Phoenix Robotics

2015 MATE Technical Report

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Our Company

The Phoenix Robotics Vision

Here at Phoenix Robotics we specialize in designing and building remotely operated, submersible vehicles. Our machines are capable of surveying many different environments and can perform a variety of tasks and challenges. We believe that curiosity and exploration is the foundation to great new oceanic discovery and we aim to provide our clients with the tools necessary to conquer this new frontier.

Deep sea exploration yields countless new opportunities for research and discovery of new species but because of harsh conditions and hazards underwater, it's sometimes not safe enough to send people to perform these tasks. Remotely operated vehicles (ROVs) can go where humans cannot travel. With the ability to withstand higher pressures, navigate in small spaces, and with the help of various sensors, see things humans cannot, ROV's are qualified to venture further than any human has gone.

The latest ROV model designed at Phoenix Robotics, the NAUTILUS-71, was made to investigate the arctic depths, repair and inspect pipelines, and provide maintenance for offshore oilfields. The NAUTILUS-71 is perfect for people working in challenging arctic environments and small work areas. Its potential is unprecedented and combines the best design features from all of our ROVs thus far.

(where are your names)

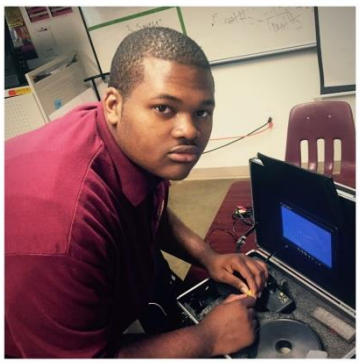
Meet the Team

Klarissa Cortez
Chief Executive Officer
Florida Polytechnic University
Nanotechnology and Multi-Purpose Materials

Tyler Stultz
Pilot/Chief of Engineering
Hillsborough Community College and University of Central Florida
Aerospace Engineering

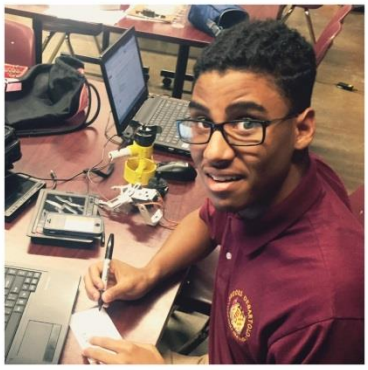
Jaalin Harvey
Media Director/ Tether Manager
Florida Polytechnic University
Geometric Dimensioning and Tolerancing

Daniel Hauser
Co-Pliot
California Polytechnic
Aeronautical Engineering



Justin Mitchell
Systems engineering/Tether
Florida Polytechnic University
Multipurpose Materials

Ben Glow
Public Relations director/
Photography
Standford
Biochemistry



John Fernandez
Chief Financial Officer
Florida Polytechnic University
Geometric Dimensioning and Tolerancing
Cyber Gaming and Concentration

Eric Fernandez
Mentor
Universidad Internacional de Andalucia
University of Kentucky
University of Florida
Conservation, Mamangement and Control of Endangered Resources

Mission Abstract

Science under the ice:

We are going to maneuver our ROV through a 75cm by 75cm hole in the ice. After that we are going to collect a sample of form the underside of an ice sheet, then collect a urchin on the floor, then we use a species identification handbook to count and determine the species of sea star. Afterwards deploy an acoustic sensor in a specific/ designated area. We use coordinates to map the location an iceberg; next we use the location, the heading, speed and depth to determine the threat level of iceberg to the oil platforms

Subsea pipeline inspection & repair:

We will conduct a close visual inspection of an oil pipeline to see for corrosion then turn a valve to stop flow of oil. Afterwards, we examine a gauge dial and determine if the pipe oil pressure is zero, then we measure the length of the section of the corroded pipe then attach the lift line the corroded section. We cut and remove the section of the section of the corroded pipe and return it to the surface. We will then install an adapter flange over the cut ends of the pipe; we then install a gasket into the wellhead.

Offshore oilfield production & maintenance:

We test the grounding of anodes by measuring the voltage of specified points along the leg of an oil platform; we then determine which anode is not properly grounded. Measure the height of a wellhead from the seafloor. Afterwards we use a map to determine the pathways of flow through a pipeline system, we turn valves to ensure that oil will flow through the specified pathway, and push water through the pipeline system to verify that oil will flow through the correct pathway.

Meet the Machine

NAUTILUS-71

Key features:

- 4 Underwater Motors
- 40 Feet of Tether
- 4 Underwater Cameras with Lights
- Hydraulic Manipulator/Claw
- Conductivity Probes
- Topside Color Monitors
- Structural Space to Easily Interchange Payloads

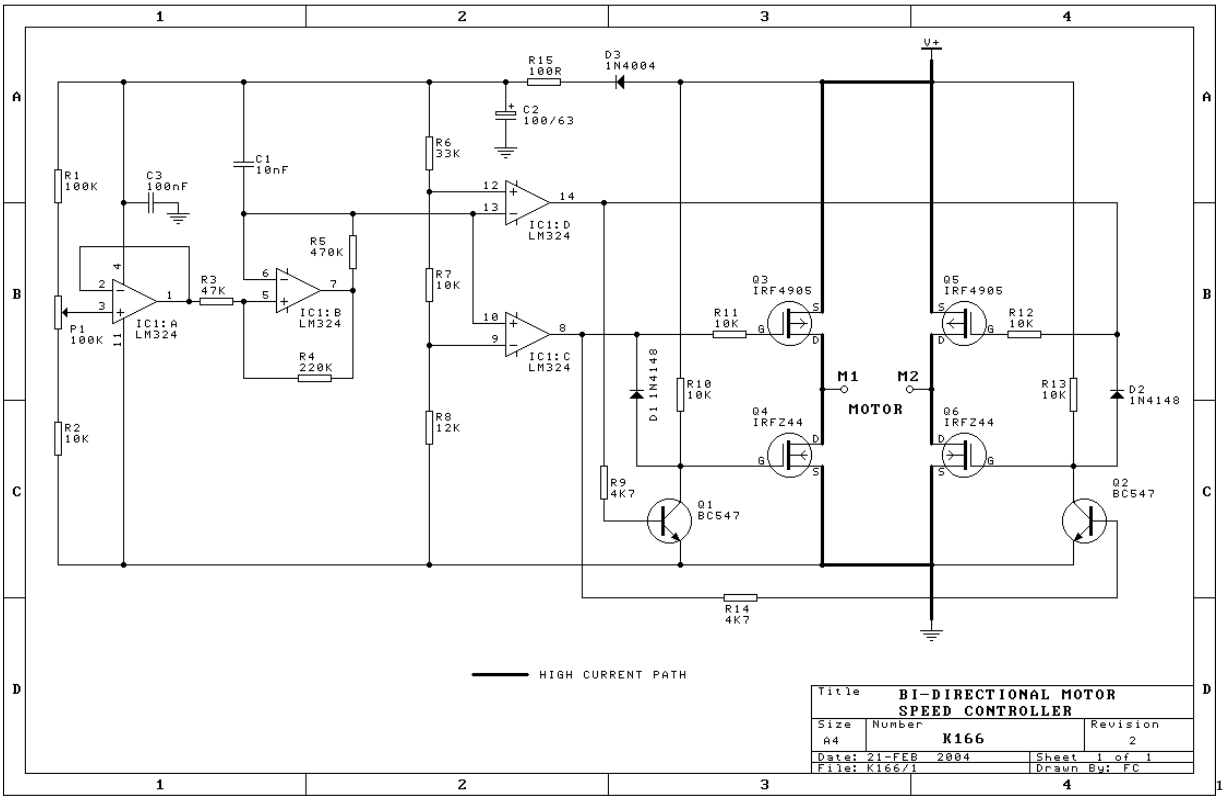
Design:

Our current design, the NAUTILUS-71, was made with specific tasks in mind to efficiently perform in Artic areas. The ROVs shape was derived from the MATE Triggerfish design and modified slightly to accommodate a wider variety of payload. After the regional competition we decided against using the control box designed by MATE as we noticed a few flaws and, while working with it, came to realize it was rather difficult to modify/upgrade.

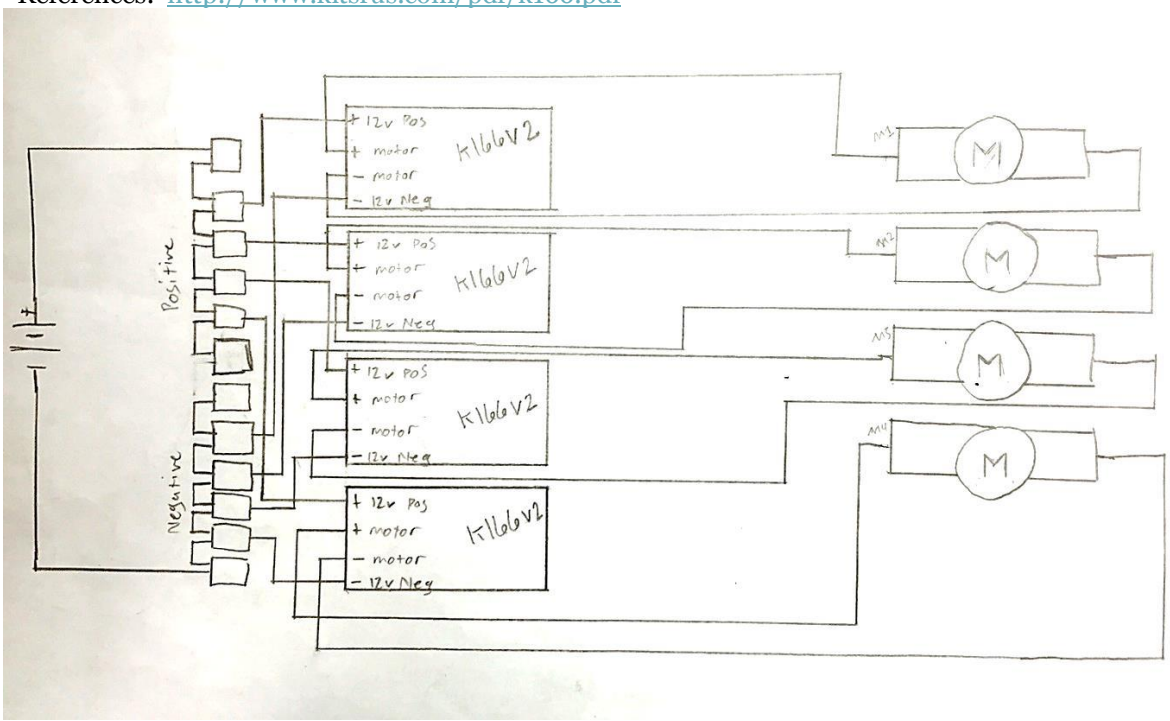
Many of our supplies were reused or taken from other projects/previous ROVs. As such, we saved a lot of money on materials and were able to greatly improve upon our earlier designs.

Our previous machines have varied greatly in both shape and size, from cuboidal to our current prism-like shape.

System Schematics



[1] References: http://www.kitsrus.com/pdf/k166.pdf



Financial Report

RCA DPTM70R 7-Inch 60Hz 480 x 234 LED-Backlit LCD TV (Black)	$20.00	4	
NTSC Version - Tiny Mini Bullet Camera 520TVL with 8PCS LED IR Invisible Glow	$64.39	8	
330 Ohm ½ watt resistors	$3.74	8	
Terminal Strip	$2.99	1	
Banana Plugs	$3.95	1	
Blade Fuse holder	$2.29	1	
15 amp blade fuse 60 pcs	$1.99	1	
Power cord stress relief connector	$17.99	2	
Octura Propellers	$7.26	1	
Propeller Adapters 4pcs	$5.25	1	
1/2 PVC slip/threaded adapter	$4.49	4	Local middle school
PVC cross	$2.99	1	Local middle school
Octura Propellers	$2.90	1	Local middle school
Propeller Adapters 4pcs	$2.99	1	Self fund.
Screws and nuts 10pcs	$2.90	1	Self fund.
Dorming at local university	$120.00	8	Self fund.
Plane tickets to St.Johns	$800.00	8	Self fund.
Total budget	$9,896.72		

Technical Challenges

Projections for the Future

As a team we have come a long way dealing with communicating during the competition to the construction of the ROV. We have come a long way from when we used to use analog. We are now headed to the use of Arduino controllers and mechanical parts that will help our team greatly in future competitions, along with trying new frame models that might or might not prove to be more efficient to future challenges. We also plan to make it where we will have two operators on the ROV one of which will be running the motors and the ROV as a whole while the other will be operating the mechanical components such as manipulators and other arms. Our plan with the camera system is to set it up in the middle of the ROV and have a panoramic view.

Acknowledgements

We Would Like to Thank:

-The Cortez family for using their pool to test all of our equipment

-Brooks DeBartolo Collegiate High School for providing the establishment (lab) and some of our funding for all four years

-Erica Moulton for providing us with the opportunity to participate in MATE events

- Marine Advanced Technology Education Center, our competition organizers who have challenged us to create a greater product, and for providing this wonderful opportunity for us to compete with so many different teams across the world

-Eric Fernandez for giving us the knowledge to create advanced machinery to perform task

-Steinmetz for providing us with a grant for PVC in order to modify our machine

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