Code Warriors Team

MATE International ROV Competition

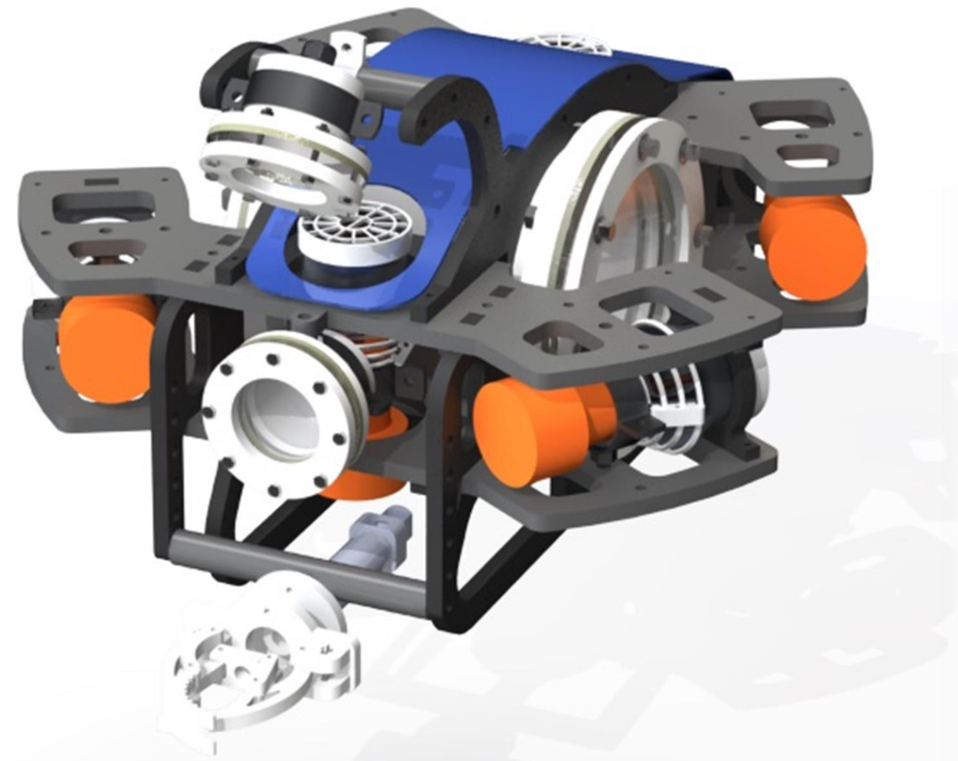
2019 – Ranger Class

Design Rational

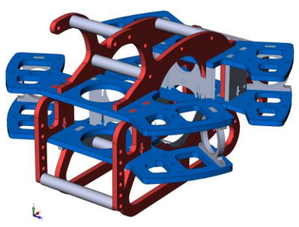
We started the design phase keeping in mind that we are participating in the competition for the first time. Learning from the previous experiences of the other teams was our philosophy.

Mechanical System: The design strategy started with thrusters selection according to the local market limitations, thrusters configuration, electronics enclosure configuration, cameras selection and positioning, gripper selection and finally frame design and optimization as shown below.

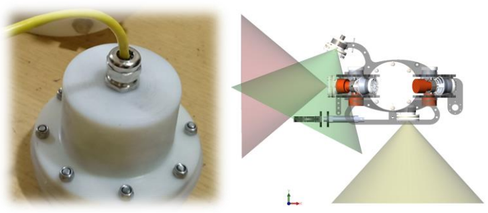
Electrical System: It is designed in order to provide power and communication through all the sensors, actuators and cameras with minimal power consumption and with simple circuitry. The ROV is surface-powered by a 12 volt external power supply powering the relays, cameras, sensors and lighting systems. The ROV is controlled by a joystick in the control station besides the pool through a communication system and the cameras are displayed on an external LCD screen.



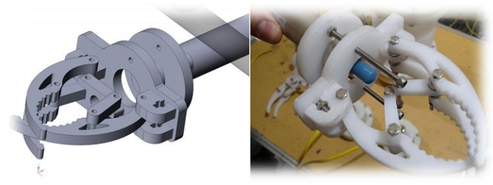
GRANICHO ROV assembled



Chassis
An optimized design for the chassis to maximize the rigidity and minimize the weight. Fabricated out of 10 mm German Artylon using CNC machine which is an perfect choice due to its safety features and similar density to water



3 X Cameras
It is modified security camera system with water sealing fabricated using Artylon tubes, DVR and external 19 inch monitor

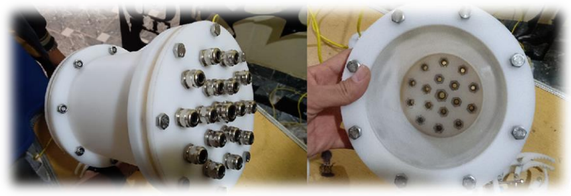


Gripper
Pneumatic four-bar gripper mechanism fabricated out of an 8 mm polyamide sheet using CNC Machine

GRANICHO ROV disassembled

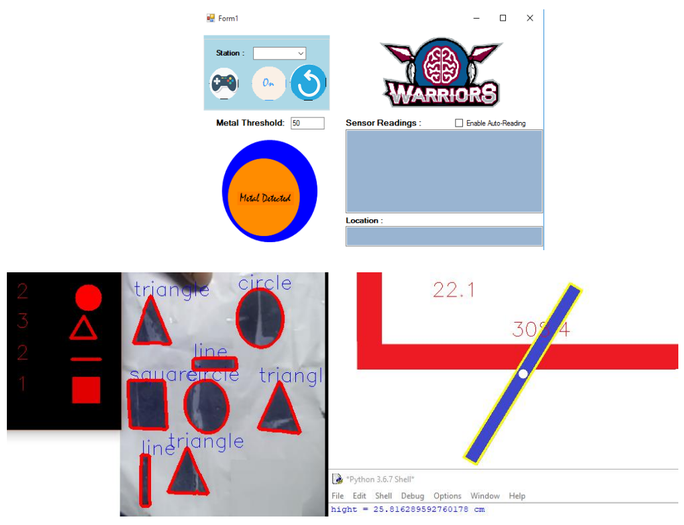
6 X Thrusters
modified using bilge pump, couplers, propellers and aluminum nozzles

Control Station
The main control panel consists of a DVR, an LCD HP screen, an Ardunio Nano, and an RS485 module included in the station PCB. A gaming pc Joystick is used for controlling the ROV motion

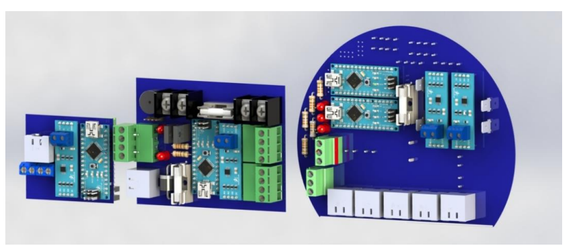


Electronics Enclosure
Made for keeping all the electronics safe from water using a special design made out of a lathed Artylon cylinder. It has transparent side and another solid with glands for the wires

Safety Features
Granchio has smooth curved edges with no sharp corners. Thruster guards completely cover any openings to prevent entry of foreign objects.
Short circuit and over current protections and fuse with an isolated casing are provided.
Warning labels are placed on thrusters and moving parts, high-pressure parts and electrical components to insure that anyone in contact with the ROV is fully aware of the possible hazards.



GUI and Image Processing
Our GUI is implemented using “Processing” java-based programming software. It receives data from the PC Joystick as well as providing the vehicle important information. Image processing is used to determine the length of different objects in the water. We are using the down camera to receive the video, send it from the DVR to the Laptop through the ethernet cable and then applying the image processing algorithm.



Printed Circuit Boards (PCBs)
3 PCBs containing two Arduino Nano boards for the control, RS485 for communication and multiple other components. We followed a mother board approach in our design to combine all components and microcontrollers to decrease wiring as much as we can