Miramar Water Jet's Sleepy Fishy 3.0: Robosub 2026 Technical Design Report

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Abstract–This technical design report outlines Miramar Water Jet's autonomous underwater vehicle (AUV): Sleepy Fishy 3.0. The Miramar Engineering Club aims to bring students from all fields together to cooperate and complete engineering projects, regardless of their level of education or background. Through the revival of a 2018 AUV, the Miramar Water Jets upgrades the electrical and software subsystems. Key modifications for 2026 include the integration of an Nvidia Jetson Nano running ROS 2, a DWE HD Explorer camera for underwater vision, new ESCs, upgraded batteries, and an actuator with flyback diode protection.

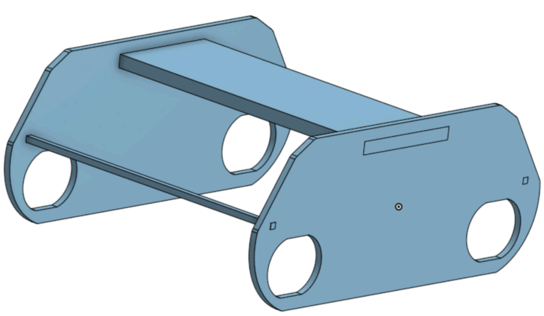


Fig. 1: Sleepy Fishy 3.0 chassis

I. Competition Strategy

Based in a community college, the Miramar Engineering Club must address the distinct obstacle of student turnover every semester. Moreover, this year, the team had to pivot from remotely operated vehicles to autonomous vehicles due to funding complications. With the acquisition of an autonomous underwater vehicle (AUV) developed in 2018 [1], the team–comprised of mostly new faces–have decided to repurpose the AUV into Sleepy Fishy 3.0 for the 2026 Robosub competition. This pivot required significant investment in the understanding of existing hardware and software before any modifications were made.

With these constraints, the team's strategy is centered around upgrades that target the electrical and software subsystems while minimizing mechanical modifications. This approach allows the team to focus on improvement rather than replicating the same AUV.

The primary competition goals are:

1) Successfully navigate through the start gate through dead-reckoning.
2) Attempt the slalom task with the same approach for the gate.
3) Integrate computer vision centered gate detection through the YOLO26n model.

These goals ensure that the AUV is able to attempt and complete tasks even if computer vision capabilities are not yet robust at the time of the competition. Moreover, by emphasizing the gate and slalom tasks, the team allocates their limited time and budget to achieving these goals while also leaving room for computer vision based navigation that can be improved on by the next cohort of members.

II. Design Strategy

A. Mechanical

The Sleepy Fishy 3.0's chassis is kept from the 2018 design [1] with slight modifications to save on costs. The frame is constructed from High-Density Polyethylene (HDPE) that measures to approximately 74 x 63 x 32 cm (see Fig. 1) with aluminum mounting brackets. The waterproof enclosure is a 6-inch diameter, 49 cm long acrylic cylinder that is secured with stainless steel U-bolts wrapped in a protective rubber coating. Six Blue Robotics T200 thrusters are mounted in a vectored configuration (see Fig. 2) with newly added 3D-printed motor guards for safety concerns.

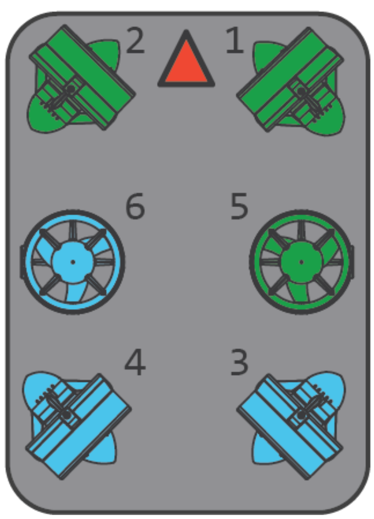


Fig. 2: Thruster configuration

B. Electrical

ESC Replacement: The original electronic speed controllers (ESCs) that were integrated with battery eliminator circuits (BECs) were replaced with Maxynos 2-6S bidirectional ESCs. This modification reduces heat generation as the BECs of the original ESCs generated a significant amount of heat within the sealed enclosure that caused thermal issues during extended operation. The Pixhawk servo rail is now powered by the mRobotics AUAV ACSP4 power module (see Fig. 3).

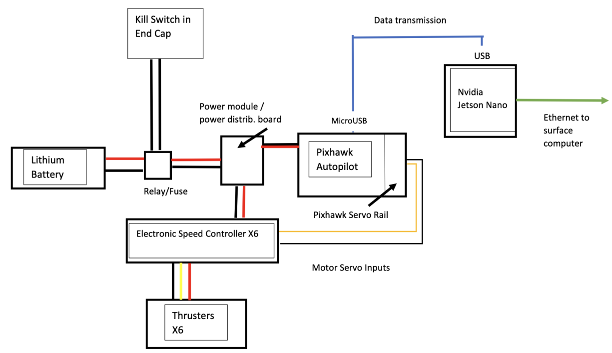


Fig. 3: Electrical schematic

Actuator: The previous actuator was replaced with a new Nilight 12V 120A starter relay which introduces a flyback diode to suppress voltage spikes during switching. Additionally, a fuse is added to the circuit to ensure safety.

Battery: The AUV is now powered by two Ovonics 3S-2P LiPO batteries that are rated at 15,000 mAh, 11.1V, and 130C discharge. These new batteries are an increase from the previous 4S 10,000 mAh battery which allows for longer dive times and higher current delivery for the thrusters.

C. Computing

The team voted to transition from using an Nvidia TX-1 to an Nvidia Jetson Nano due to the previously used TX-1 no longer being in service and a replacement costing substantially more than the Nano.

Having acquired a brand spanking new Deepwater Exploration ExploreHD epoxy camera from our lovely sponsors, the previously used Zed Cam was replaced in favor of the ExploreHD's clearer video and superior ease of use.

D. Software

The team is transitioning from PyMavLink to ROS 2 Humble as the middleware framework which is running within a Docker container on the Jetson Nano. This containerized approach is necessary due to the lack of native support of ROS 2 Humble on the Jetson Nano's operating system.

For computer vision, the team is developing two approaches: training a Yolo26n model and utilizing OpenCV-based color detection.

In the event of the team's computer vision software not being operational, dead reckoning will be employed. Dead reckoning is the practice of preloading a list of actions for the AUV to perform based on the assumed speed of the sub and obstacle layout.

III. Testing Strategy

The majority of testing surrounding the dead-reckoning contingency revolved around measuring the speed with which the AUV moved, both linear and rotational. The vertical movement was highly dependent on its buoyancy, another system which required a solid amount of testing. Originally, foam was used to maintain neutral buoyancy in the AUV, but the team decided to pivot to a more adjustable system involving water bottles. This system proved to be more convenient and is the system that will be used in the future. Once the team finished nailing down the basics of locomotion for the AUV, the next step was programming the Nano to spin the motors on its own, something that was successfully accomplished. The final major component of our testing was detection of the prop gates. The team found a rudimentary algorithm for detecting vertical lines in a picture and adapted it to work for the AUV.

IV. Acknowledgements

We recognize that San Diego Miramar College sits on the ancestral homeland of the Kumeyaay people who have lived in this area for over 10,000 years and honor the past, present, and future stewardship of this land by Kumeyaay peoples. We acknowledge our occupation of unratified treaty territory and the systemic injustices that occupation of this land has perpetuated for Native peoples of this region. We pay respect to the indigenous people of San Diego County - past, present, and future - and their continuing presence in their homeland and throughout their historical diaspora [3].

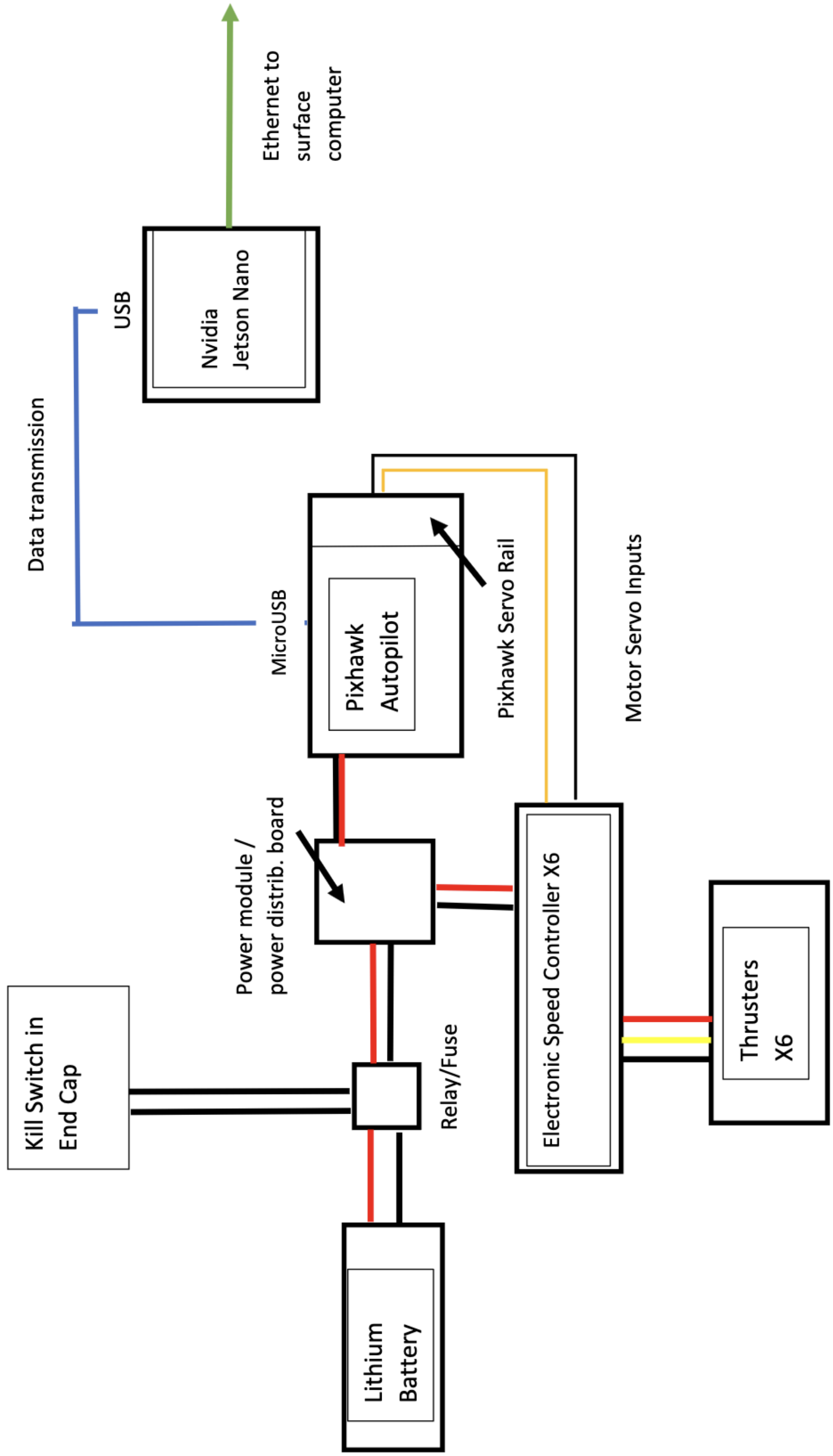
The San Diego Miramar College Engineering Club would not be able to succeed in this endeavor without the assistance provided by many people and organizations. We would like to thank, first and foremost, Professor Bocicchio for her incredible dedication to this club, we wouldn't be where we are today without her. We would also like to thank the physics department at Miramar College and the staff at the Ned Baumer Aquatic Center for providing us a space to work and learn. We thank the Miramar College Associated Student Government, the Miramar MESA Program, the Marine Technology Society, and DeepWater Exploration for providing this program with the funding and equipment necessary to turn our ideas into a reality. Finally, we would like to thank Franklin Industries for their help in machining parts for our AUV.

V. References

[1] G. Angel et al., "San Diego City College Autonomous Underwater Vehicle: Design and Implementation of the Zoidberg AUV," 2018.

[2] San Diego Miramar College, "Creating a Meaningful Land Acknowledgment at Miramar College," San Diego Miramar College, 2022. https://sdmiramar.edu/services/lead/landacknowledgment

Appendix A: Electrical System Schematic



Appendix B: Component Specifications

	Vendor	Model/Type	Specs	Custom/Purchased	Cost	Year of Purchase
Buoyancy Control						
Frame	N/A	Custom	74x 63x32cm HDPE/AL	Custom	N/A	N/A
Waterproof Housing	Eplastics	6" enclosure	49cm L, acrylic	Purchased	$253	2026
Waterproof Connectors	TE Connectivity	WET-CON connectors	1-16 contacts, 19A, 20K psi max		donated	2018
Thrusters	Blue Robotics	T200 x 6	watercooled	Purchased	$1380	
Motor Control	Maxynos	2-6S ESC with XT60 Conn	45A Bi-Directional	Purchased	$170 (6)	2025
High Level Control	Blue Robotics	Pixhawk 1 with FPU	32-bit ARM Cortex M4 core	Purchased	$200	2018
Actuators	Nilight	Starter Relay	12V 120 A	Purchased	$21.54	2026
Propellers	Blue Robotics	Propellers for T200	3 CW 3 CCW	Purchased	$30	2018
Battery	Ovonics	3s-2p Lipo Battery x2	15000mAh 11.1V 130C	Purchased	$140	2026
Converter	N/A				donated	2020
Regulator	mRobotics	AUAV ACSP4	5V, 12V regulated power module	Purchased	$40	2018
CPU	Nvidia	Jetson Nano	cortex A-57 x4	Purchased	$100	2020
Internal Comm Network	USB					
External Comm Interface	Ethernet					
Compass	Blue Robotics	ST Micro LSM303D	accelerometer and magmetometer	Purchased	see Pixhawk	
Inertial Measurement Unit (IMU)	Blue Robotics	Invensense MPU 6000	3 axis gyroscope/ accelerometer	Purchased	see Pixhawk	
Doppler Velocity Log (DVL)						
Manipulator						
Algorithms						
Vision	Open CV					
Acoustics						
Localization & Mapping	Custom					
Autonomy	Custom					
Open Source Software	pymavlink					
Inter-Vehicle Communication						
Programming Language(s)	python					