Teensy 4.0 microcontroller and integrating it into the ROS 2 framework, the Controls team developed software nodes to command and regulate each of these actuators. The team also coordinated closely with Autonomy to ensure these mechanisms could be triggered as part of the sub's mission.




```
}

/*****************************************************************************
  Function: control_claw()
  Date:     April 9, 2025
  Revision: 1.0

  Description:
    This function commands the claw to open or close based on data
    received from ROS 2 and the current reading from the claw's OCM pin.

  Functionality:
    - If `claw_msg.data` is true, the claw will be commanded to open.
    - If `claw_msg.data` is false, the claw will be commanded to close.
    - In both cases, the command will only execute if the measured current
      from `CLAW_OCM_PIN` is below the `CLAW_CURRENT_LIMIT` threshold.
    - If the current exceeds the threshold, the motor is disabled to prevent
      damage or overheating (fail-safe).

  Inputs:
    - claw_msg.data : Boolean from ROS 2 indicating open (true) or close (false).
    - CLAW_OCM_PIN  : Analog pin monitoring current draw.
    - CLAW_CURRENT_LIMIT : Max allowable current before the motor is shut off.

  Outputs:
    - Commands motor control pins:
        - CLAW_ENABLE_PIN : Enables or disables the claw motor.
        - CLAW_CW_PIN     : Controls clockwise motion (open).
        - CLAW_CCW_PIN    : Controls counter-clockwise motion (close).
*****************************************************************************/

void control_claw()
{
  if (claw_msg.data && analogRead(CLAW_OCM_PIN) < CLAW_CURRENT_LIMIT)       /* open claw */
  {
    digitalWriteFast(CLAW_ENABLE_PIN, 1); /* enables the motor */
    digitalWriteFast(CLAW_CW_PIN, 1);     /* Sets the motor direction to clockwise */
    digitalWriteFast(CLAW_CCW_PIN, 0);    /* Turns off the counter-clockwise input */
  }

  else if (!claw_msg.data && analogRead(CLAW_OCM_PIN) < CLAW_CURRENT_LIMIT) /* close claw */
  {
```

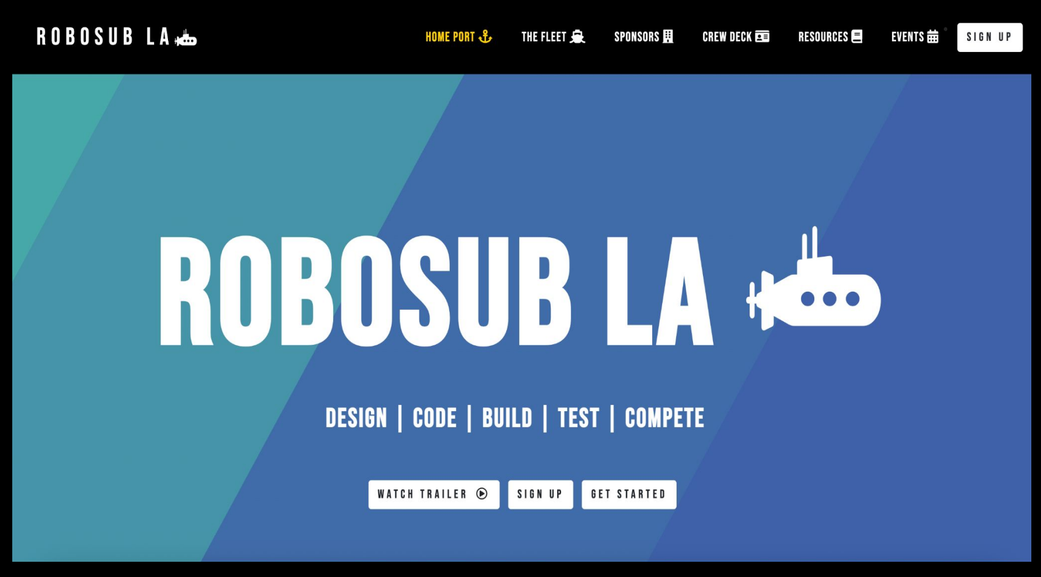
Computer Vision

The Computer Vision team has focused on developing the "eyes" of the Lanturn AUV, enabling it to detect and recognize objects in its environment. Leveraging the open-source OpenCV framework and the YOLO real-time object detection algorithm, the team worked on capturing and processing raw video feeds, training the system to identify relevant objects, and ensuring accurate recognition. Key targets include multicolored lanes, buoys, targets, and images.

RoboSub Website Redesign

The RoboSub website has undergone a complete redesign, moving from its previous rustic state to a sleek, modern, and contemporary experience. Built with **React**, the new site harnesses the power of **React Hooks** and optimized dependencies for a seamless, responsive interface. To ensure a structured and visually appealing design, **Bootstrap** was integrated, enhancing both functionality and styling with clean, intuitive CSS.

This overhaul brings not only a fresh aesthetic but also improved usability and performance, creating a dynamic hub for RoboSub's latest innovations and community engagement.



//TECHNOLOGIES//

YOLO · ROS · OpenCV · Linux · kubuntu