

PVIT ROV

Palos Verdes High School

Students

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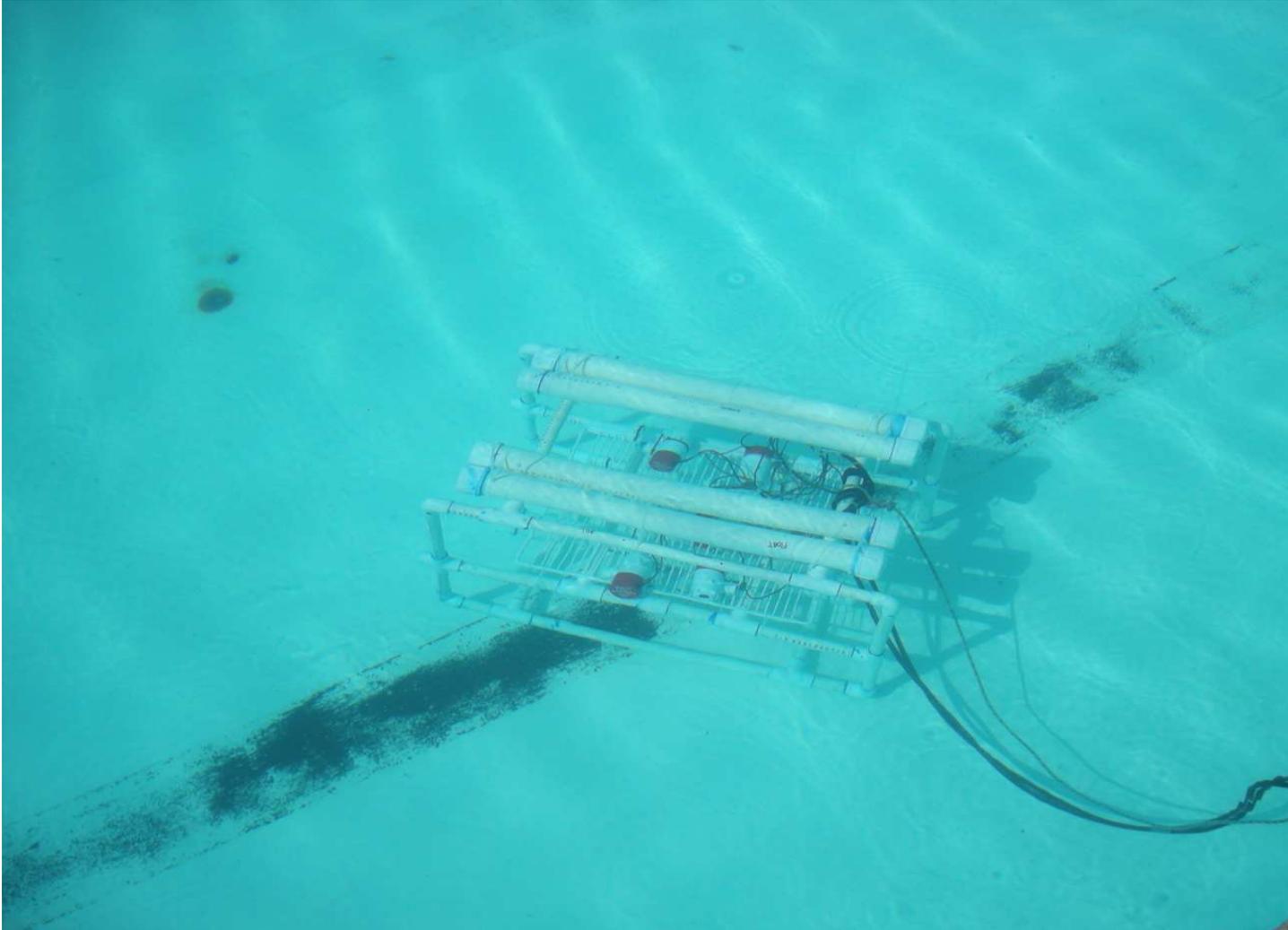
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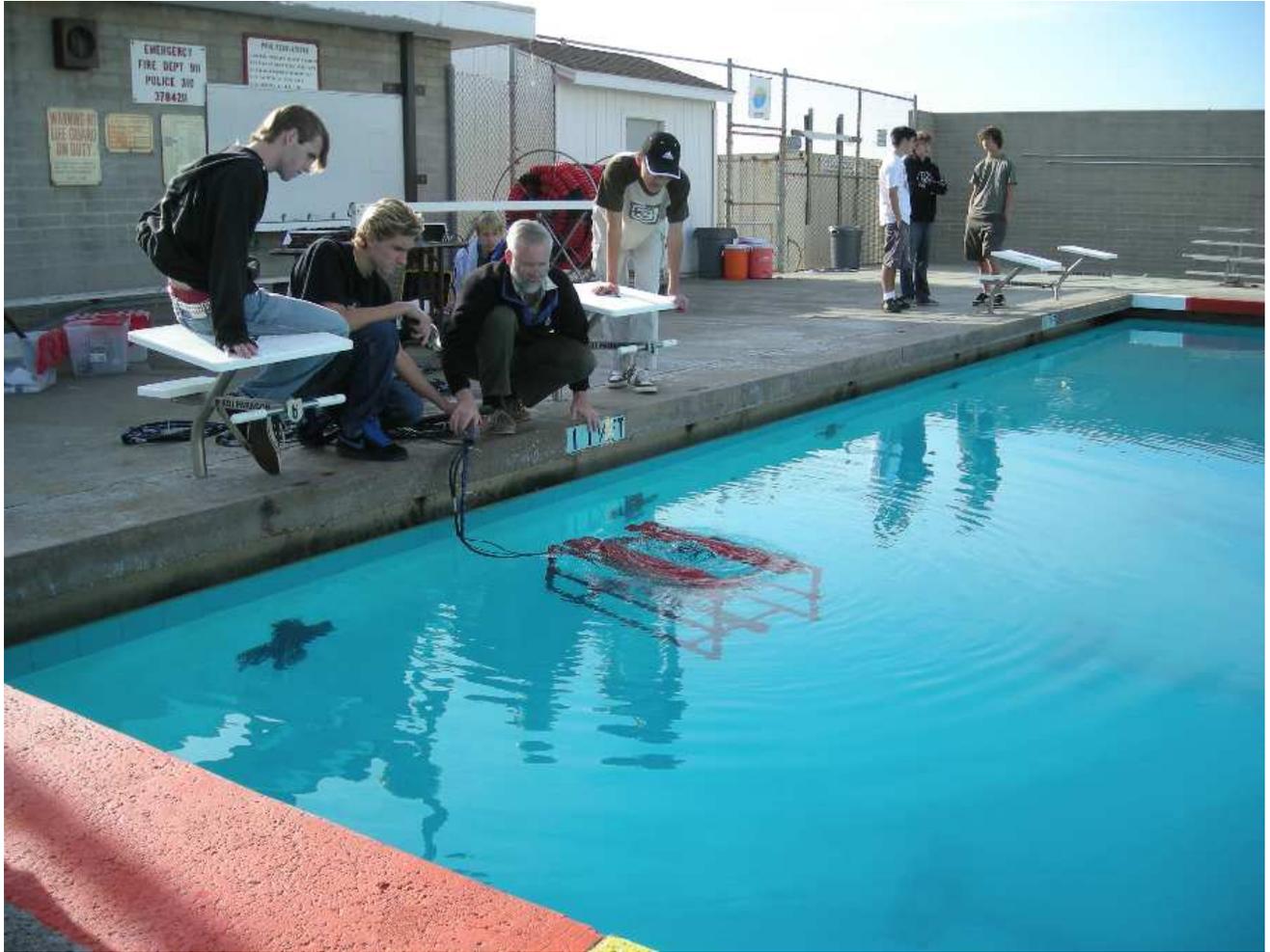


Abstract

The six member team from PVHS PVIT Club first decided to design and build an Underwater Remote Operated Vehicle (ROV) to explore the ocean off the Palos Verdes Peninsula and nearby Catalina Island. A high quality camera was chosen for use in the ocean, to bring back high resolution images. Then the ROV Competition was identified and the team became interested to compete. A grabber arm was designed to pick up samples. The team developed good team work skills while overcoming challenges and obstacles.

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Photograph(s) of completed ROV

Budget/ Expense Sheet

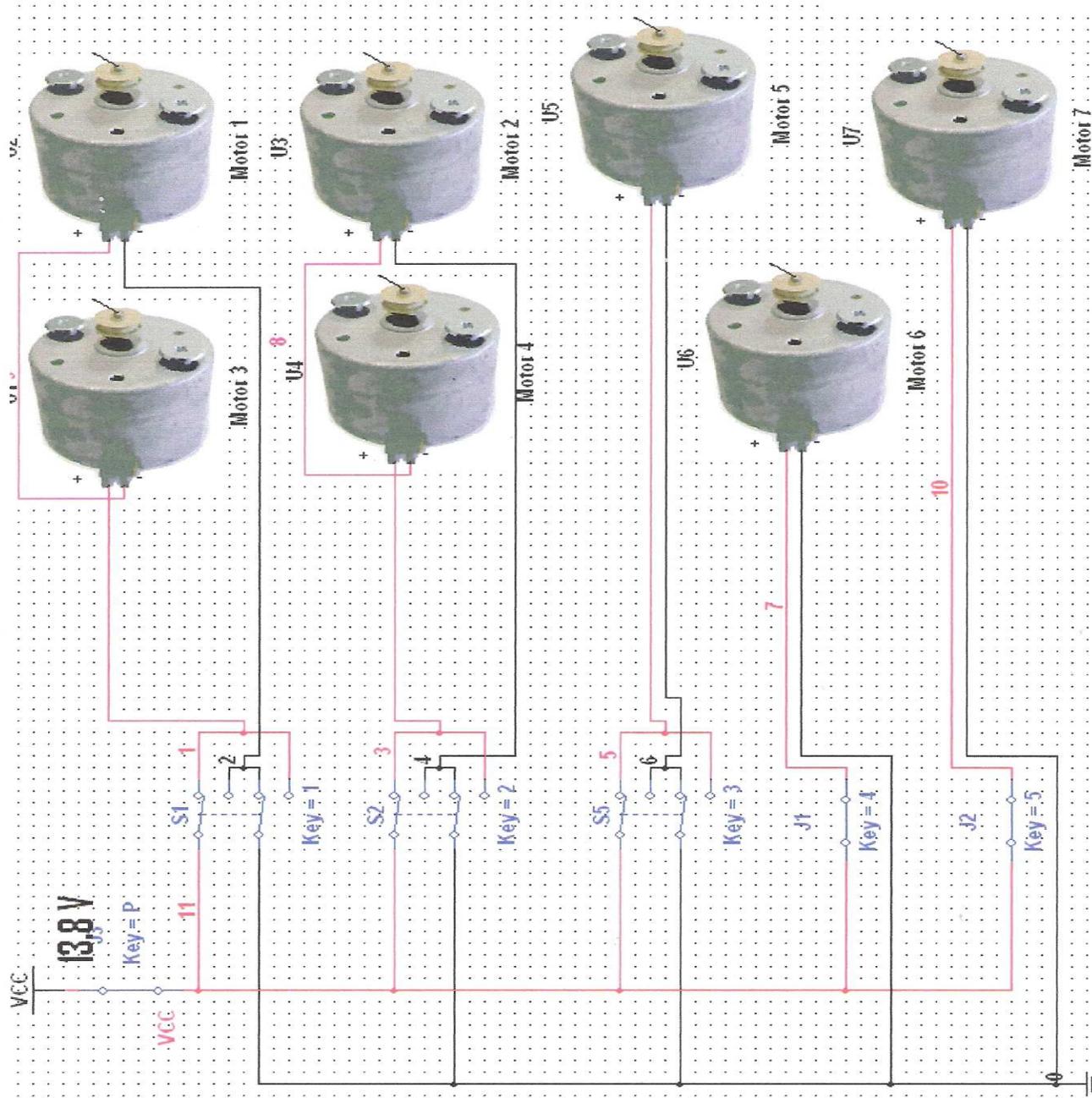
- Purchased
 - Frame- \$50
 - large pumps- \$40/ pump (6 total) \$240
 - small pump- \$30
 - basket- \$30
 - camera (including monitor and DVR)- \$1200
 - control wire- \$30

Total \$1,580

- Donated
 - Tether wire

Electrical schematic

- Power and Control box with Fuse [25 amp]
- Strength rope used instead of pulling on electrical wires
- Same power source for everything



Design Rationale

The original purpose of the PVIT ROV design was to create a vehicle which could explore the ocean for fun. The team wanted to film underwater fish and stuff at Catalina Island, and planned to show film on the high school news network (Live From 205). The team chose to use inexpensive and durable materials. The materials selected were common materials that were readily available, (PVC pipe, bilge pumps, and a pooper scooper. In contrast the team chose a premium camera that would provide a good underwater image and provide needed reliability.

One Challenge

During the building process we gained many skills from over coming obstacles. The one that we are most proud of is our ability to improvise and jury-rig things that would fit and function on the vehicle. For example our first attempt at the grabber arm, the fruit basket, could grab rocks but couldn't pick them up. We decided to make a stationary arm a grabber arm that did not have to move to drop the object it had picked up. Our solution was to take an ordinary wire drawer on rollers and put it below the grabber. After the arm would pick something up the basket would roll out and catch the object.

Troubleshooting technique(s)

1. Check power supply
2. Make sure power and master switches are turned on
3. Check fuse inside control box
4. Check for exposed wires
5. Check for possible shorts

One lesson or skill gained

The most important skill we gained was teamwork – using everyone’s strengths. The designing and building of the ROV was the product of everyone’s skills, mechanical, electrical, report writing, creativity and trouble shooting.

We quickly realized that everyone had different strengths:

Thomas – electronics and innovation

Jamie – mechanical and innovation

Tim – innovation and design

Amy – business manager and organizer

Will – ideas, creativity and enthusiasm

Harrison – all around support

In order to use everyone’s skills and strengths we needed to learn to listen to the ideas from other team members, and combine their ideas with our own.

Future improvements

In the near future, we plan to put pumps on the back of the ROV so it can tilt forward and back. This will make it easier to control the pitch of the arm, and give us better angles of attack. The pitch control will also help when trying to resurface with extra weight in the front. We also plan to upgrade our up/down motor from an 1100 g.p.h. to a 1750 g.p.h. pump. Throughout the whole process of improvements, we are always going to have to worry about being able to reballast it.

Scientist that uses ROVs to study mid- oceanic ridges

Submarine Ring of Fire

In 2007, the New Zealand American Ring of Fire exploration expedition first saw the Brothers volcano caldera for the first time using an ROV. The ROV, using sonar, was able to transmit back to the boat the topography of caldera and show the hydrothermal ventilation activity off the top of the volcano. Research made by this expedition, allowed discoveries to be made that could have never before been possible. On board with this exciting research was ABE Team of Dana Yoerger, Al Duester and Andy Billin in addition to Colin Devey, the Chief Scientist, and Thomas Kuhn, the ROV Team Leader. All were astonished with the amazing beauty and magnitude of the caldera.

Reflection of Experience

Construction of our R.O.V. truly was a learning experience for all of us. We learned new skills. We refined old ones. Every time we worked on the R.O.V. we learned something new, be it computer wiring skills or simply how to correctly ballast the vehicle. Every member of our team has gained something uniquely positive from our time working together, and everyone learned how to work with others and on a team. The experience was extremely positive, and worth every second.

References

REFERENCES: <http://www.oceanexplorer.noaa.gov/explorations/07fire/logs/aug16/aug16.html>
<http://www.whoi.edu/oceanus/viewArticle.do?id=34926&archives=true>

Acknowledgments

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