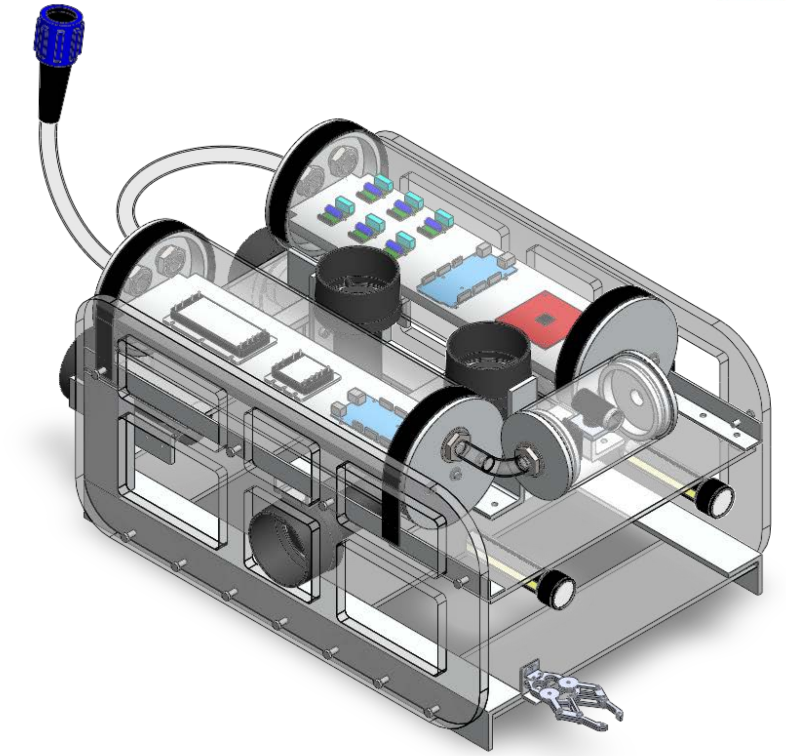

Underwater Remotely Operated Vehicle

University of New Hampshire

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ABSTRACT

The University of New Hampshire Remotely Operate Vehicle (ROV) is an interdisciplinary team devoted to designing, building, testing, and competing with an underwater ROV. UNH ROV currently consists of students studying mechanical engineering, computer engineering, and computer science. The team will participate in an international and intercollegiate competition in the spring of 2014. The competition will be held by the Marine Advanced Technology Education (MATE) Center. This project provides an opportunity to apply our knowledge in engineering, including fluid dynamics, systems and controls, finite element analysis, machining, and computer science. In order to maximize time efficiency and each team member's specific strengths and interests, the team is split into three subgroups: chassis, propulsion, and controls.

The chassis subgroup drew inspiration from past ROVs as well as commercial ROVs while adapting these designs to fit the mission tasks of the MATE competition. The responsibilities of the chassis subgroup are to design and construct the ROVs frame and buoyancy system. The 2013-2014 ROV was designed to fulfill the competition requirements while maintaining a degree of simplicity. The ROV chassis main goal was to minimize size. Size proved to be a problem in last year's ROV and the MATE competition this year has a solid size requirement having to fit through a 75cmx75cm square hole. The chassis also wanted to keep slight positive buoyancy as a failsafe in case of electronic failure during testing. Symmetry was pivotal in the design of the frame. By keeping the ROV as symmetrical as possible, the center of mass and buoyancy stay close to the center of the vehicle, which is ideal for maneuverability. The chassis team is also in charge of waterproofing electronics and mounting the tether to the ROV keeping the tether relieved of strain for safety purposes.

The propulsion subgroup is in charge of and is responsible for providing the ROV with maneuverability. Achieving a propulsion system that provides the vehicle with maneuverability requires that the propulsion subgroup work very closely with the rest of the subgroups; chassis and controls. This year, the propulsion team decided to use six BTD-150 thrusters manufactured by Seabotix, or two for each of the three translational degrees of freedom. This configuration also allows for both pitch and yaw control; roll was considered unnecessary for the required mission tasks.

The controls group is tasked with writing the software that controls the ROV and extracts data from the ROV. In writing this software, the team hoped to make controlling the ROV quick and effective. The software should be robust but also easy for the operator to use. It should respond to user input quickly and return data from the ROV in a timely manner. It should be written in a clean manner to ensure that others who read the source can understand how it works and modify it easily. It should be able to deal with issues that may arise and either handle the situation or alert the operator. Overall, the goal for the software was to make it functionally robust and easy to operate.

One of the software components for this project is the GUI that is run from the laptop by the operator. The GUI is written in Java, which allowed the team to create and modify the program quickly and with relative ease. This also allows it to be run on multiple platforms with little effort. The GUI connects to the on-board computer using TCP sockets over an Ethernet connection to send and receive data. This allows the team to send and receive data to easily leveraging existing protocols. This GUI performs several tasks for the team. It interprets commands from a connected PS3 (Playstation 3) controller and uses the input to control thrusters on the ROV. The face buttons are used to select which thrusters are powered, the analog stick controls the amount of power the selected thrusters should receive, and a shoulder button allows the direction to be changed. On top of this, a panel on the GUI shows which thrusters are activated and the

direction in which those thrusters are running. This allows the operator to easily see what thrusters the GUI is telling the ROV to activate.

SYSTEM INTEGRATION DIAGRAM